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Approaches to mortality measurement in the MCE

Mortality measurement is an important component of the MCE. All participating countries[1] will use one of three approaches to measure mortality levels: mortality surveys, demographic surveillance or vital statistics. These approaches are discussed below.

Most of the impact of IMCI on mortality is likely to occur through a reduction of the key IMCI diseases: pneumonia, diarrhea, malaria, measles and malnutrition. Other causes of death, however, may also be reduced. For example, the young infant module covers generalized infections in neonates (septicemia, meningitis, etc); increases in vaccine coverage will likely decrease mortality due to other vaccine-preventable diseases; and improvements in breastfeeding and nutritional status will contribute to reducing infectious diseases as a whole. On the other hand, as currently implemented, IMCI is not likely to have an impact on perinatal mortality since there are no specific interventions aimed at children aged under 7 days. Therefore, IMCI mortality impact will be higher among children aged 7 days to 5 years. This was taken into consideration when defining the key mortality indicators for the MCE, which include:

Under-five mortality rate. Probability of dying between birth and exactly 5 years of age.

Post-perinatal under-five mortality rate. Probability of dying between 7 days and exactly 5 years of age.

Infant mortality rate. Probability of dying between birth and exactly 1 year of age.

Sample sizes, even in large studies, are unlikely to be sufficient for the statistical assessment of cause-specific mortality. Nevertheless, it was decided that such variables should be included as

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[1] In at least one country participating in the MCE (Peru), baseline mortality levels are already quite low and it may be difficult to detect a significant impact of IMCI; nevertheless, existing mortality data are available at no extra cost and these will be analyzed to detect possible trends in underfive death rates.

they will help interpret the plausibility of IMCI impact. Four indicators were proposed:

Proportionate measles mortality. Proportion of underfive mortality due to measles.

Proportionate diarrhoea mortality. Proportion of underfive mortality due to diarrhoea.

Proportionate ARI/pneumonia mortality. Proportion of underfive mortality due to ARI/pneumonia.

Proportionate malaria mortality. Proportion of underfive mortality due to malaria.

The timing of measurements of mortality impact should be taken into account. A two- to three-year period is required from initial introduction to expansion of IMCI in a given area. According to the IMCI Impact Model, the link between IMCI implementation and mortality is mediated through several intervening variables, including changes in behavior leading to reductions in the incidence and case-fatality of diseases, an increased quality and utilization of health care, and an improvement in nutritional status both in terms of macro and micronutrients. Since these changes will not occur right away, the full impact of IMCI will only be measurable after an additional two- to three-year period of full implementation. The design of the mortality component of the MCE must therefore allow for this time lag.

Measurement approaches

Countries involved in the MCE will be using one of three alternative methodologies for mortality measurement. The choice of a method is largely based on local data availability and quality. The methods are:

1. **Mortality surveys**

These will be carried out in Bangladesh, Uganda and possibly Bolivia, following standard approaches to demographic and health surveys. Women of reproductive age (usually 15-49 years) will be asked to report their birth histories - information on births and deaths among their children in recent years. Mortality rates will be calculated for different time periods before the survey date. Information on causes of death will be obtained using verbal autopsies.

In Bangladesh, mortality rates for the two years preceding the baseline survey and for the two years previous to the end-of-project survey will be calculated for the catchment areas of 20 health facilities. Two-year rates will be used as annual rates per facility catchment area fluctuate considerably. Ten facilities will then be allocated to the intervention (IMCI) group, and 10 to the comparison group. To detect a 20% reduction in underfive mortality, each survey will cover about 35,000 households in the IMCI and 35,000 in the comparison area. A useful characteristic of the Bangladesh design is that there will be an overlap of approximately 30,000 households with the existing Matlab Health and Demographic Surveillance System, the longest-running such system in a developing country. Comparison of survey and surveillance results will provide a validation exercise.

In Uganda, a baseline demographic survey in ten districts will assess mortality levels in the three preceding years, by collecting birth histories from women aged 15-49 years. Approximately 14,000 households will be surveyed. The demographic survey will be repeated after IMCI has been adequately implemented for at least two years in a sufficient proportion of these districts. Estimates from the final survey will relate to the two previous years, that is, after IMCI implementation. This design will allow the detection of a 20% reduction in mortality (the required sample size is smaller in Uganda than in Bangladesh, partly due to higher baseline mortality levels).

In the Bolivian IMCI evaluation, currently in the planning stage, a demographic survey will also be used to measure mortality in the intervention and comparison districts.

2. **Demographic surveillance**

In Tanzania, two districts with IMCI implementation (Morogoro and Rufiji) are being compared to two other districts (Kilombero and Ulanga). Sections of all four districts have been under continuous demographic surveillance of underfive mortality for a number of years, with records all births, deaths, pregnancies, and in/out migrations. In Morogoro, 102,000 people are under surveillance using a system of annual censuses. In the other three districts, 138,000 people are covered by censuses and continuous re-enumeration (to define births and migration), and by a network of community key respondents (to provide information on deaths). The total population under surveillance is 240,000 (36,000 underfives). Information on cause of death based on verbal autopsies is currently available for Morogoro and Rufiji. By collecting information on mortality over a two-year period (2001 and 2002), it will be possible to detect an 18.5% reduction in mortality comparing IMCI and control districts.

In Bangladesh, as mentioned, data from the Matlab Health and Demographic Surveillance System will be used to double-check the results of the demographic survey.

3. **Vital statistics**

In the Peruvian study, the rate of IMCI implementation in each of the 25 departments in the country will be correlated with changes in intervention coverage, nutritional status and mortality. The proportions of infant and of underfive deaths over all deaths (age-specific proportionate mortality ratios), based on vital statistics, will be calculated. Although mortality registration is knowingly incomplete, the use of age-specific proportionate mortality ratios will minimize the effects of under-registration. If the quality of the data allow, the proportions of infant and underfive deaths due to the conditions targeted by IMCI (diarrhea, pneumonia, malaria, measles and malnutrition; hence referred to as cause-specific mortality ratios) will also be calculated.

Information on mortality is also available from the Peruvian Demographic and Health Survey (DHS) based on birth histories, but departmental-level mortality estimates are based on births taking place in the 10 years preceding the survey, that is, the estimates from the 2004 survey will reflect mortality levels in 1989. Due to this time lag, such results are not appropriate for measuring IMCI impact. It should be noted that the correlation coefficient between the DHS estimates and the vital-statistics-based age-specific proportionate mortality ratio (that is, the ratio between infant deaths due to all causes and all reported deaths at every age), for 1996, was equal to 0.85, showing a high degree of agreement between the two sources.

Conclusions

Use of multiple methods for mortality assessment is consistent with the flexibility of the MCE design. In each country, existing sources of mortality data - including vital statistics and established demographic surveillance systems - were assessed initially. If these sources were not available or unreliable, the more costly option of a demographic survey was favored.

Despite the use of different methods, consistent and reliable information on mortality will be produced.