SELECTION AND USE OF HEALTH STATUS INDICATORS

136. A recurrent message throughout the report has been the need for health status indicators which are relevant to each country's own situation. Thus, although the case-studies presented in the previous section showed certain similarities in both the disease profile and the approaches to health care, it was also apparent that many other factors influence the selection and use of indicators which are peculiar to each national and sub-national setting. It is the sheer diversity of local, district and national circumstances in which health status indicators may be called into play which makes it unrealistic and inappropriate to provide a list for universal use. Instead, it seems more useful to provide insights into some of the key questions which need to be answered and to demonstrate how these may strengthen the potential users' ability to select the indicators most appropriate to their needs and situation. Whilst the emphasis here is on measures for evaluating the impact of PHC activities, clearly some indicators have multiple uses and may be equally relevant to other stages in the priorities-planning-implementation-evaluation cycle.

137. The style of presentation of these guidelines takes the form of check-lists of questions, sub-divided by key topics, as an aid to quick reference. This approach should also enable the reader to by-pass those sections and questions which are less relevant to their needs and knowledge. It is important to stress that the selection of the optimum indicator or set of indicators for particular circumstances, involves an iterative process since the answer to a question at one stage may feed back to influence previous and subsequent answers. Thus for example, an indicator may appear as optimum as regards its validity and reliability, but subsequently proves impractical for that setting because of its information requirements. Furthermore, although most of the questions are phrased in terms of a single indicator, in many situations it will be necessary to use several indicators and therefore the questions may need to be repeated several times over.

138. To support these necessarily abbreviated check-lists, cross-references are made with the earlier text and key works are cited to provide further guidance or technical details. In addition, an example is given to illustrate the application of some of these questions in a specific country setting. The Commonwealth developing country of The Gambia has been selected for this. However, it should be stressed from the outset that this is a preliminary attempt to provide guiding questions rather than a comprehensive and definitive presentation. An important recommendation, therefore, is that these guidelines are followed-up with practical applications and adaptations in country settings. Equally the case-study presented here is for illustrative purposes only and the findings would need to be supported with additional work in the field before the final selection of indicators could be made and the procedures set-up for collection and use.

Check-lists of guiding questions

139. Who are the intended users and what are the intended uses for the indicators?

Users:

a). at what level in the health delivery system is the user located and/or concerned with? eg. village health worker; ministry of health's chief planning officer; regional medical officer of health; programme field officer; [paras. 36,37,134]

b). what is their degree of expertise and training? eg. medically-qualified; literate; numerate; familiarity with handling data;

c). what financial, technical and manpower resources are available to them? eg. funding to support data-gathering activities; equipment available such as calculators, computer facilities, transport; statistical assistants;

d). who are the other users with whom collaboration is important? eg. Central Statistics Unit; donor agencies; international and regional organizations; officials working in other government sectors - such as public works or agriculture; [paras. 70,83,95,118,]

Uses:

a). at what level are the indicators primarily intended to be used to measure impact? eg. global, regional, national,local; [paras. 35,63]

b). what is the specific purposes for which the indicators are required? Are multiple uses desired? eg. evaluation of the effectiveness of a disease-specific programme; evaluation of the impact of PHC activities; [paras. 37,39,50,66]

c). what is the intended flow of the indicator values? eg. feedback to lower levels; relevance at central level for prioritization, planning and management; [paras.111,134]

d). how do these uses fit in with other potential uses? [paras. 33,37]

e). what are the requirements for indicators at a Regional and Global level for monitoring progess towards HFA/2000? [paras. 63,71]

References: Baylet, 1979; Murnaghan, 1978,1981; Nord-Larsen, 1983; Uhde, 1983

140. Is the necessary background information available for the evaluation of impact?

a). what is the overall or local context in which the programme(s) operates - with regard to health; demographic characteristics; physical, social and economic circumstances? eg. developing country, predominence of acute infections and communicable diseases. [paras. 34,79,89,104,122]

b). what are the stated objectives of the health strategies or individual programmes which are being evaluated with regard to impact? eg. reduce the infant and child mortality rate; reduce the prevalence of communicable diseases; [paras. 41,80]

c). what are the targets which have been set at the level at which the indicators are required? eg. nationally to reduce infant mortality to 50 per 1000 live births; to reduce the proportion of low birth weight (LBW) babies delivered by TBAs in the district to 10% or less; to ensure there are no new cases of diptheria in the child population under five served by a health centre; [paras. 42,96]

d). what are the desired outcomes and to what extent are the processes linking inputs to outcomes in terms of health status understood? [paras. 40,47]

e). is there evidence that the programme(s) is functioning and being utilized at the intended level? What is the coverage achieved? Has an evaluation been carried out of the programme's performance? [paras. 50,117]

References: Holland, 1983; Martini et al, 1976; Payne,1985; WHO, 1981a, 1985a;

141. Which of the alternative health status indicators may be appropriate for the specified users and uses?

a). which indicators have been found useful by other countries/programmes/districts? [paras. 66,73,74]

b). which indicators have been suggested by international and regional organizations? eg. WHO, OECD, UNSO [paras. 55,58,61,62].

c). which (if any) health status indicators are currently being used and in what capacity?

