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EVALUATION OF THE EXPANDED PROGRAM ON IMMUNIZATION INFORMATION SYSTEM AND KAP SURVEY COVERAGE ANALYSIS

USAID/Quito

November 1987

Resources for Child Health Project

REACH

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LIST OF ABBREVIATIONS AND ACRONYMS

BCG	Tuberculosis vaccine with the Bacillus Calmette Guerin
EPI	Expanded Program on Immunization
INEC	National Institute of Demographics and the Census
INNFA	National Institute of the Family and Child
KAP	Knowledge, Attitudes, and Practices Survey
MSP	Ministerio de Salúd Pública (Ministry of Public Health)
OPV	Oral Polio Vaccine, **OPV1** = first dose, **OPV2** = second dose, **OPV3** = third dose
PAHO	Pan American Health Organization
PREMI	Infant Morbidity-Mortality Reduction Plan
PRICOR	MSP's Outpatient Care Information Subsystem
REACH	Resources for Child Health Project
SES (SSE)	Socio-economic status
TC	Total coverage
USAID	United States Agency for International Development

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SUMMARY

The EPI information system was evaluated through interviews, site visits, examination of reports, manuals, and data, estimates of immunization coverage, analysis of KAP survey results, and survey of personnel resources. The reasons for discrepancies among data sources were examined, survey priorities were established, and pertinent recommendations to the EPI were developed in performing the study subcontracted by REACH pursuant to their agreement with USAID and to the request of the Ministry of Public Health of Ecuador.

The discrepancies observed and difficulties encountered in comparing KAP surveys and MSP data are due to:

1. The inherent consequences of the various methodologies used: a point prevalence is compared with a period prevalence. This is the principal cause of the differences in coverage rates of infants under one year of age, requiring an interpretation in accordance with the methodology used.

2. Lack of definition of denominators in estimates of vaccine coverage rates limited to infants under one year of age, because the eligible population was not considered in the KAP surveys.

3. Use of different denominators in calculating immunization coverage in various agencies of the MSP, requiring the merging of two populations: children under one year of age, and those from one to four years of age.

4. Confusion of target goal and vaccination coverage rate in the provinces and in the Demographics Department of the MSP, if the former is calculated based on 80% of the target population. It is recommended that all agencies of the MSP calculate coverage against 100% of the target population.

5. Omission of reliability rates from KAP survey coverage, as required when parameters are derived from samples.

6. Inherent biases in the methodology used, possibly intrinsic to the current information system, in estimates of MSP immunization coverage of the one to four age group.

7. Revaccination or dosage repetition if the identification card is missing or lost, as required by EPI standards.

8. The existence of other organizations performing immunization activities outside the MSP, whose data are not included in the MSP information system.

When KAP surveys and immunization coverage are carefully and correctly interpreted they should be used in the EPI decision-making process.

KAP survey analyses and their comparison with MSP data should be based on the following observations:

1. BCG coverage is similar to, or presents small, acceptable variations from MSP coverage.

2. Measles vaccine and OPV3 coverage show little increase between July, 1986, and April, 1987.

3. KAP coverage of infants less than one year old, and of infants from 9 to 11 months old with OPV3 and measles vaccine, is lower than expected, and maintains a 1:4 ratio with respect to MSP coverage.

4. Coverage of children from 1 to 4 years old is similar for both methods, or KAP coverage is slightly higher.

5. There has been a delay in completing the schedule for children aged 2 to 3 years, judging from the coverage obtained for children from 1 to 2 years old.

6. There are significant statistical differences among all vaccination rates, especially in children from 1 to 4 years old, when coverage documented with an identification card is compared with that based on an identification card and a verbal statement. This comparison indicates a seriously lower presence of the identification card at the time of the survey, and possible bias.

7. There is a lower probability of immunization in children from the lowest socioeconomic stratum. This is more evident for multiple dosage vaccinations.

The KAP surveys use a very broad and unreliable dosage definition, by accepting verbal, undocumented information. This increases the risk of bias in data collection. The KAP surveys also disregard the BCG scar, which has recognized validity. Moreover, the KAP survey, which was designed to collect a large amount of diverse information, is not recommended for measuring coverage because it sacrifices precision and validity.

After analyzing coverage by canton, and classifying provinces by status of canton coverage for infants under one year old, the following was concluded:

1. Coverage has not changed significantly from 1984 to 1986.

2. 80% of the provinces and 75.5% of the cantons show a high potential risk of poliomyelitis.

3. No province or canton shows the optimum measles vaccine coverage. Only one canton exceeds 80% OPV3 coverage.

Based on these conclusions and the epidemiological behavior of poliomyelitis, coverage mini-surveys using simplified sampling methods are recommended to validate provincial statistics in:

1. The Province of Carchi: urban and rural areas.

2. Guayaquil Canton: urban areas.

3. The Province of Cotopaxi.

The above makes it necessary to intensify immunization efforts in marginal urban and rural areas, and to officially establish and issue the new immunization schedule for infants older than two months with two month dosage intervals. It is also necessary to train the health team and the community in the few true contraindications, in order to accelerate the completion of the immunization schedule before the end of the first year of life.

The surveys in the Province of Carchi validated provincial statistical data, and confirmed the 1:4 ratio between survey coverage and reported immunization coverage in infants under one year of age.

Analysis of the current information system and the personnel resources survey related to EPI information, yielded the following recommendations:

1. Consolidate EPI information at the canton and provincial levels.

2. Break down EPI information by age to obtain more reliable immunization coverage for 1 to 2 year olds.

3. Continue using MSP immunization coverage rates at times when PRICOR information cannot be substituted.

4. Include other health agencies which currently do not report their immunization activities (i.e. Social Security Institute, Peasant Social Security, Armed Forces, private clinics).

5. Provide training at the canton and local levels in calculating and using simple evaluative indicators.

Once the recommended mini-surveys have been performed to validate MSP data at the provincial level, follow-up mini-surveys should be used exclusively for monitoring the 6 to 11 month and the 12 to 23 month age groups in some of the EPI intensification areas.

1. OBJECTIVES

1.1 Identify areas where coverage mini-surveys should be performed.

1.2 Collaborate with the Expanded Program on Immunization (EPI) team in the analysis of the Knowledge, Attitudes, and Practices (KAP) surveys (KAP 1, KAP 2, KAP 3) to determine coverage changes during the PREMI (Infant Morbidity-Mortality Reduction Program) project's two years of operation.

1.3 Collaborate with the EPI team in comparing KAP survey coverage data with immunization coverage reports of the Ministry of Public Health (MSP), in order to explain differences and to suggest methodological adjustments in data collection which would yield valid results.

1.4 Provide the information, working methodology, and recommendations regarding the MSP information system to PRICOR, Birch & Davis, the Epidemiology Planning Boards, and Development/Security.

1.5 Design a reliable, practical, and efficient information flow system, from the local to the national levels, which would permit more rapid evaluation of immunization coverage.

2. BASIC INFORMATION ABOUT ECUADOR

Ecuador is in the northeastern section of South America. It has a land area of approximately 284,000 km2, and presents three distinct geopolitical and ethnographic areas: the coast, the mountains, and the east. Ecuador also owns the islands of the Galapagos Archipelago. The population is concentrated in the mountains and the coastal regions. The country is divided into 20 provinces. The following is a list of demographic and socio-economic indicators for Ecuador:

Population in mid-1987

Total Population:	9,922,514
Under one year old:	305,405
1 - 4 years:	1,244,637
General Mortality (1985):	5.4 per 1000 inhabitants
Infant Mortality (1985):	50.5 per 1000 live births
% of population with drinking water (1986):	59.7%
% of population with sewer system (1986):	39.8%
Per capita GNP (1984):	17,184 sucres (1975 base
Balance of trade surplus (1985):	$1,138,000,000 U.S.
% of economically active population with intake lower than the required family diet (1983):	84.5%
Per capita foreign debt (1985):	$793.3 U.S. per inhabitant

Personnel Resources of the Health Sector (per 10,000 inhabitants, 1983):

Doctors:	8.8
Nurses:	2.0
Nurses' aides:	11.5

Inflation has struck in recent months, resulting in a loss of purchasing power and a real reduction in the minimum wage. In 1985, the government began efforts to increase health services, broaden coverage through a primary care strategy targeted mainly to the maternal-child population, and channel resources through the Infant Morbidity-Mortality Reduction Program (PREMI).

With the support of various domestic and international agencies, five immunization campaigns were carried out from February, 1985, to November, 1986.

In order to evaluate the achievements of some of the programs, INNFA and PREMI have performed three KAP surveys. The last two surveys were performed in July, 1986, and April, 1987, and their results have not been completely analyzed.

3. ACTIVITIES

Site visits were conducted at the following health units: Health Centers 1 and 2, Hospital del Sur, Holanda Subcenter and Quito Health Clinic, Sangolqui Center Hospital, and Catogchia Subcenter in Ruminahi Canton.

Interviews were conducted with officials of various health agencies as detailed in the methodology.

Meetings with the provincial teams of Carchi and Cotopaxi took place to plan the coverage mini-surveys, and to evaluate the performance of the mini surveys in the urban and rural areas of Carchi.

The EPI team was trained in the simplified sampling methodology to be used in coverage mini-surveys. For more information see the attached activities schedule.

4. METHODOLOGY BY OBJECTIVE

A. Objective 1

1.1 Review of MSP statistics and the methodology used in calculating provincial and national coverage.

1.2 Definition of the population to be used in the denominator in cantons and provinces.

1.3 Review of morbidity and mortality statistics for immunizable diseases.

1.4 Calculation of coverage at the canton level and classification by quartiles according to the coverage achieved for the third oral poliomyelitis vaccine (OPV3) dosage.

1.5 Classification of provinces according to the immunization status of their cantons.

B. Objective 2

2.1 Interviews with INNFA, PREMI, USAID, and EPI personnel regarding the characteristics of the questionnaire, information gathering and its problems, critique of the data, characteristics of data storage, and preliminary results of the KAP surveys.

2.2 Review of the KAP2 survey questionnaire.

2.3 Critical reading of the KAP2 reports: analysis of coverage and cost.

2.4 Development of consistent criteria for certain variables, such as PREMI strategy or phase, socio-economic status, totally immunized child, and eligible population.