References: Hansluwka, 1985; Holland et al, 1979; Murnaghan, 1981; Noordin, 1979; WHO, 1981a, 1985a;

142. Which of the possible indicators has the desirable or 'ideal' qualities for assessing the impact of the programme(s) in question?

a). is the indicator valid? ie. does it measure what it is supposed to measure?

b). is the indicator reliable? ie. are the procedures used to derive the indicator accurate - do they consistently give the same result when applied to the same phenomenon? Reliability requires the elimination or control of extraneous factors influencing the measurement, and since one of the primary purposes of an indicator is comparison over time, the question of reliability concerns intervening factors under current circumstances and those causing distortions over time.

c). is the indicator sensitive? ie. is it responsive to changes in the phenomenon being measured? [paras. 46,48,49]

d). is the indicator specific ie. does it reflect **only** the phenomenon it is intended to? eg. the infant mortality rate clearly reflects more than the delivery of health services. [para. 47]

e). is the indicator a direct or proxy measure? eg. use of contraceptive prevalence as a proxy indicator for assessing levels of fertility rather than using fertility rates.

f). is the indicator relevant and compatible with wider socio-economic concerns and indicators? [para. 57]

References: Goldsmith, 1972; Holland, 1983; Palloni. 1985; Rosser, 1983; WHO,1981a, 1983b;

143. What are the basic sub-categories and disaggregations by which the indicator should be available?

a). what are the demographic and socio-economic variables needed for meaningful intepretation of the indicator? eg. proportion of LBW babies by age and parity of the mother; cause-specific mortality rates by age and sex. [paras. 49,55,57]

References: Jazairi, 1976; Murnaghan, 1981; OECD, 1982; UNSO, 1978, 1981; WHO, 1982.

144. What is the state of readiness of the indicator?

a). have the precise information requirements of the indicator been defined? eg. proportion of LBW babies- need: total number of infants born in a community over a defined period and, of these, the number whose weight at birth was less than 2500g.

b). have operational definitions, codes, reference standards, etc. been developed for the indicator?

145. What are the study designs and procedures most appropriate to the assessment of impact using specific health status indicators?

a). what types of study designs are available? eg. quasi-experimental, cross-sectional, cohort, case-control, historic. [para. 48]

b). what types of comparisons are made using these designs? eg. over time for the same population against a specified target; between different sub-groups at one moment in time. [para. 27]

c). do these designs require the indicator information to be collected continuously, periodically or on one occasion, and prospectively or retrospectively?

d). what methods of data collection can be employed? eg. record reviews, sentinel surveillance, sample surveys, health facility sampling. [paras. 49,51,52]

References: Holland, 1983; Nord-Larsen, 1983; WHO, 1983a, 1985b.

146. Given the answers to the above questions, which health status indicators are most appropriate in the current context - technically, operationally, and financially?

a). is the necessary information for the construction of the indicator(s), and for its disaggregation, already being gathered as part of the existing health information system or by the data-collection activities of other sectors? [para. 49]

b). is the information of adequate quality, quantity and frequency for the intended uses of the indicator?

c). if the necessary data are not already being gathered, is it feasible to do so within the existing information system? [paras. 51,52]

d). have practical and affordable methods of gathering the necessary information to construct the indicator been demonstrated in other similar situations? Can these methods be applied in the present situation and will they remain equally practical and affordable? [para. 49]

e). is the disaggregated information for the construction of the indicator at that level also useful at higher levels?

f). can the indicator be constructed in such a way as to reveal any differences between groups within the same population?

g). is a single indicator adequate and if not, what is the optimum set of indicators - technicaly, operationally, and financially?

h). which indicators could be constructed from the same sources of information and/or using the same data-collection methods?

References: Murnaghan, 1981; OECD, 1982; Sundaresan, 1984; WHO, 1981a.

147. If 'new' information is required, what procedures will be used to obtain it?

a). what methods of data collection are preferable - technically, operationally, and financially? eg. sample survey, observational study, sentinel surveillance.

b). who would be responsible for gathering and/or supervising the collection and how would this fit in with their existing roles? eg community health nurses; village elders; health centre records clerks. [paras. 116,134]

c). do those who would be given this responsibility have the necessary skills, time and commitment to the collection of the information, ? If not, how could this be rectified?

References: UNSO, 1981; WHO, 1981a, 1983b.