2.5 Development of KAP2 and KAP3 survey data matrices, requested from the INNFA.

2.6 Tabulation of the data by specific variables (age, strategy or phase, vaccine and dosage, totally immunized, socio-economic status), coverage calculation, sampling errors, and reliability rates of 95% certainty based on KAP2 and KAP3 data.

C. Objective 3

3.1 Definition of population to be used in denominators.

3.2 Awareness of methodology used in calculating indicators.

3.3 Recalculation of immunization coverage based on data supplied by the EPI between 1979 and 1986, by variables selected in the KAP survey analysis, with the exception of socio-economic status and total coverage.

3.4 Performance of coverage mini-surveys, in order to compare immunization coverage data with "field data", with respect to vaccine coverage by age, vaccine and dosage, and schedule completion in rural and urban areas of the Province of Carchi. The results of the survey in the urban area of Guayaquil and those in the Provinces of Cotopaxi and Chimborazo are not included in this report, but the MSP is responsible for their performance and analysis.

D. Objectives 4 and 5

4.1 Interviews with EPI information officials in operations units of various complexity at the local and canton levels, and with provincial and national level officials.

4.2 Review of the EPI and PRICOR questionnaires.

4.3 Personnel Resources Survey related to information from the EPI operating in randomly selected operations units.

5. RESULTS, CONCLUSIONS, RECOMMENDATIONS

A. Results and Conclusions from Objective 1

1. There is no consistency in the populations used in the denominator. In the final report of the Third National Evaluation of the EPI, September, 1985, the 1985 population differs from that projected by the INEC for that year. There were 8.5% fewer infants under one year old, and 10.5% fewer children from 1 to 4 years old than the projected figures.

2. The percentages reported by the Demographics Department of the MSP are not for coverage, but for target objective. These percentages utilize the figure of 80% of the target population as the goal for infants under 1 year old. This same figure is also used for those at risk in the 1 to 4 year old age group. If the resulting indicators are unwittingly interpreted without this information, conclusions are reached showing higher than actual achievement, adding to the confusion when these indicators are compared to the survey results.

3. The morbidity-mortality rates for immunizable diseases were recalculated by the demographics division of the MSP, specifically for infants under one year old, and for the 1 to 4 year old age group. These were substituted for the general rates first provided. A decline in the morbidity and mortality rates for measles in both age groups was observed during the period from 1982 to 1986, with a peaks in 1981 and 1984, indicating a three-year cycle. During the same period the morbidity-mortality rates for whooping cough declined until 1984, and then showed a slow growth trend, without reaching the levels of the beginning of the period. In general, the magnitude of these diseases has decreased, but the rates are still high. This illustrates that the current epidemiological situation is far from under control. With respect to polio, after no cases were reported during 1984 and 1985, outbreaks occurred in 1986 and 1987, when there was better epidemiological surveillance.

4. The INEC population projections derived from the censuses (the last one was in 1982), are not reliable when broken down by parish, but are acceptable at the canton level.

5. The extent of reported BCG coverage for certain provinces before 1986 and the disparities with the coverage calculated for 1986, are explained by possible recording errors. These errors occurred mainly through underestimation of the population and confusion with the targeted goal percentage.

6. The situation in the provinces did not change between 1984 and 1986, judging from immunization coverage for infants under one year old with OPV3 and measles vaccine. (See table 1).

7. OPV3 immunization coverage was low in 80% of the provinces (16/20), and none reached optimum levels for infants under one year old.

8. Measles immunization coverage was low in 85% of the provinces (17/20), and none attained optimum coverage for infants under one year old.

9. 75.5% of the cantons (105/139) have a high potential risk for polio, with OPV3 coverage rates of less than 50%. 23.7% (33/139) have medium potential risk, and only one canton achieved optimum OPV3 coverage in infants under one year old. Optimum OPV3 coverage is equal to or greater than 80%. (See table 2).

10. All of the cantons in 35% of the provinces (7/20) have a high potential polio risk, and 60% of the provinces (12/20) are comprised of cantons with high and medium polio risk. Only in the province of Carchi are all of the cantons classified as medium-risk (See table 3).

11. Despite existing flaws, current statistics and immunization coverage allow a diagnosis of the status of the EPI, especially if they are correlated with morbidity-mortality rates. This is useful for making decisions about future EPI activities.

B. Recommendations for Objective 1

1. Use consistent population data. Use of INEC projections is recommended. Table 4 presents the 1982 and 1987 populations by age group, calculated in two ways yielding similar data:

   a. The first considers infants under one year old as 0.030779 of the total population.

   b. The second is obtained by multiplying the population under 5 years old by 0.19703, the 1985 distribution of children from 0 to 4 years old.

2. Develop consistent EPI evaluative criteria used in the various agencies of the MCP, or define the target as 100% of the population under one year old, and 100% of children from 1 to 4 years old, in which case cumulative coverage should be calculated.

3. Use immunization coverage data in making decisions on EPI strategies and activities.

4. Perform coverage mini-surveys, using simplified sampling methods, in the following priority provinces:

   a. Carchi, the province with the best immunization coverage: one single-sample survey of the urban areas, and another independent single-sample survey of the rural areas.

b. Guayaquil, the largest city of the country, representing 80% of the population of its province, but whose low coverage is approximately equal to the median coverage of all of the cantons of the country.

c. Cotopaxi, a mountain province with most of its population in rural areas, a large number of indigenous groups, and very low coverage in all of its cantons. A single representative sample of the province is required. If the difficult logistics encountered during this study delay the performance of the survey, it is recommended that the mini-survey be performed in the province of Chimborazo, which has similar characteristics.

C. Results and Conclusions from Objectives 2 and 3

Three data sources were considered in the coverage analysis by vaccine: KAP-2, KAP-3, and the MSP; that is, immunization coverage. This part of the analysis was done by considering the age groups used by the MSP: infants under one year of age, children from 1 to 4 years old, and children under five years old. The data provided by the INFA were tabulated for KAP-2 as well as for KAP-3 according to the information's quality or degree of reliability. The criterion for distinguishing the quality of information was the presentation of an immunization document or certificate, designated in the tables by the header "WITH CARD" ("WITH I.D."), and verbal information, noted in the tables as "DOC + VERB". In parentheses, beneath each header, are reliability rates of 95% certainty.

1. Methodologies and Resulting Indicators

Before continuing it is necessary to comment on the methodologies used in calculating the immunization coverage and the KAP survey coverage, their effect on the results, and the differences in their interpretation when analyzed.

Chart 1 presents successive birth cohorts for each month from January, 1985, through February, 1987. These are represented by horizontal bars and assume constant birth frequency, so that the bars have equal dimensions. .The vertical dashed lines show the annual cohorts on December 31 of each year, and the months of each calendar year are shown on the lower horizontal axis. The columns or vertical bars show the dates of the KAP-2 (July, 1986) and KAP-3 (April, 1987) surveys, whose intersections with the horizontal bars have been numbered according to the age in months of the survey's target population, the universe to which the selected sample belongs. Their heterogeneous composition, derived from different birth cohorts, can be seen. The right ends of the horizontal bars, indicating birth cohorts by month, have been shaded to represent the period or months during which each cohort reached 9, 10, and 11 months. In the space corresponding to the year 1986, the times are highlighted with dots at which the children of different cohorts could have been immunized during 1986, before reaching one year of age,

with a vaccine which could be administered during the fourth quarter (for example, measles vaccine or the third polio vaccine (OPV3)), according to the schedule in effect during the period of KAP surveys. Infants of 9, 10, and 11 months at the time of the KAP surveys have been indicated with shaded areas or oblique lines. In this model, the rate at which infants under one enter the cohort is constant or equal to the exit rate when they reach one year of age. In addition, the surveys are performed within one month, and the vaccine whose coverage is measured has an age limitation, being restricted to infants under one year old.

Comparison of the coverage measured by the immunization method with those obtained by surveys is equivalent to comparing a period prevalence with a point prevalance. In other words, cumulative coverage is being compared with a coverage point (prevalence by month section). In the first case (the immunization method), they are immunized during 1986, and recorded as children under one year old, who at the time of a survey, may still be under one year old, or may have entered the 12 month plus age cohort. In the second case (the prevalence survey), the target population of infants under one year old, is only a fraction of those immunized during that year who were recorded as infants under one year old. That is, the 1986 immunization coverage approximates the percentage of children of various ages included in the sample of those immunized in 1986 before reaching age one.

In the cases of OPV3 and measles vaccines, under ideal conditions, the coverage obtained by the survey would equal one fourth of the immunization coverage. The maximum coverage possible for these vaccines at the time of the survey would be 25% of infants under one year old, given the ideal that all of the children under one year of age would have been immunized when they reached the optimum age, according to the then current standard. The maximum immunization coverage would be 100%. Thus, under ideal conditions, the ratio between the coverage is 1:4, so that a survey covering 20% of infants under one year old would correspond to an immunization coverage of 80%.

For vaccines carrying no age restriction this difference would not exist. If the age restriction could be resolved making the opportunity for immunization constant from birth, the coverage rates for all methods would agree. The differences would then be due to repeated vaccination for particular cases and standards, to dosage and/or age recording errors, to data duplication, or to immunization underrecording because the information system does not include other health agencies.

2. BCG (See table 5 and Chart 2)

It is useful to note that data on the presence or absence of a scar was not recorded in the KAP surveys.

2.1 The MSP corrected coverage and those of the KAP surveys under "DOC + VERB" indicate that children have effective contact with the health services.

2.2 Comparison of the results of the KAP surveys indicates that coverage is similar for infants under one year old. Coverage for children from aged 1 to 4 years show significant statistical differences, indicating real growth between July, 1986, and April, 1987.

2.3 The MSP immunization coverages, calculated in December, 1985, and December, 1986 do not correspond to an equivalent time frame for the KAP coverage, but the MSP figures fall within the reliability rates of the KAP coverage for infants under one year old.

2.4 The MSP coverage for children from 1 to 4 years old is greater than the KAP coverage, but the differences for the upper limit do not exceed 10% of the KAP-2 coverage, and do not exceed 5% of the KAP-3 coverage.

2.5 In the 1 to 4 age group there are significant statistical differences in both KAP surveys when the documented information is compared with the combination of documented and verbal information. This comparison indicates a significantly lower presence of immunization cards in this group at the time of the survey, which decreases reliability and renders interpretation difficult if the immunization scar has not been considered.

3. Measles Vaccine (See Table 6 and Chart 3)

3.1 Immunization coverage as well as KAP coverage show that coverage for infants under one year old and for children from 1 to 4 years old remained stable. In other words, the EPI achieved no increase during the period analyzed. The same may be concluded from analysis of the KAP survey coverage according to eligible population, from 9 to 11 months, and from 9 to 60 months.

3.2 In the 1 to 4 age group there are significant statistical differences when the documented coverage is compared with that including undocumented information. This indicates a real lower probability of availability of immunization cards or certificates for this group at the time of the survey.

3.3 The coverage for children under one year old is lower for the KAP coverage than for the immunization surveys and maintains a ratio of approximately 1 to 4. However, they

are lower than expected. KAP coverage for infants from 9 to 11 months old is far from that expected or considered optimum for control.

3.4 The KAP coverage for children from 1 to 4 years old is greater than the MSP coverage, but should be interpreted carefully, considering that it lacks documentation and adequate reliability. In some cases the data is lower than the optimum 95% reliability rate, and it is not likely that many non-immunized 1 to 4 year olds would have natural immunity.

4. OPV (See Tables 7, 8, and 9, and Charts 4, 5, and 6)

4.1 The KAP coverage for OPV3 of infants under one year old is lower than the immunization coverage (MSP coverage), and shows a 1 to 3 ratio for KAP-2 and a 1 to 4 ratio for KAP-3.

4.2 The KAP coverage for OPV3 of infants under one year old shows no increase from July, 1986, to April, 1987, although the MSP coverage shows a 25% increase from 1985 to 1986.

4.3 Comparison of the "WITH CARD" and "DOC + VERB" coverage of infants under one year old and children from 1 to 4 years old immunized with OPV1, OPV2, and OPV3 in the KAP surveys, shows significant statistical differences in both surveys, indicating serious unavailability of immunization cards or immunization certificates at the time of the survey, exclusively for children from 1 to 4 years old.

4.4 The "DOC + VERB" KAP coverage and the MSP coverage for the 1 to 4 age group exceed 80%, and the KAP coverage is equal to or slightly greater than the MSP coverage.

4.5 Successive comparison of the "WITH CARD" and "DOC + VERB" KAP coverage for each OPV dosage illustrates significant statistical differences in both surveys, indicating significant departure from the scheduled interval between two consecutive dosages. In spite of acceptable OPV1 coverage which was possibly delayed, infants under one year old and the EPI suffer poor follow-up and continuity, which impedes completion of the immunization schedule before reaching age one. The schedule apparently is completed during the second or third year of life.

4.6 The differences between the KAP and MSP coverage for OPV1 and OPV2 of infants under one year old, is partially or mainly explained by the inherent differences in the measuring methods used. These differences are also explained by repeated dosages caused by adherence to the standard in which the lack of an immunization card means

the child has not been immunized. The possibility that a child under one year old will receive repeated dosages is greater for OPV1 than for OPV2, and unlikely for OPV3.

5. KAP Coverage According to Socio-Economic Status (SES) (See Tables 10, 11, 12, 13 and 14).

5.1 Comparison of "WITH CARD" and "DOC + VERB" for each KAP by vaccine shows significant statistical differences among the indicators, lower availability of immunization cards at the time of the surveys, and the same possibility of bias in the information for all socio-economic strata. It should be noted that the classifications used by the INNFA to reconcile categories to strata do not mean economic income, but rather the availability and accessibility of public services. The SES1 stratum is the lowest, and the SES4 is the highest, and includes all public services. In summary, even if there is bias in the data collection, this bias would be similar for all socio-economic strata. Therefore the comparison of KAP "DOC + VERB" coverage is valid.

5.2 BCG (See Table 10 and Chart 2)

5.2.1 Comparison of reliability rates within each stratum reveals no real difference between KAP-2 and KAP-3. That is, the coverage has remained stable in each stratum between July, 1986, and April, 1987.

5.2.2 The differences between socio-economic strata are more significant in KAP-2 than in KAP-3. In KAP-2 the differences between SES 1 and the SES 3 and SES 4 strata are statistically significant when "WITH CARD" and "DOC + VERB" coverage is compared. In KAP-3 the differences among the same strata only occur for the "DOC + VERB" coverage. That is, there are differences among the more marginal population groups and those with greater access to public services. In summary, the probability of BCG immunization is inversely proportional to SES stratum.

5.3 Measles Vaccine (See Table 11 and Chart 3)

5.3.1 The immunization situation for each stratum has remained stable for the two KAP surveys.

5.3.2 The only differences observed between the SES strata in the KAP-2 (July, 1986) are in the extreme SES 1 and SES 4 strata.

5.3.3 The differences between SES strata that existed in July, 1986, have disappeared in April, 1987. That is, the probability of immunization has become equal for the various SES strata.

5.4 OPV (See Tables 12, 13 and 14, and Charts 4, 5, and 6)

5.4.1 Comparison of reliability rates for coverage verified with immunization cards between KAP-2 and KAP-3 shows no differences for any OPV dosage within any stratum. That is, during the period, the coverage by dosage did not change in real terms for the two KAP surveys in any of the strata. The same is true of a comparison of "DOC + VERB" coverage within each stratum.

5.4.2 Comparison of coverage between strata yields statistically significant differences between SES 1 and SES 4 for all three OPV dosages in KAP-2. The differences are more evident from a comparison of the lowest stratum with any other stratum in OPV2 and OPV3, whether the "WITH CARD" or the "DOC + VERB" coverage is compared.

5.4.3 Statistically significant differences are observed for KAP-3 in the comparison of "DOC + VERB" coverage of the extreme strata, but not in the comparison of "WITH CARD" coverage.

5.4.4 The lower probability of immunization of SES 1 stratum children is not so evident, or rather, is not so strongly supported by KAP-3 as by KAP-2.

5.4.5 Finally, comparison of reliability rates for the "DOC + VERB" KAP-3 coverage, between the first, second and third OPV dosages within each stratum, shows statistically significant differences between OPV1 and OPV3. This means a greater than expected discontinuation between the first and third dosages in all socio-economic strata. Comparison of these rates for the "WITH CARD" coverage shows this difference only in the lowest stratum.

6. Contribution of the PREMI to EPI Coverage (See tables 15, 16, 17 and 18)

6.1 MSP and KAP survey data are not comparable because of inherent differences in the methodologies used, and also because they apply different criteria in the definition of the PREMI phase. While the KAP considers any dosage administered during the calendar month of the campaign as falling within the "PREMI phase", the MSP only counts dosages administered during official campaign days as occurring during the "PREMI phase".

6.2 The sampling errors in these KAP survey percentages are greater, and their reliability rates, more varied, therefore no comparison between KAPs would be valid.

6.3 The BCG coverage attributable to the PREMI is very low for children from 1 to 4 years old, but greater for infants under one year old.

6.4 It appears that the "PREMI phase" or campaigns improve the contact of infants under one year old with immunization services, and increase the start and completion of the basic multi-dosage immunization schedule. One year old children benefit from completion of the schedule begun when they were less than one year old, who in the KAP survey appear in the 1 and 2 year old age groups. In these groups the percentages with second and third dosages administered during the PREMI campaigns are progressively greater than the first dosage coverage attributable to the PREMI.

D. Recommendations from Objectives 2 and 3

1. Continue BCG immunization as a requirement for civil registrar birth registration. This mechanism has been effective and explains the high coverage from an early age.

2. Consider the presence of the BCG scar in the coverage surveys in order to measure immunization coverage and immune reaction, even without immunization card. This data is completely valid.

3. The KAP survey is not the best methodology to determine EPI coverage, because the questionnaire's length resulting from the volume of information collected does not allow the interviewer the time to stop and give the client time to search for documentation verifying the immunization status of the child. It is more advisable to perform simple surveys targeted exclusively at coverage measurement.

4. With the exception of BCG, accept only immunization certificates as valid proof of immunization status. The final coverage of the KAP surveys includes between 10% and 25% verbal information, depending on age and the vaccine analyzed. Relying on verbal information detracts from the reliability of the surveys.

5. The sampling results should always be analyzed by calculating the reliability rates, in order to make reference to the limits within which the universe parameters are expected with 95% reliability. The lack of these rates increased the confusion associated with the KAP-2 preliminary results.

6. The survey results should be carefully interpreted by considering their logical differences with MSP coverage, inherent in their methodologies, mainly in infants under one year old, and the risk of bias in the data for the 1 to 4 age group noted in recommendation 4.

7. The MSP coverage should also be fully and carefully interpreted. The indicator for infants under one year old in reality refers to cohorts of infants under one year old combined with cohorts of children older than one. The ideal ratio between KAP and immunization coverage for infants under one year old is 1 to 4.

8. MSP statistics for the 1 to 4 age group have an additional distortion factor caused by repeated dosages when the schedule is begun again when there is no immunization card. This is only a factor for infants under one year old for initial doses of multiple dosage vaccines.

9. The coverage is very dependent on the current schedule and the main strategies used in the EPI, especially for infants under one year old. Although not an objective for this study, it is recommended that the immunization schedule be reviewed and that the age of two months be officially declared the optimum age to begin immunization. The regular or minimum intervals between successive doses should also be reduced. These measures would broaden the population base eligible for immunization, improve the opportunity for immunization, and accelerate the completion of the dosage series. These improvements are sometimes hindered by rigidly interpreted institutional standards. Moreover, the institutional strategy should be reformulated to increase service provision, and the campaign strategy should be revised and made more efficient and effective so that the EPI user and services are brought together by increasing the number of immunization sites or units.

10. The data show that the immunization process is slow. Nevertheless, it can be increased by changing the schedule and the combination of strategies, including health education, which is well developed in Ecuador. In addition, intensified training of the health team is recommended. Training in the few real contraindications of the vaccines would eliminate ignorance of these as a factor impeding schedule completion during the first year of life.

11. Both KAP and MSP immunization coverages show low immunization coverage of infants under one year old. Also, analysis of the KAP surveys indicates lower coverage in marginal sectors and neglected communities. Therefore, EPI intensification in marginal urban areas and in rural areas is recommended.

12. MSP coverage statistics should be used in the selection of areas requiring such intensification. The factors noted above which affect their interpretation should be considered, and the survey methodology should be reserved for special monitoring cases.