148. What are the procedures involved in the construction of the indicator(s) and the demonstration of impact?

a). which study designs have been selected? [paras. 48,147]

b). have the necessary protocols and field manuals been prepared, describing the study design, methods of data collection, and guidelines for data aggregation?

c). what analytical techniques will be used in the presentation of the indicator values?

d). what mechanisms have been set-up to monitor the quality of information and the reliability and usefulness of the indicator(s)?

e). has a system been established for the feedback of the indicator values to higher and lower levels?

f). how will the indicator values be displayed? eg. diagrammatically; in tabular form.?

References: Holland et al, 1979; OECD, 1982; Rosser, 1983; Sundaresan, 1984; WHO, 1981a.

Illustrative case-study

149. The objective of this section of the report is to illustrate the application of some of the guiding questions for the selection and use of health status indicators to a particular country. The case of The Gambia will be used here. The first part of the discussion introduces the setting, including the health profile and strategies. This is followed by the demonstration of the use of the guiding questions. Obviously it is not possible to discuss all the questions nor all the possible indicators which may be relevant and feasible in The Gambia, and therefore the discussion concentrates on just two possible indicators which could be used to meet the needs assumed in this example. Of course, in practice, the selection of health status indicators is not just based on each ones' individual relevance and feasibility, but also on their combined usefulness, as a noted previously (para. 137). Similarly it should be reiterated that the case presented is for illustrative purposes only and is not in any way meant as a recommendation of specific indicators or procedures. The findings here would clearly need to be supported with additional work in the field before the final selection could be made.

The Gambia

150. The Republic of The Gambia, located on the west coast of Africa, covers a narrow area of just 11,000 square kilometres, through which the Gambia River flows. Away from the marshland adjacent to the river, the terrain is savannah - a reflection of the semi-arid climate, with an annual average of just 90-115 centimetres of rain falling generally between June and October.

151. The Gambia became formally independent in 1965, when it adopted a parliamentary system of government. For administrative purposes the country is divided into five divisions, made up of 46 rural districts and 2 urban councils. The districts, in turn, comprise villages - an estimated 1000 in total in 1981 (Medical and Health Department - The Gambia, MHD-G, 1981).

152. The estimated population of The Gambia in 1984 was 725,000, with an average density of 47 persons per kilometre square, although the figure ranges from 13 to 58 between the various rural districts. There is evidence for an increasing rate of townward migration, with about 13% of the total population resident in the urban areas in 1975 (MHD-G, 1981). The projected annual growth rate in 1983 was 2.6-2.7%, with a characteristic young age structure - almost half of the population are less than 15 years of age (World Bank, 1984). An estimated 15-20% of the adult population are illiterate. Whilst the people of The Gambia comprise many different ethnic groups, the Mandinka are the most numerous. The majority of the population are Muslim.

153. The economy of The Gambia is dependent on agricultural production in order to provide both internal revenue and foreign exchange. Recurrent droughts and the high rate of population increase have adversely affected cash-crop production and food production and consumption. The per capita GNP in 1982 was US$ 360 (World Bank, 1984), whilst the percentage of government expenditure on the health sector was just over 8% (Ministry of Health, Labour and Social Welfare, MHLSW-G, 1985).

Health profile

154. The major health concerns in The Gambia are similar to those described previously for the four other countries, with acute infectious and communicable diseases representing the major causes of mortality and morbidity. Malaria, tuberculosis, respiratory infections, tetanus, and diarrhoeal diseases are all still significant problems - especially for the younger age groups, whilst most of the vaccine-preventable diseases, such as measles, polio and pertussis, have become of lesser importance within the last few years, as will be discussed shortly.

155. The government health services of The Gambia are organized in a pyramidal system, with two general hospitals at the apex, functioning as major referral centres, but also providing out-patient clinics (Hill and Graham, 1986). Below this level, and apart from certain specialist units, there is a network of health centres, dispensaries, sub-dispensaries and health posts. The health centre is the main institution in the rural areas, providing MCH/EPI services, curative outpatient care and environmental education, and staffed by qualified medical personnel, mostly nurses. Dispensaries primarily provide basic care, with periodic MCH/EPI services delivered by visiting mobile teams, and are run by a nurse/dispenser. At the next level is the sub-dispensary, which usually has a resident community health nurse (CHNs), and which, in her absence, are lock-up units. At the base of the pyramid of fixed health facilities are health posts manned by village health workers (VHWs) and TBAs. In addition to these government-provided services, there are a number of non-governmental facilities offering inpatient and/or outpatient care (MHD-G, 1981).

156. In The Gambia, PHC is seen as both a philosophy and a strategy for health development. This is outlined in the PHC Action Plan 1980/81-1985/86 (MHLSW-G, 1985) which stresses the following components of its implementation:

a). the phased establishment of Village Health Services, initial action being concentrated in the least served areas;

b). the strengthening and re-organization of the National Health Services in order to support the extension of the health care system to the village communities;

c). promotion of community participation and self-reliant effort in health activity at the community level;

d). mobilization of extra resources for health through inter-sectoral co-operation and co-ordination at village and other levels.

The emphasis is placed on the integration of curative and preventive services, including vertical programmes which were already in operation prior to the adoption of the PHC Action Plan, such as EPI.

157. The implementation of PHC in The Gambia has occurred in phases, with national coverage scheduled for 1986. Village Health Services are being established in villages with over 400 inhabitants, based on trained community health workers (CHWs), comprising one village health worker (VHW) and two TBAs for each PHC village and providing simple curative, promotive and preventive care (MHLSW-G, 1985). This lowest level in the health services heirarchy is supported by referral centres at the higher levels, with the CHWs supervized by CHNs generally based at key PHC villages. Each CHN supports a cluster of 4 to 8 PHC villages,

promoting community activities as well as providing technical assistance to the CHWs, and they thus represent the first and main link between the community and the formal health sector (MHLSW-G, 1985). These CHNs are, in turn, supported by nearby health centres, although a recent review of PHC in The Gambia noted that this support was often lacking and represented a weak point in the chain of formal sector back-up for PHC (MHLSW-G, 1985).

158. The major support for CHNs and CHWs seems infact to come from the Regional Health Teams (RHTs), which provide an intermediate connection between peripheral and central health services. There are currently three RHTs - Central, Eastern and Western, each one having to collaborate with two separate Divisional administrations. The RHTs are responsible for supervizing all basic health services, below hospital level, within their jurisdiction, although it appears that they are tending to concentrate on the furtherance of PHC in terms of Village Health Services.

159. At the central level, management and supervision of the health sector is carried out within a complex organizational structure. As regards PHC, the most relevant sections include the Health Planning Unit and Committee, and under the Director of Medical Services, the various committees, working groups - such as the PHC Working Party, and central specialized units. The latter, including MCH/EPI, Epidemiology and Statistics, Community Health, Health Education, and Nutrition, plan and monitor specialized programme components within the integrated service structure and in collaboration with RHTs.

160. Although the health information system has undergone revision almost yearly since 1980, the recent PHC Review noted the need for further development, in particular with regard to the feedback of information to the peripheral units from the central level, and the use of the information in service management and evaluation (MHLSW-G, 1985). Weaknesses and problems seem to exist at all levels in the reporting network, including the level of the CHWs and CHNs who collect information and pass it on directly without utilizing it in their day-to-day activities and without receiving any feedback from higher services, and at the level of the RHTs where a wealth of available data is under-utilized.

161. Having briefly introduced the setting provided by The Gambia, the discussion can now move on to the selection of health status indicators. As mentioned previously, in order to confine the scope of this section, attention will be focused on two possible indicators for the evaluation of the impact of PHC activities and of a specific programme - MCH/EPI. Furthermore, the focus here is on the level of the RHT since this clearly represents a critical link between central and peripheral health services in The Gambia and it is at this level that the need for guidance in the selection of indicators has been so keenly expressed.

Check-lists of guiding questions

162. Who are the intended users and what are the intended uses of the indicators?

a). Users: as just mentioned, the RHTs will be assumed to be the primary users of interest. The three RHTs in The Gambia each comprise 5 or less members, some of whom are professionally qualified, all are literate and most have at least some ability to handle data. The financial and personnel resources available

to each RHT for the purposes of the collection and use of health information are limited. There is no designated individual with responsibility solely for health information, restricted access to data-processing facilities, and limited transport for field data collection. The principal other users with whom the RHTs collaborate include the central specialized units of the Ministry of Health, Labour and Social Welfare, such as the newly established Health Statistics and Epidemiology Unit; multi-lateral and bi-lateral agencies supporting PHC, such as UNICEF and WHO; other ministries active in areas inter-related with PHC, such as the Central Statistics Office and the Ministry of Economic Planning and Industrial Development; and local externally-funded research activities, such as those of the Medical Research Council (MRC) of Great Britain.

b). Uses: it will be assumed here that there are two principal purposes for which the indicators are required - firstly, to evaluate the impact of all PHC activities on the health status of the population falling within each RHTs area, and secondly to evaluate the impact of the MCH/EPI services. These two examples will raise many issues which are of general relevance. In view of the limited resources for gathering and analysing information found in most developing countries, including The Gambia, the preference is for indicators which have multiple uses, although this is often at the sacrifice of specificity (see para. 142). Besides being relevant and useful at the RHT level, the selected indicators should also be useful to planning, management and evaluation at the national level, and to provide useful feedback to health centres, CHNs and CHWs.