13. The suggested mini-surveys which have yet to be performed by the MSP should initially be done to complete data validation in the provinces prioritized in section B.4 above. Following this, the mini-surveys should be used to monitor specific groups. Six to 11 and 12 to 23 month age groups are suggested for some of the areas

where the EPI is intensified. The mini-surveys should use simplified sampling methods and be designed for coverage measurement only.

14. The contribution of the PREMI according to the MSP could be compared with the KAP results, in spite of the different PREMI phase definition criteria. This can be done if the MSP coverage resulting from the PREMI from August, 1985, to July, 1986, and from May, 1986, to April, 1987 are calculated with the KAP 2 and KAP 3 surveys respectively. That is, the data needs to be reorganized so that it refers to the same calendar year.

E. Results and Conclusions from Objectives 4 and 5

1. Survey of the Urban Areas of Carchi Province

28 groups were assembled in which 1159 infants under one year of age were surveyed. Their distribution by age appears in Table 19, which shows a lower proportion of four year old children. This may indicate a differential loss of data for this age group among non-respondent children of the survey. The non-response rate was 10.4%, within the expected range.

1.1 The sampling percentages and their reliability rates (Table 20) indicate low coverage in infants under one year old, with the exception of BCG, and high coverage of children of other ages for all of the vaccines.

1.2 The coverage in the 1 to 4 age group agrees with provincial data calculated by the immunization method. In the under one year age group the results are correlated with the immunization coverage, confirming the 1 to 4 ratio.

1.3 Table 21 presents coverage by eligible population (i.e. populations composed of children old enough to be immunized). This is a more representative indicator of immunization status and of EPI performance. The results show low OPV3 coverage, significant dropout or delay in completing the dosage series in those who have received the initial dose, and measles vaccine coverage far below optimal coverage.

1.4 The differences between OPV3 coverage and the percentage of totally immunized children are due to the fact that the eligible population used in the denominator to calculate coverage was arrived at through the new schedule which was in effect for 6 months. The new schedule permits the third OPV dose at 6 months of age, whereas for measles vaccine or for totally immunized children, infants from 9 to 11 months old were included in the denominator.

2. Survey of Rural Areas of Carchi Province

30 groups were selected, and 1274 children under five were surveyed with a non-response rate of 3.9%. The age distribution (See Table 22) was similar to that of the urban areas.

2.1 The coverage for infants under one year old is related to the immunization coverage. Calculating the coverage rates by eligible population (Table 24), shows low OPV3 coverage, and medium coverage for measles vaccine and totally immunized children, which is somewhat greater than the rates for urban areas. It should be noted that operations units periodically perform concentration or house-to-house immunization campaigns, independent of PREMI campaigns, which explains these coverage rates in rural areas.

2.2 The coverage of the remaining age groups is very good for all vaccines, reaching optimal coverage for some vaccines.

F. Recommendations from Objectives 4 and 5

1. PREMI information should be consolidated at the canton level. The operations units in each canton would send EPI data to the unit in the canton capital. The latter unit would be responsible for the coverage analysis and the quality of the information. In this way decisions could be made more quickly and at a level closer to the communities with the needs and problems. This process could be initiated before service regionalization is introduced. The accomplishments of the EPI information system could be used as a model, illustrating the benefits of regionalization, and accelerating their application to health services in general.

2. The official total population should be reported according to INEC to the cantons for coverage calculations and EPI activity programming.

3. Consider collecting regular EPI information broken down by simple age groups, to obtain more reliable data on the immunization status of the one and two year old age groups. The method currently used to calculate cumulative coverage in the 1 to 4 year old age group, which is the only possible method for the available data, may underestimate or overweight coverage for these ages depending on whether the EPI is beginning or phasing out. Coverage by simple age would permit the definition of the population targeted by EPI intensification activities, probably in children under three years old.

4. Change the EPI questionnaires to implement the previous recommendation.

5. Continue the traditional or regular EPI system and the use of immunization coverage in all auxiliary units and administrative sections of the MSP. The PRICOR model will neither be able to replace the current system, nor the EPI immunization coverage.

6. Broaden the coverage of the EPI information system to include other health organizations or agencies which do not report to the MSP. This linkage should be done at the canton level if possible.

7. Train information personnel and EPI personnel in the operations units in the calculation and use of the simplest evaluative indicators, such as coverage and discontinuation rates.

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ANNEX

Data was gathered from 51 organizations, of which 25% were hospital centers, 16% health centers, and 59% health subcenters.

The surveys were answered by 4 managing doctors (7.8% of the total), 17 statisticians or statisticians' aides (33.3%), the hospital centers and health centers, 2 health inspectors, and 28 nurses' aides (54.9%). Their average time employed was 8.8 years (2.3 for the doctors, 8.4 for the statisticians, and 9.5 for the nurses' aides). 62.7% had some secondary education, and 22% higher education.

47% (24/51) of the operations units in the sample reported the existence of 82 MSP units in their jurisdiction and the jurisdictions of their sub-agencies. The average of sub-agencies was 4.4 for the hospital centers, 2.0 for the health centers, and 0.3 for the subcenters. Of these 24 units, only 29.2% receive data from sub-agencies, of low level complexity, with reliability rates of from 16.6% to 41.8%.

In the jurisdictions of the units sampled there were another 103 units of other organizations, health agencies, and health sectors (12% belonging to the Ecuadoran Institute of Social Security (IESS), 21% to Peasant Social Security (SCC), 5% to the Armed Forces, 48% to the private sector, and 14% to other organizations).

The average was 2.2 per operations unit surveyed, greater for hospital centers (3.9) and health centers (5.0) than for subcenters (0.8). In general, 61% (31/51) of the MSP units have some other health service unit within their jurisdiction, of which 18% (18/103) provide regular immunization services.

Only 2/13 of the operations units of the MSP units surveyed receive data on immunizations performed by units not belonging to the MSP.

90% of EPI information officials who completed the survey have been trained processing EPI questionnaires. Two-thirds of these replied that they had not been trained as statisticians' aides. Reliability rate: 82% - 98.4%.

69% of the officials in the sample of MSP operations units replied that they had not received training in the calculation of coverage rates or immunization dropout rates (65% of the statisticians' aides and 71% of the nurses' aides). Reliability rate: 56.2% - 81.8%.

TABLE 1

RANKING OF PROVINCES
ACCORDING TO OPV 3AND MEASLES VACCINE COVERAGE
OF INFANTS LESS THAN ONE YEAR OLD IN 1984 AND 1986

PROVINCE	OPV 3				MEASLES VACCINE			
	1 9 8 4		1 9 8 6		1 9 8 4		1 9 8 6	
	Rank	Cov (%)	Rank	Cov (%)	Rank	Cov (%)	Rank	Cov (%)
CARCHI	1a	86.8	1a	72.4	2a	84.3	1ª	79.6
TUNGURAHUA	3ª	60.8	2ª	60.4	6ª	55.6	2ª	66.0
MANABI	2ª	74.1	3ª	54.0	1ª	84.5	4ª	56.3
PICHINCHA	4ª	54.3	4ª	51.1	12ª	49.5	10ª	49.0
CAÑAR	7ª	47.4	5ª	49.0	14ª	47.6	11ª	48.0
BOLIVAR	11ª	47.6	6ª	48.4	11ª	50.2	3ª	61.1
IMBABURA	8ª	44.6	7ª	45.7	8ª	53.3	5ª	53.6
AZUAY	16ª	36.1	8ª	43.7	16ª	38.6	16ª	40.2
LOS RIOS	13ª	39.8	9ª	41.4	4ª	56.6	6ª	51.9
EL ORO	6ª	47.9	10ª	41.0	20ª	29.2	14ª	44.0
PASTAZA	9ª	42.7	11ª	40.4	13ª	48.2	9ª	48.7
GALAPAGOS	5ª	52.6	12ª	40.3	9ª	52.6	8ª	49.4
GUAYAS	9ª	42.7	13ª	39.1	10ª	51.9	7ª	50.9
LOJA	15ª	36.2	14ª	34.0	7ª	54.0	19ª	37.0
CHIMBORAZO	14ª	39.0	15ª	32.3	15ª	44.5	18ª	38.0
ZAMORA CHINCHIPE	17ª	34.1	16ª	30.6	17ª	34.2	13ª	44.7
COTOPAXI	18ª	27.4	17ª	29.6	19ª	30.0	20ª	33.6
NAPO	19ª	25.7	18ª	28.7	18ª	33.5	12ª	45.2
ESMERALDAS	12ª	40.1	19ª	26.1	5ª	56.0	16ª	40.2
MORONA SANTIAGO	20ª	16.5	20ª	24.7	3ª	75.5	15ª	41.0

TABLE 2

RANKING OF CANTONS ACCORDING TO POTENTIAL RISK
BASED ON OPV 3COVERAGE OF CHILDREN
LESS THAN ONE YEAR OLD - ECUADOR 1986

RISK	COVERAGE	CANTONS	
		No.	%
High	Less than 50%	105	75.5
Moderate	50-79%	33	23.7
Low	80% and more	1	0.7
TOTAL		139	99.9

TABLE 3

DISTRIBUTION OF PROVINCES ACCORDING TO POTENTIAL RISK IN THEIR CANTONS BASED ON OPV 3COVERAGE OF INFANTS LESS THAN ONE YEAR OLD - ECUADOR 1986

RISK	PROVINCES			CANTONS		
	No.	%	Name			
HIGH EXCLUSIVELY	7	35.0	Cotopaxi, Chimborazo, Loja Esmeraldas, Pastaza, Morona Santiago, Zamora Chinchipe.	41	29.5	
HIGH AND MODERATE	12	60.0	Cañar, Imbabura, Pichincha,	64	46.0	(Alto)
			Bolívar, Los Ríos, Guayas,	28	20.1	(Mod.)
			Napo, Tungurahua, Azuay, Manabí, Galápagos, El Oro	92	66.2	(Subtotal)
MODERATE, EXCLUSIVELY	1	5.0	Carchi	5	3.6	
LOW	0	0.0		1	0.7	
TOTAL	20	100.0		139	100.0	

TABLE 4

DEMOGRAPHIC DATA - ECUADOR 1982-87

TOTAL POPULATION	1982	1983	1984	1985	1986	1987
	8.606.116	8.857.444	9.114.866	9.377.980	9.647.107	9.922.514
< 1 (1)	264.888	272.623	280.546	288.645	296.928	305.305
(2)	270.726	277.652	284.696	291.608	298.454	305.403
1-4 (1)	1.109.153	1.136.570	1.164.402	1.191.381	1.217.845	1.244.637
(2)	1.103.315	1.131.541	1.160.252	1.188.418	1.216.319	1.244.639
0-4	1.374.041	1.409.193	1.444.948	1.480.026	1.514.773	1.550.042

(1): <1 = .030779 of the total population

(2): <1 = .19703 of the 0-4 year old population

TABLE 5

BCG COVERAGE ACCORDING TO AGE AND SOURCE OF DATA* - ECUADOR

AGE	KAP - 2		MSE	KAP - 3		MSE
	WITH I.D.	DOC+VERB**	1985	WITH I.D.	DOC + VERB	1986
<1	79.6 (73.5-85.7)	89.0 (84.2-93.7)	81.6	79.7 (71.4-88.0)	87.5 (80.6-94.4)	92.8
1-4	62.4 (58.5-66.3)	88.5 (86.0-91.0)	100.1	62.4 (59.7-65.0)	95.9 (93.6-98.1)	101.0
0-4	70.5 (67.04-73.6)	94.5 (92.8-96.2)	95.3	66.4 (61.7-71.1)	93.9 (91.5-96.3)	99.4

* INNFA -PREMI - Ministry of Health

** With and without I.D.

TABLE 6

MEASLES VACCINE COVERAGE ACCORDING TO AGE AND SOURCE OF DATA*

ECUADOR 1985-86

AGE	SOURCE OF DATA					
	K A P - 2		MSE	K A P - 3		MSE
	WITH I.D.	DOC+VERB	1985	WITH I.D.	DOC+VERB	1986
<1	9.8 (5.3-14.3)	12.3 (7.4-17.2)	46.7	9.2 (3.2-15.2)	11.6 (5.0-18.2)	49.7
9-11 months	35.9 (22.0-49.8)	45.0 (30.6-59.4)		27.4 (9.8-45.0)	32.2 (13.7-50.7)	
1-4	64.0 (60.0-68.0)	86.2 (83.3-89.1)	77.7	61.9 (56.4-67.4)	85.7 (81.7-89.7)	77.7
0-4	51.9 (48.2-55.5)	70.0 (66.7-73.3)	71.7	49.4 (44.7-54.7)	68.0 (63.4-72.6)	72.2
9-60 months	61.8 (57.9-65.7)	83.1 (80.1-86.1)		59.2 (53.8-64.5)	81.6 (77.4-85.8)	

* INNFA -PREMI - Ministry of Health

TABLE 7

OPV 1 COVERAGE ACCORDING TO AGE AND SOURCE OF DATA*

AGE	SOURCE OF DATA					
	K A P - 2		MSE	K A P - 3		MSE
	WITH I.D.	DOC+VERB	1985	WITH I.D.	DOC+VERB	1986
< 1	61.2 (53.8-68.6)	67,3 (60.2-74.4)	83.1	56.9 (46.6-67.2)	62.3 (52.2-72.3)	86.5
1-4	70.8 (67.0-74.6)	95.4 (93.6-97.1)	86.6	67.7 (62.4-73.0)	96.0 (93.8-98.2)	99.5
0-4	68.6 (65.2-72.0)	88.9 (86.6-91.2)	86.4	65.2 (57.7-67.3)	88.2 (85.0-91.4)	96.9
2-60 months	72.1 (68.8-75.4)	93.4 (91.6-95.2)	-	67.2 (62.5-71.9)	90.9 (88.0-93.8)	-

* INNFA - PREMI - Ministry of Health

TABLE 8

OPV 2 COVERAGE ACCORDING TO AGE AND SOURCE OF DATA*

AGE	SOURCE OF DATA					
	K A P - 2		MSE	K A P - 3		MSE '
	WITH I.D.	DOC+VERB	1985	WITH I.D.	DOC+VERB	1986
< 1	32.0 (24.9-39.0)	36.9 (29.6-44.2)	56.4	28.6 (19.2-38.0)	32.4 (22.7-42.1)	70.5
1-4	66.9 (63.0-70.8)	89.7 (87.2-92.2)	84.8	65.7 (60.3-71.1)	92.0 (88.9-95.1)	80.8
0-4	58.8 (55.2-62.4)	77.4 (74.4-80.4)	79.3	57.1 (52.2-62.0)	78.3 (74.2-82.4)	78.8
6-60	65.6 (61.9-69.2)	86.2 (83.6-88.9)	-	63.1 (60.4-65.7)	86.4 (82.8-90.0)	-

* INNFA-PREMI - Ministry of Health

TABLE 9

OPV 3 COVERAGE ACCORDING TO AGE AND SOURCE OF DATA*

AGE	SOURCE OF DATA					
	K A P - 2		MSE	K A P - 3		MSE
	WITH I.D.	DOC+VERB	1985	WITH I.D.	DOC+VERB	1986
< 1	8.7 (4.4-13.0)	12.5 (7.5-17.5)	36.0	8.7 (0.0-18.7)	10.9 (4.4-17.4)	43.6
1-4	61.9 (57.8-65.9)	81.8 (78.6-85.0)	89.0	63.2 (57.7-68.7)	84.4 (80.3-88.5)	76.7
0-4	49.5 (45.8-53.1)	65.7 (62.2-69.2)	78.6	50.7 (45.7-55.7)	67.5 (62.8-72.2)	70.2
9-60 months	59.2 (55.3-63.1)	78.1 (74.8-81.4)		60.4 (55.1-65.7)	80.4 (76.1-84.7)	

* INNFA - PREMI - Ministry of Health

TABLE 10

COMPARISON OF BCG COVERAGE OF CHILDREN LESS THAN 5 YEARS ACCORDING TO SOCIO-ECONOMIC STATUS IN KAP SURVEYS

SSE	K A P - 2*		K A P - 3**	
	WITH I.D.	DOC+VERBAL	WITH I.D.	DOC+VERBAL
SSE1	59.7 (53.2-66.2)	88.0 (83.7-92.3)	61.0 (54.0-67.9)	86.7 (8.9-91.5)
SSE2	69.6 (63.3-75.9)	96.2 (93.6-98.8)	63.0 (53.5-72.5)	95.4 (91.3-99.5)
SSE3	78.3 (73.0-83.6)	98.1 (96.3-99.9)	74.8 (64.4-85.2)	96.4 (91.9-100.0)
SSE4	79.2 (75.1-83.3)	97.8 (96.3-99.3)	70.0 (61.4-78.6)	98.5 (96.2-100.0)
TOTAL	70.5 (67.2-73.8)	94.5 (92.8-96.2)	66.4 (61.7-71.1)	93.9 (91.5-96.3)

* July, 1986

** April 1987

TABLE 11

COMPARISON OF MEASLES VACCINE COVERAGE OF CHILDREN LESS-THAN 5 YEARS ACCORDING TO SOCIO-ECONOMIC STATUS IN CAP SURVEYS

	KAP - 2*		KAP - 3**	
SSE	WITH I.D.	DOC+VERBAL	WITH I.D.	DOC+VERBAL
SSE1	44.4 (39.7-49.1)	63.3 (58.8-67.8)	44.0 (36.9-51.1)	61.0 (54.0-67.9)
SSE2	53.7 (48.9-58.5)	72.3 (68.0-76.6)	48.4 (38.6-58.2)	71.0 (62.1-79.9)
SSE3	55.0 (48.6-61.4)	72.4 (66.6-78.2)	57.2 (45.3-69.1)	71.2 (60.3-82.1)
SSE4	56.7 (51.7-61.7)	73.9 (69.4-78.4)	52.4 (43.0-61.8)	72.9 (64.6-81.2)
TOTAL	51.9 (48.2-55.5)	70.0 (66.7-73.3)	49.7 (44.7-54.7)	68.6 (64.0-73.2)

* July 1986

** April 1987

TABLE 12

- COMPARISON OF OPV1 COVERAGE ACCORDING TO SOCIO-ECONOMIC STATUS IN KAP SURVEYS*

SSE	K A P - 2		K A P - 3	
	WITH I.D.	DOC+VERBAL	WITH I.D.	DOC+VERBAL
SSE1	59.7 (53.2-66.2)	88.0 (83.7-92.3)	59.7 (52.7-66.7)	80.2 (74.5-85.9)
SSE2	69.6 (63.3-75.9)	96.2 (93.6-98.8)	61.6 (52.0-71.1)	89.6 (83.6-95.6)
SSE3	78.3 (73.0-83.6)	98.1 (96.3-99.9)	72.2 (61.4-83.0)	90.4 (83.3-97.5)
SSE4	79.2 (75.1-83.3)	97.8 (96.3-99.3)	70.0 (61.4-78.6)	94.0 (89.5-96.4)
TOTAL	**68.6**	**88.9**	**65.2**	**88.2**

* INNFA - PREMI

TABLE 13

COMAPRISON OF OPV 2 COVERAGE ACCORDING TO SOCIO-ECONOMIC STATUS IN KAP SURVEYS*

SSE	K A P - 2		K A P - 3	
	WITH I.D.	DOC+VERBAL	WITH I.D.	DOC+VERBAL
SSE1	48.0 (43.3-52.7)	66.9 (62.5-71.3)	48.8 (41.7-55.9)	67.5 (60.8-74.2)
SSE2	59.2 (54.4-64.0)	79.9 (76.0-83.8)	55.6 (45.8-65.3)	81.2 (73.5-88.9)
SSE3	62.5 (56.2-68.8)	80.6 (75.5-85.7)	64.7 (53.2-76.2)	81.4 (72.0-90.7)
SSE4	68.5 (63.8-73.2)	84.8 (81.2-88.4)	62.6 (53.5-71.7)	84.8 (78.0-91.5)
TOTAL	58.8	77.4	57.1	78.3

* INNFA - PREMI

TABLE 14

COMPARISON OF OPV3 COVERAGE ACCORDING TO SOCIO-ECONOMIC STATUS IN KAP SURVEYS*

SSE	K A P - 2		K A P - 3	
	WITH I.D.	DOC+VERBAL	WITH I.D.	DOC+VERBAL
SSE1	37.5 (32.9-42.1)	54.1 (49.4-58.8)	42.4 (35.4-49.4)	57.1 (50.0-64.2)
SSE2	51.4 (46.6-56.2)	68.1 (63.6-75.6)	48.4 (36.8-58.2)	68.4 (59.3-77.5)
SSE3	53.3 (46.8-59.7)	69.2 (63.2-75.2)	58.1 (46.2-69.9)	69.5 (58.4-80.6)
SSE4	59.0 (54.0-64.0)	74.2 (69.8-78.6)	56.8 (47.5-66.1)	76.4 (68.4-84.4)
TOTAL	49.5	65.7	50.7	67.5

* INNFA- PREMI

TABLE 15

PREMI COVERAGE ACCORDING TO AGE AND TYPE OF VACCINE
AS PER KAP SURVEYS (JULY 1986 AND APRIL 1987)

	LESS THAN ONE YEAR		ONE TO FOUR YEARS		LESS THAN FIVE YEARS	
TYPE OF VACCINE	K A P 2	K A P 3	K A P 2	K A P 3	K A P 2	K A P 3
BCG	29.8	17.4	4.8	7.9	10.9	10.1
OPV 1	29.5	13.2	13.6	16.6	17.4	15.8
OPV 2	15.1	5.1	16.6	19.2	16.3	16.0
OPV 3	4.6	-	19.2	21.2	15.8	16.3
MEASLES VACCINE	6.4	.4	21.1	21.0	18.0	15.9
	(23.4)*	(.8)*			(21.3)*	(19.5)*

* Coverage according to eligible population of 9-11 and 9-60 month old infants.