163. Is the necessary background information available?

a). Objectives and targets - in The Gambia, PHC is seen as an integral part of the national development strategy - "the aim being to extend health service coverage to the entire Gambian population and to attack the main disease problems of communities" (MHLSW-G, 1985). The priority diseases for prevention and control are set-out in the PHC Action Plan 1980/81-1985/86. These include malaria, diarrhoeal diseases, EPI target diseases, complications and conditions associated with pregnancy and childbirth, and acute lower respiratory tract infections. Other concerns for which programmes are being developed for incorporation in PHC are child spacing, nutritional surveillance and intervention, primary oral and ophthalmic care, sexually transmitted diseases, schistosomiasis, leprosy and tuberculosis. In addition to the overall aim to reduce infant and child mortality rates, there are more specific objectives related to particular programmes. For example EPI aims to make immunization services available to all children under five years of age and to pregnant women by the year 1990, whilst the CDD programme aims to reduce 'to a minimum' the morbidity and mortality rates due to diarrhoea amongst children under five. Clearly many of the preventive and curative services are aimed at similar target groups, in particular mothers and children under five. More specific programme targets have been set at the RHT level and below, although many of these focus on delivery and coverage rather than impact and effects.

b). Inputs and outcomes - it was noted earlier in the report (para. 40), that specifiying the linkages between inputs-processes-

outcomes still provide a major challenge to health research. Thus, for example, although it is generally agreed that the mechanisms leading to a reduction in infant and child mortality also include those which lie outside the immediate influence of the health sector, for other more specific conditions, such as deaths due to neonatal tetanus, the processes may be directly amenable to intervention. In the case of The Gambia, both the MCH programme and EPI are relevant, since the provision of ante- and post-natal care **and** the delivery of tetanus toxoid to pregnant women have the potential to reduce deaths due to neonatal tetanus.

c). Operational performance of the programme(s) - as was also true of the four other countries, the evaluation of PHC in The Gambia has tended to concentrate on operational aspects. This does, however, provide essential background information for the assessment of impact since, as noted earlier, outcome evaluation assumes that the programme(s) is functioning and being utilized as intended. The Gambian Government carried out a comprehensive review of PHC in 1984/85. This included questionnaire surveys both of personnel involved in the delivery of PHC in the rural areas and of a sample of 580 households in PHC and non-PHC villages. Whilst noting the PHC programmes' considerable achievements, high coverage and effective technology, the Review also highlights some of the problem areas. As regards MCH/EPI, several other sources in addition to the PHC Review give insights into performance. Thus, over 90% of mothers are estimated to have their babies delivered by trained TBAs, almost three-quarters of all mothers are examined at least three times by a TBA, and almost 100% of women attended by TBAs at birth are seen post-natally during the first week. This high degree of contact of mothers with the providers of health care, is confirmed by a study in 1982 which found that 90% of mothers possessed an infant welfare card and attended clinic regularly (MHLSW-G, 1985). In addition, immunization services have a long history in The Gambia, being traced back to the smallpox and measles vaccination campaigns in the late sixties and early seventies. EPI was launched nationally in 1979 before the PHC Action Plan was adopted, but is now more or less fully integrated with MCH services. High rates of immunization coverage are recorded from several sources (for example, Hull, Williams and Oldfield, 1983), some using the standard EPI cluster sampling design (Lemeshow and Robinson, 1985). Although national coverage in terms of BCG is placed at 98% and for DPT3, Polio 3 and measles all above 80%, the proportion of children fully immunized in 1984 was just over half (but over two-thirds in 1982). As regards pregnant women receiving three doses of tetanus toxoid, figures upwards of three-quarters have been recorded (MHD-G, 1981). In addition to the above, a number of other indications of the coverage and quality of PHC activities are available, including those from the USAID-funded project on Mass Media for Infant Health (1981-1984) and from the MRC's longitudinal monitoring and evaluation study involving 14 PHC villages in the Central RHT's area.

164. Which of the possible health status indicators may be appropriate for the purposes described?

a). Possible indicators for assessing the impact of PHC activities - the earlier discussions and the examples presented in Appendix III, suggest that there are basically three groups of indicators, namely those relating to mortality, to morbidity, and to disability, and that these, in turn, may reflect positive or negative health. It may be recalled that mortality indicators, for instance, may refer to survival (positive health) - such as the life expectancy at birth, or death (negative health) - such as the infant mortality rate. These two indicators are commonly used to measure and compare social and economic as well as health conditions among population groups, and are discussed at length in the literature (Hansluwka, 1985; Murnaghan, 1981; Jazairi, 1976). As regards morbidity and disability indicators, many of these serve the dual purpose of evaluating the impact of the overall health services as well as that of specific programmes. Possible indicators include: infant mortality rate; life expectancy at birth; maternal mortality rate; birth rate; proportion of live-born infants with birth weight of less than 2500g; age specific death rates for three principal causes of death; incidence and/or prevalence rates for the six most prevalent diseases; and the rate of long term disability in the adult population. In terms of current usage by RHTs in The Gambia, there do not appear to be any health status indicators which are routinely constructed for evaluation or for other purposes.

b). Possible indicators for assessing the effectiveness of MCH/EPI services -there are many outcome indicators which could be suggested here reflecting the 5 D's - death, disease, disability, discomfort and dissatisfaction, mentioned earlier (para. 45). Possible indicators include: infant mortality rate; proportion of children dying before age 2 or 5 years; proportion of deaths of under 5 years due to diarrhoeal diseases; proportion of children under 5 years with at least one diarrhoeal episode in the last two weeks; proportion of live-born infants dying from neonatal tetanus; proportion of children under 5 years who have had measles and the number of these who have died; and the proportion of children aged 5-9 who are fully or partially paralyzed (WHO, 1983b).