TABLE 16

PREMI COVERAGE ACCORDING TO AGE AND TYPE OF VACCINE
AS PER MINISTRY OF PUBLIC HEALTH

1985 - 1986

TYPE OF VACCINE	LESS THAN ONE YEAR		ONE TO FOUR YEARS		LESS THAN FIVE YEARS	
	1 9 8 5	1 9 8 6	1 9 8 5	1 9 8 6	1 9 8 5	1 9 8 6
BCG	10.8	20.6	3.8	3.2	5.2	6.6
OPV1	20.2	39.0	7.7	5.2	9.9	11.8
OPV2	8.5	32.6	4.5	11.1	5.3	15.3
OPV3	4.3	16.0	6.0	12.1	5.6	15.2
MEASLES VACCINE	11.3	23.8	9.7	7.8	10.0	12.5

TABLE 17

PREMI COVERAGE ACCORDING TO TYPE OF VACCINE AND AGE IN KAP SURVEYS

VACCINE	ONE YEAR		TWO YEARS		THREE YEARS		FOUR YEARS	
	KAP2	KAP3	KAP2	KAP3	KAP2	KAP3	KAP2	KAP3
BCG	7.4	18.2	3.8	5.0	5.4	3.9	3.7	2.6
OPV 1	25.7	35.2	10.4	12.8	10.9	7.8	5.4	7.3
OPV 2	34.0	31.1	13.2	22.4	10.5	11.5	6.4	9.1
OPV 3	31.4	20.8	20.5	34.7	13.1	16.8	9.7	10.8
MEASLES VACCINE								
YEARS	40.5	25.6	20.3	35.2	13.0	12.9	7.6	7.9

TABLE 18

PREMI CONTRIBUTION TO FINAL COVERAGE DOCUMENTED ACCORDING TO AGE, TYPE OF VACCINE AND CAP SURVEYS

VACCINE	ONE YEAR		TWO YEARS		THREE YEARS		FOUR YEARS	
	KAP2	KAP3	KAP2	KAP3	KAP2	KAP3	KAP2	KAP3
BCG	7.6	23.9	4.0	8.0	5.7	6.9	3.8	5.0
OPV 1	26.9	37.4	11.0	13.3	11.5	8.0	5.6	7.6
OPV 2	39.7	35.2	14.9	24.5	11.5	12.1	6.8	9.7
OPV 3	43.2	27.7	21.1	40.4	15.3	18.8	10.9	12.1
MEASLES VACCINE								
YEARS	60.7	39.5	30.7	55.0	20.9	21.2	12.6	13.8

TABLE 19

COVERAGE SURVEY OF CHILDREN LESS THAN 5 YEARS
URBAN AREAS OF CARCHI PROV. - OCTOBER 1987

DISTRIBUTION OF THE SAMPLE POPULATION ACCORDING TO AGE

AGE		No.	%
YEARS	MONTHS		
	less than 3	59	23.7
	3 - 5	60	24.1
	6 - 8	73	29.3
	9 -11	57	22.9
	SUBTOTAL	249	21.5
1		254	21.9
2		246	21.2
3		222	19.2
4		188	16.2
0 - 4		1159	100.0

TABLE 20

COVERAGE AND RELIABILITY LEVELS ACCORDING TO AGE AND VACCINE
URBAN AREAS, CARCHI PROVINCE - OCTOBER 1987

AGE	B C G	OPV 1	OPV 2	OPV 3	MEASLES VACCINE	TOTAL COVERAGE	
1	92.4	67.9	46.6	20.5	13.6	12.4	
	(87.0-97.8)	(58.3-77.5)	(36.4-28.8)	(12.2-28.8)	(6.6-20.5)	(5.6-19.1)	249
1	90.6	92.9	90.2	83.1	81.9	78.3	
	(84.8-96.4)	(87.8-98.0)	(84.2-96.1)	(75.6-90.6)	(74.2-89.6)	(70.0-86.5)	254
2	92.3	91.0	89.4	84.6	83.3	72.4	
	(86.8-97.8)	(85.1-96.9)	(83.0-95.7)	(77.2-92.0)	(75.6-91.0)	(63.2-81.6)	246
3	90.5	88.3	87.4	85.6	84.2	82.0	
	(84.1-96.9)	(81.2-95.3)	(80.1-94.7)	(77.9-93.3)	(76.2-92.2)	(74.9-90.9)	222
4	92.6	89.4	88.3	87.4	84.0	78.2	
	(86.4-98.8)	(82.1-96.6)	(80.7-95.9)	(80.1-95.5)	(75.4-92.6)	(68.5-87.9)	188
5	92.6	85.7	88.3	87.4	84.0	78.2	
	(90.1-95.1)	(82.4-89.0)	(76.0-83.6)	(66.9-75.5)	(63.9-72.7)	(59.2-68.3)	1159

TABLE 21

COVERAGE AND RELIABILITY LEVELS IN 1 YEAR OLD and 1-4 YEAR OLD CHILDREN ACCORDING TO ELEGIBLE POPULATION* - URBAN AREAS, CARCHI PROVINCE

AGE	B C G	OPV1	OPV2	OPV 3	MEASLES VACCINE	TOTAL COVERAGE
1	92.4	80.9	68.2	39.2	59.6	54.4
	(87.2-97.6)	(72.5-89.3)	(57.1-79.3)	(25.9-52.5)	(39.3-79.9)	(33.8-75.0)
1 - 4	92.6	90.5	88.9	85.0	83.3	77.8
	(89.9-95.3)	(87.5-93.5)	(85.7-92.1)	(81.3-88.7)	(79.5-87.1)	(73.5-82.1)
0 - 4	92.6	88.7	85.6	79.3	81.9	76.4
	(90.2-95.0)	(85.8-91.6)	(82.3-88.9)	(75.4-83.2)	(78.1-85.7)	(72.2-80.6)

* ELIGIBLE POPULATION

	LESS 1 YEAR OLD	1-4 YEARS
BCG	249	1159
OPV1	209	1159
OPV2	170	1080
OPV3	130	1040
MEASLES VACCINE	57	967
TOTAL COVERAGE	57	967

TABLE 22

COVERAGE SURVEY FOR CHILDREN LESS THAN 5 YEARS
RURAL AREAS OF CARCHI PROVINCE - OCTOBER 1987

DISTRIBUTION ACCORDING TO AGE OF THE SAMPLE POPULATION

AGE		No.	%	
YEARS	MONTHS			
	0 - 2	68	23.6	
	3 - 5	72	25.0	
	6 - 8	86	29.9	
	9 -11	62	21.5	
	SUBTOTAL	288		22.6
1		288		22.6
2		258		20.2
3		244		19.2
4		196		15.4
0 - 5		1274		100.0

TABLE 23

COVERAGE AND RELIABILITY LEVELS ACCORDING TO AGE AND TYPE OF VACCINE IN THE RURAL AREAS OF THE CARCHI PROVINCE - OCTOBER 1987

AGE Years	BCG %	OPV1 %	OPV2 %	OPV3 %	MEASLES VACCINE %	TOTAL COVERAGE %	n
<1	93.8 (89.3-98.2)	72.2 (63.9-80.5)	48.3 (39.1-57.5)	22.9 (15.1-30.7)	13.9 (7.5-20.3)	12.8 (6.6-19.0)	288
1	98.3 (95.9-100.0)	96.2 (92.7-99.7)	93.8 (89.3-98.2)	89.6 (84.0-95-2)	96.2 (92.7-99.7)	83.3 (76.4-90.2)	288
2	97.7 (94.8-100.0)	94.2 (89.7-98.7)	93.4 (88.6-98.2)	92.6 (87.5-97.6)	88.8 (82.7-94.9)	87.2 (80.8-93.6)	202
3	97.1 (93.7-100.0)	91.4 (85.7-97.0)	91.4 (85.7-97.0)	91.0 (85.2-96.8)	87.3 (80.6-94.0)	86.5 (79.6-93.4)	237
4	98.0 (94.9-100.0)	93.4 (94.9-100.0)	92.9 (87.1-98.6)	92.9 (87.1-98.6)	87.8 (80.5-95.1)	86.7 (79.1-94.3)	196
0-4	96.9 (95.4-98.4)	89.0 (86.2-91.8)	82.8 (79.5-86.1)	75.9 (72.1-79.7)	71.3 (67.3-75.3)	69.3 (65.2-73.4)	1274

TABLE 24

COVERAGE AND RELIABILITY LEVELS ACCORDING TO TYPE OF VACCINE AND ELIGIBLE POPULATION*

RURAL AREAS OF THE CARCHI PROVINCE - OCTOBER 1987

AGE YEARS	B C G	OPV1	OPV2	OPV3	MEASLES VACCINE	TOTAL COVERAGE
< 1	93.8	78.2	63.8	44.6	64.5	59.7
	(89.3-98.2)	(70.3-86.1)	(53.7-73.9)	(31.9-57.3)	(45.5-83.5)	(40.2-79.2)
1 - 4	97.8	93.9	92.9	91.4	88.0	85.8
	(96.4-99.2)	(91.5-96.3)	(90.4-95.4)	(88.6-94.2)	(84.8-91.2)	(82.4-89.2)
0 - 4	96.9	90.6	87.6	85.3	86.6	84.2
	(95.4-98.4)	(88.0-93.2)	(84.6-90.5)	(82.0-88.6)	(83.3-89.9)	(80.7-87.7)

* Eligible population: LESS THAN 1 YEAR OLD 0-4 YEARS

BCG	288	1.274
OPV1	266	1.252
OPV2	218	1.204
OPV3	148	1.134
Measles vaccine	62	1.048
TOTAL COVERAGE	62	1.048

CHART 1

Explanatory
Model

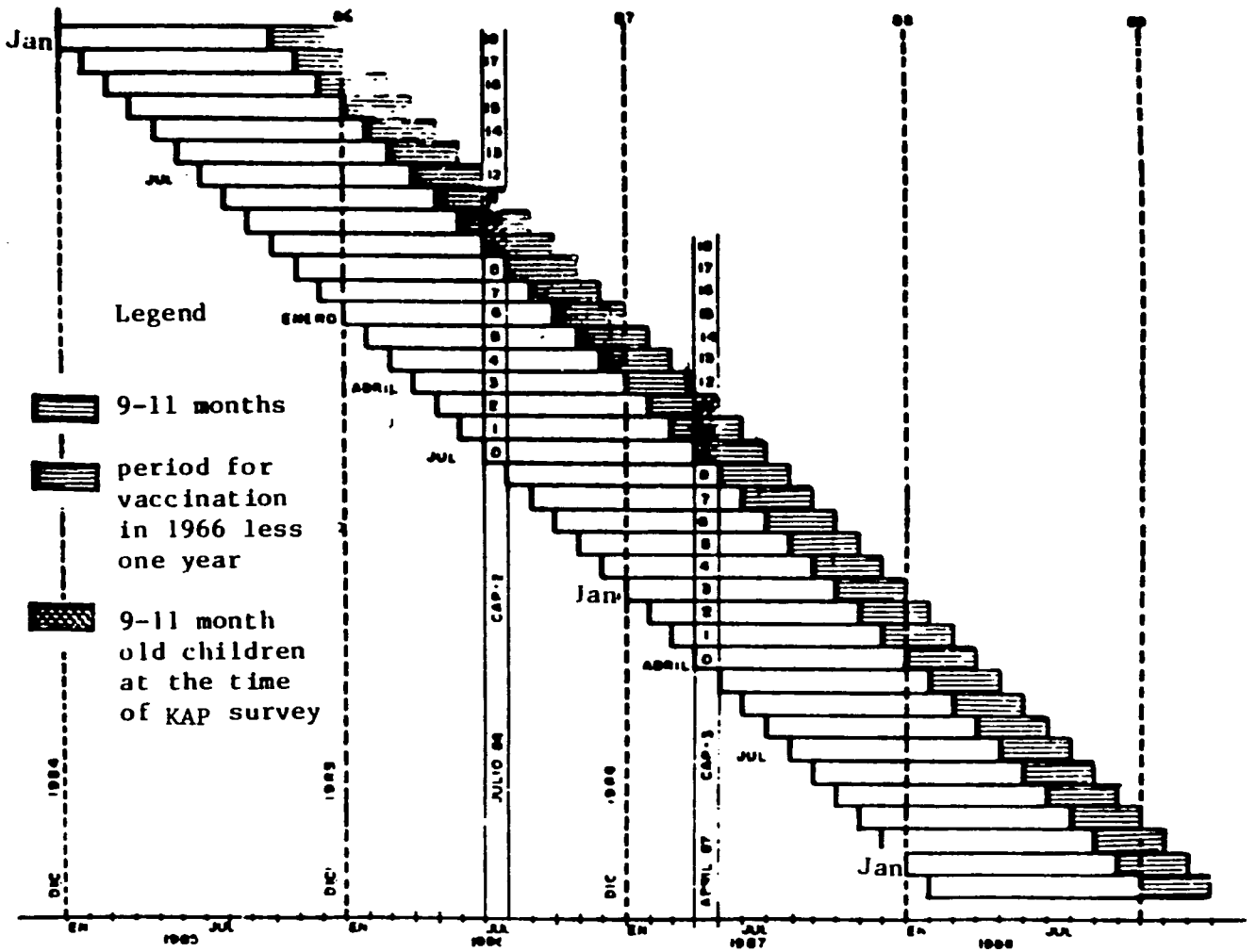

CHART 2

BCG COVERAGE ACCORDING TO AGE AND SOURCE OF DATA

ECUADOR

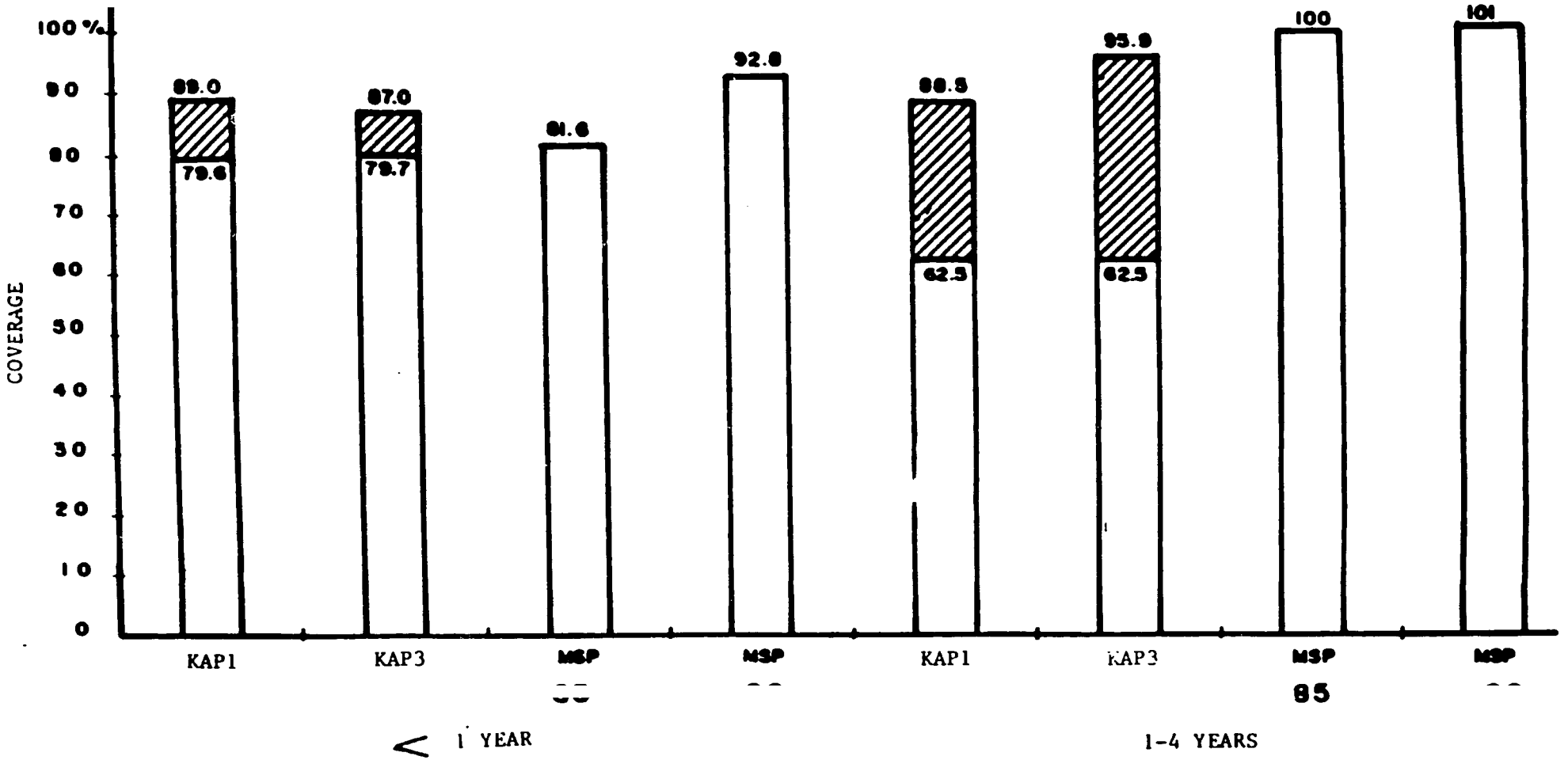

CHART 3

MEASLES VACCINE COVERAGE ACCORDING TO AGE AND SOURCE OF DATA

ECUADOR