165. Do these indicators have desirable technical qualities?

As mentioned previously, it is not possible to consider the relative merits of all the possible indicators here and, therefore, the following discussion will concentrate on just two for the purposes of illustration: the infant mortality rate and the proportion of live-born infants dying of neonatal tetanus. It is important to note that both of these are essentially population-based measures and this has a number of implications for the methods and sources for their construction, as will become apparent in the following pages. Clearly either indicator could be used to evaluate the combined impact of all PHC activities **and** to evaluate the effectiveness of the MCH/EPI programme, but we shall concentrate on the use of the infant mortality rate for the former purpose and the death rate for neonatal tetanus for the latter.

a). infant mortality rate(IMR): as mentioned above, the qualities and drawbacks to this indicator have been discussed at length in

the literature. It is one of the most widely used measures in the developing countries but is increasingly being replaced by the perinatal mortality rate in the developed countries. In terms of the technical qualities of the IMR, it is the question of reliability which is usually regarded as important in the context of the developing countries. Although there is a long tradition and wealth of experience to draw-on and the basic analytical techniques are well developed, the tremendous difficulties of collecting reliable and reasonably complete information to construct this indicator cannot be neglected and have been the subjects of much concern and research effort throughout the developing countries. The application of the same data-collection procedures applied more or less to the same population have been found to yield surprisingly different IMRs in many country settings. Moreover, the problems of controlling for the multitude of factors outside of the health sector which are known to influence the level of infant mortality are considerable, both in terms of cross-sectional and longitudinal assessments. The IMR as an indicator of the impact of PHC activities is not, therefore, a very specific measure. However, as are most mortality-based measures, this indicator is relatively sensitive to changes over time in these influencing factors, and has been found to be particularly useful in differentiating between sub-groups of the population. In the short term, the IMR is affected by fluctuations in the birth rate which may distort the values for individual years, particularly at the sub-national level where the problems of incomplete information have a proportionally greater distorting effect. Moreover, although the operational definition of the IMR seems reasonably straight forward, there is a continuing debate on the composition of the numerator and denominator linked to the definition of live-birth, stillbirth, foetal death etc. and how this may affect the level and comparability of rates (Hansluwka, 1985). The mismatching of the numerator and denominator with regard to the period and to the base population is especially serious at the lower levels of aggregation. Finally, one of the major advantages to this indicator is undoubtedly its compatibility with wider socio-economic concerns and, indeed, it is frequently used to reflect these.

b). neonatal tetanus death rate - as with the IMR, the question of reliability is usually more critical for this indicator than validity. One of the major problems relates to the accuracy of the diagnosis of cases of neonatal tetanus and of the age of the infant ie. less than 28 days. In particular, differences are bound to emerge between lay diagnoses by, for example, parents, and diagnoses by qualified medical personnel. Moreover, even amongst the latter group inconsistent results often emerge. The sensitivity of this indicator has been found to be reasonably high, responding fairly rapidly to changes in the quality and coverage of the relevant health programmes. However, in the short-term and at the local level, it is also affected by fluctuations in the birth rate, and by distortions arising from the small number of cases. As regards specificity, it was noted earlier that just as there are many indicators which could be chosen to assess the impact of the MCH/EPI programme, so the death rate due to neonatal tetanus reflects more than just these services. In particular, the availability and uptake of the necessary curative care is relevant since this may prevent an infant with neonatal tetanus from dying, although it must be

said that there is usually a high case-fatality rate for this disease. The major controlling factors are, however, felt to be maternal immunization with tetanus toxoid, hygienic practises at the time of delivery, and post-natal care. In The Gambia, these activities all fall under the MCH/EPI programme, although health education and overall improvements in the living conditions into which infants are delivered are also relevant.

166. What are the basic sub-categories and disaggregations by which the indicator should be available?

a). infant mortality rate - at the sub-national level, the degree to which the IMR may be considered by various sub-categories is governed partly by the problems of insufficient births and deaths to produce stable rates. The use of this indicator in the identification of 'high risk' groups at the sub-national level is therefore often dependent on crude disaggregations by, for instance, maternal factors such as parity, age or education, or of particular importance here, residence in PHC or non-PHC villages or in rural or urban areas.

b). neonatal tetanus death rate - the above reservations also apply to this indicator. In addition to the residential and maternal factors just mentioned, other relevant disaggregations include, for example, place of delivery, attendance at delivery of birth, mother's immunization history, number of ante- and post-natal clinic or home visits received by the mother, and access to curative care facilities.