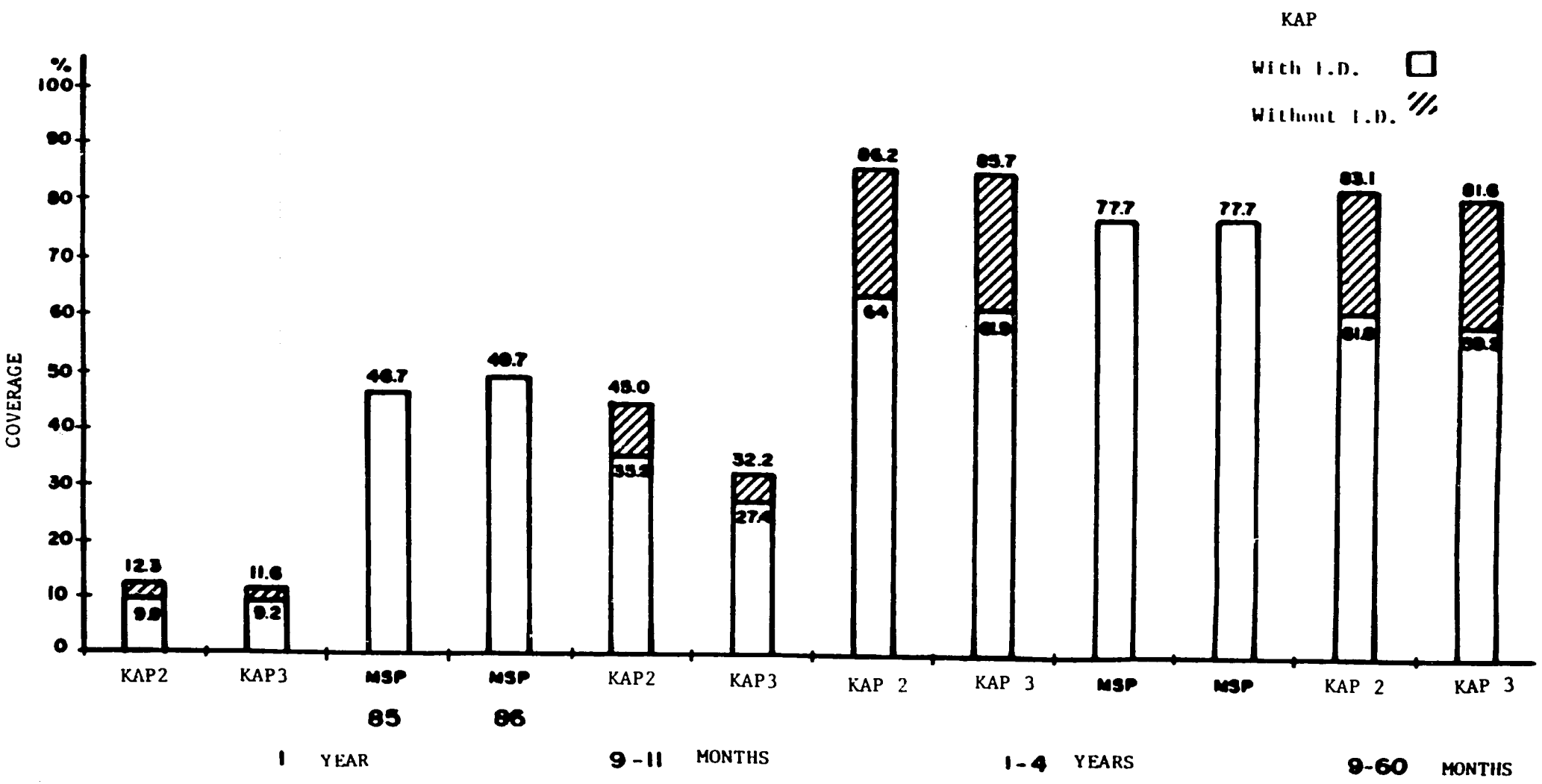

CHART 4

COVERAGE OF INFANTS LESS THAN ONE YEAR OLD
ACCORDING TO OPV DOSAGE AND SOURCE OF DATA

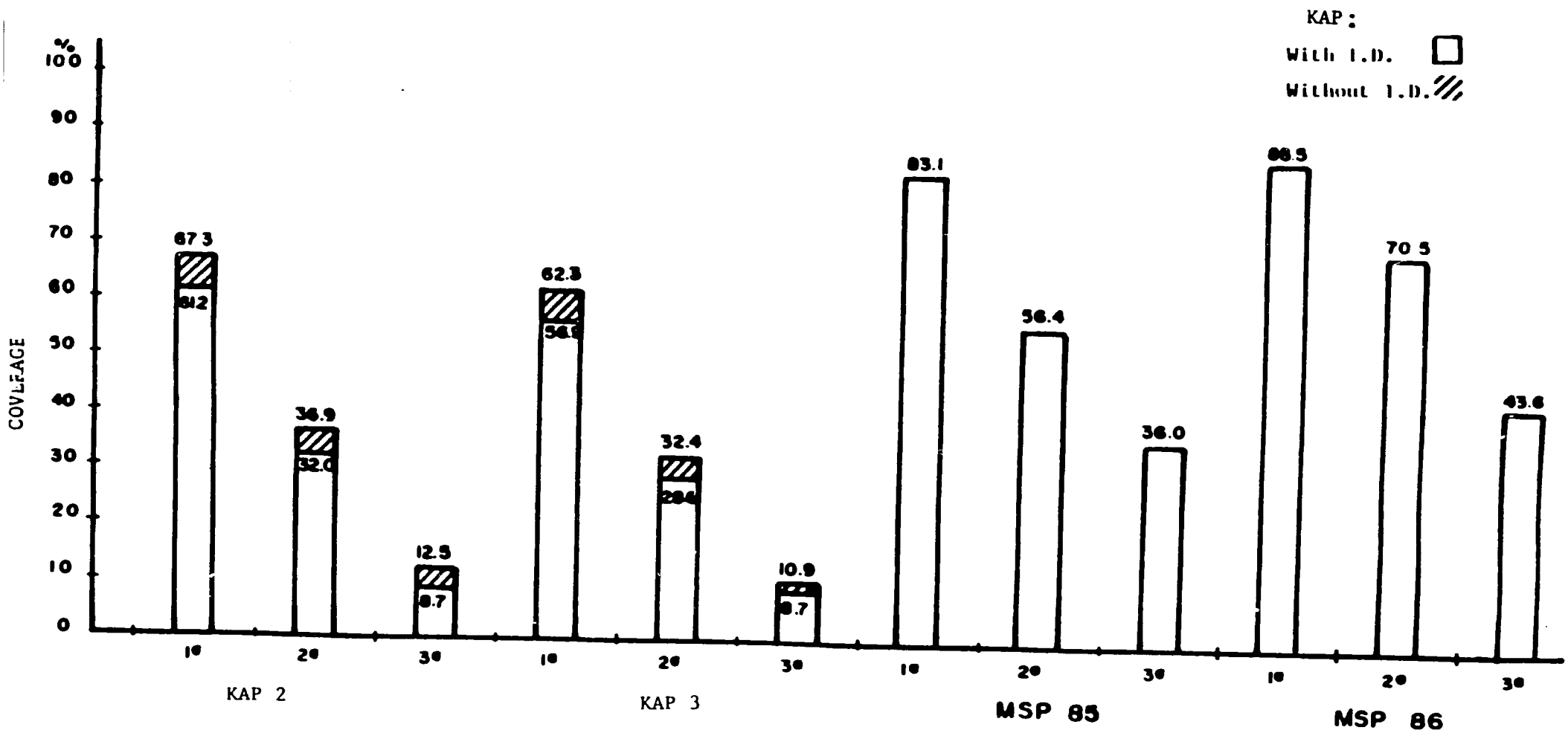

CHART 5

COVERAGE OF CHILDREN 1 TO 4 YEARS OLD ACCORDING TO OPV DOSAGE AND SOURCE OF DATA

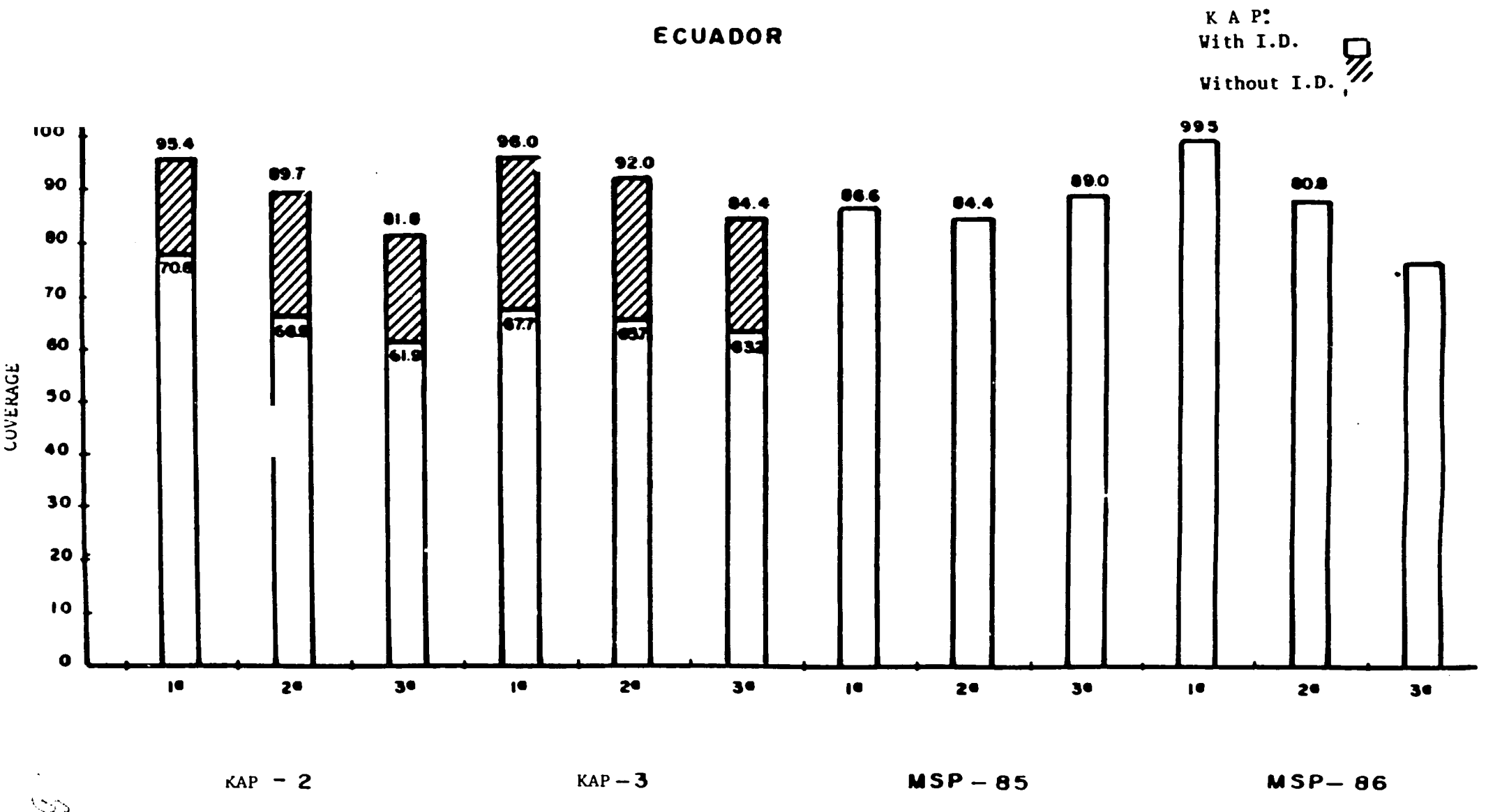

CHART 6

COVERAGE ACCORDING TO OPV DOSAGE

AND ELEGIBLE POPULATION OF CHILDREN LESS THAN 5 YEARS OLD

ECUADOR