167. What is the state of readiness of these indicators?

a). infant mortality rate - this is usually defined as:

$$\text{IMR} = \frac{\text{Deaths under age one during year}}{\text{Live-births during year}} \times 100$$

Calculated in this way, however, the IMR is not a 'true' rate since the denominator is not necessarily the same population at risk of death as that represented in the numerator. Some of the deaths under one year of age may infact be births which occurred in the previous year whilst, equally, some of the births occurring during the year may die in the next year. If the date of birth is recorded at the time of death registration, then the year of birth of those dying is available and therefore a 'true' IMR can be calculated. The extent to which these two calculations produce different IMRs is influenced by the magnitude of the fluctuations in the number of births. As noted earlier, the problem of including strictly live births in the calculations may lead to some errors. The procedures involved in the collection of the necessary data, in the analysis and in the corrections for errors, are well-documented (see, for example, Kpedekpo, 1982; Palmore, 1971; UN, 1983, 1984; Vallin, Pollard and Heligman, 1984). Briefly, there are two basic approaches to estimating the IMR - direct and indirect - the choice of which is partly influenced by the data already available. These methods have different data requirements and involve different collection and analytical procedures. In countries where the vital registration system has a reasonable coverage (ie. around 90% of all vital events are reported), the IMR may be computed dirctly from registered live-births and deaths under one year of

age. Alternatively, it may be calculated directly from births and deaths reported in maternity histories gathered during household sample surveys. The indirect approach has arisen both as a response to the lack and inaccuracy of vital statistics found in most developing countries, and as a means of avoiding some of the omissions and errors associated with the direct approach.

b). neonatal tetanus death rate - usually calculated as:

$$\frac{\text{Number of deaths due to neonatal tetanus during year}}{\text{Number of live-births during year}} \times 100$$

168. What study designs and procedures are most appropriate to the assessment of impact using these indicators?

a). impact of PHC activities - the use of the IMR to evaluate impact could be employed in the context of cross-sectional, cohort or historic study designs. These designs are discussed in a number of standard texts (for instance, Casley and Lury, 1981; Fleiss, 1981; Kleinbaum et al, 1981; MacMahon and Pugh, 1970;).The basis of comparison could either be for the same population over time observing trends in the IMR, or between population groups, for one or more moments in time, with differential 'exposure' to PHC activities. The latter type of design was employed during the recent Gambian Government review of PHC (MHLSW-G, 1985), using sample survey methods to collect the necessary information and comparing PHC and non-PHC villages. The question of controlling at the point of data collection or analysis for extraneous influences ie. those not directly related to PHC activities which may obscure the comparison (such as comparing villages which are fundamentally different with regard to, say, socio-economic status of their populations), is particularly important though frequently neglected. Assessment of impact by comparison over time encounters similar difficulties with regard to allowing quantitatively for other influences, such as natural changes in the virulence of particular pathogens or perhaps the introduction of a local industry or agricultural scheme which leads to the overall improvement in the standard of living and, in turn, to a fall in the IMR.

b). effectiveness of MCH/EPI - the indicator chosen for discussion here, the death rate for neonatal tetanus, can also be constructed for comparisons over time or between groups. It is often particularly difficult to collect the necessary information retrospectively within the community using, say, household surveys, owing to both under-recording of these early deaths and misdiagnoses of neonatal tetanus as the cause, unless of course there is complete death registration and medical certification. Health facility reporting generally provides a continuous source of data on the numerator but not the denominator for the calculation of a rate. An alternative to using cross-sectional or historic designs is the cohort or longitudinal approach, involving the collection of information prospectively. The technical and financial draw-backs to this design have tended to be regarded as prohibitive. However, the prospects for follow-up studies have been enhanced by the development of PHC reporting systems where, for example, in The Gambia, CHWs have direct contact with the households in their

village and where TBAs carry out postnatal visits and are thus following infants as part of their routine responsibilities.

169. Are these indicators appropriate technically, operationally and financially in the context of The Gambia?

a). infant mortality rate - In The Gambia, there are several sources of information - of varying quality and completeness - which provide a basis for calculating past or present IMRs; these have been reviewed recently by Hill and Graham (1986). The registration of births and deaths is the responsibility of the Ministry of Health, Labour and Social Welfare and is centrally controlled from the Registry in the capital Banjul. In the rural areas, births and deaths are supposed to be notified to the nearest fixed health facility, but this system is known to be seriously deficient. More recently, the establishment of Village Health Services has diversified the reporting networks. Recording of certain events, including births and deaths, is one of the responsibilities of VHWs and TBAs. These CHWs, in turn, report to their supervisory CHN, whilst health centres and dispensaries are also required to make monthly returns. This information is then forwarded to the RHT and subsequently passed-on to the Health Statistics and Epidemiology Unit in Banjul and to the Central Registry in the case of births and deaths. Whilst this PHC-based reporting system has the capability of greatly improving birth and infant death registration, and thus the IMR, there do not appear to be any in-built or independent mechanisms for checking the quality and completeness of reporting. Nevertheless, this undoubtedly represents one of the key sources of continuous data on early age mortality, particularly at the regional and local levels. Other sources providing historic information include the decennial censuses, the last one being carried out in 1983 and for which the results are still awaited, household surveys, and the longitudinal studies carried out by the British MRC (Hill and Graham, 1986). Whilst there are a wide variety of published estimates of the IMR, some purporting to be nationally representative (for example, 217 per 1000 live births from the 1973 Census) and others referring to localized areas (for instance, 175 from the study in Keneba village for the period 1971-75 - Billewicz and McGregor, 1981), there do not appear to be any figures produced regularly for the areas covered by the RHTs.

b). neonatal tetanus death rate - as just mentioned, in the absence of reliable and complete death registration and certification data, which is the case in The Gambia, the principal source of information on cases of neonatal tetanus and fatalities are fixed health facilities. The difficulty here is the lack of information on the number of births within the facilities' catchment. Although CHWs are required to routinely record births, infant deaths and cases of tetanus within the community, the latter does not necessarily lead to death and does not necessarily involve neonates, and therefore this source requires some modification before it can be used to calculate the death rate due to neonatal tetanus, as will be returned to shortly. Historic information on the neonatal tetanus death rate is available from a number of small-scale community-based surveys and from the continuous surveillance carried out by the British MRC.

170. If 'new' information is required, what procedures will be used to obtain it?

a). infant mortality rate - a further problem with using the existing sources of information described above, such as vital registration or census data, is that they are unable to provide all the necessary details for the useful disaggregation of the indicator or to enable the control of the extraneous factors influencing infant mortality. These are some of the reasons why specific data-collection activities may be required, such as sample surveys. A further advantage of the latter is that information for more than one indicator may be gathered at the same time, thus improving cost-effectiveness. The possibility of sample surveys being carried routinely as part of the national information system is receiving support under the United Nations Household Survey Capability Programme, as mentioned earlier in the report (paras. 52,56), whilst the current USAID-Westinghouse programme on Demographic and Health Surveys in developing countries is a further important initiative. In the context of The Gambia, the use of periodic health-interview surveys, both to supplement the alternative sources and as a means of establishing the quality and selectivity of information from the health services, is worth serious consideration. Moreover, given the high degree of contact between TBAs and mothers at the time of birth in The Gambia, there is scope here for the application of a technique for producing regular estimates of the probability of dying by age 2 and 5 (and so deriving estimates of the IMR), based on simple questions about the survival of the women's previous child or children asked at the time of the current birth. This technique was applied in the Solomon Islands as described earlier (para. 125), and a field trial has recently been carried out in Mali (Hill and Macrae, 1985).

b). neonatal tetanus death rate - although sample surveys could provide a means of collecting data specifically for the construction of this indicator, in view of the large sample of households which would be required and the problems mentioned previously (para. 168), the possibility of CHWs systematically following birth cohorts does provide an attractive alternative - both in terms of data collection and the identification of high risk groups. This would require the development and application of a suitable diagnostic algorithm to aid the CHWs' reporting abilities for neonatal tetanus (see, for example, Essex, 1981).

171. What are the procedures involved in the construction of these indicators and the demonstration of impact?

a). infant mortality rate - the precise steps involved in calculating this, using the direct or indirect approach, have been adequately explained elsewhere, as noted above. Although some of the calculations are reasonably straight forward, the analysis of differentials and the control of extraneous factors is likely to require technical support to the RHT, at least initially, possibly from the Health Statistics and Epidemiology Unit. The importance of feeding the resultant regional indicator values back to health centres and to CHNs and CHWs must be stressed since these are the levels at which the basic information is gathered and at which there is potential for immediate action. The presentation could be in the form of simple graphs showing the overall trend in the RHT area,

removing random fluctuations by smoothing procedures, or where the numbers permit, in the form of maps indicating where the IMR is reportedly higher than the figure for the whole region. Seasonal trends in the IMR could also be calculated at the regional level when series over several years are available. At the higher central levels, more detailed breakdowns may be more useful, together with the unaggregated statistics for the calculation of national IMRs.

b). neonatal tetanus death rate - the procedures involved were mentioned earlier (paras. 167,168). As with the IMR, it seems likely that some degree of technical support to the RHTs will be needed. Although it is obviously equally important to ensure feedback of the values for this indicator as for the IMR, the presentation could perhaps place greater emphasis on differentials which may help to identify areas of reduced impact. Finally, the indicator value could also be graphed simultaneously with information on the performance of the MCH/EPI programme, such as proportion of pregant women receiving tetanus toxoid, or proportion of births delivered by trained personnel.