The IMCI Impact Model and Community-Based Indicators for the Multi-Country Evaluation of IMCI Effectiveness

Re-revised draft by C. Victora, December 10, 1998
incorporating 2nd round of comments by J. Bryce and T. Lambrechts

This draft paper includes a preliminary list of indicators to be measured through community-based surveys as part Multi-Country Evaluation of IMCI Effectiveness. It does not cover indicators that are primarily measurable at health facility (HF) level, which are addressed by other documents.

A list of IMCI community indicators for routine monitoring and evaluation activities is being prepared separately. Efforts have been made to ensure that the two lists are fully compatible, but there are differences in emphasis between the two due to their distinct objectives. The present list includes a number of indicators that are not feasible to measure in the context of routine activities, and for this reason were excluded from that list.

The core CDD/ARI indicator list (WHO/CDR. Household survey manual. Diarrhoea and Acute Respiratory Infections. WHO/CDR/94.8) was used as a resource in developing the present document to maximize possible comparisons with existing survey results in participating countries. Annex I shows how that list corresponds to the present one.

Whenever possible, we have attempted to use existing indicators, drawing from the following sources: UNICEF Multiple Indicator Cluster Survey I and II; WHO/UNICEF Indicators for Assessing Breastfeeding Practices in Households; WHO Catalogue of Health Indicators; WHO/UNICEF/UNU Indicators for assessing iron deficiency and strategies for its prevention; WHO/AFRO Information systems for the evaluation of malaria control programmes; WHO Indicators for assessing Vitamin A deficiency and their application in monitoring and evaluating intervention programmes.

To elaborate the list, Tables 2-4 in the document "Modeling IMCI impact on mortality: from interventions to impact" (revision 4, incorporating comments by participants in the Meeting on Global Evaluation of IMCI, Geneva, October 5-9, 1998) were reviewed. Every outcome in these tables was assessed in terms of its relative importance, measurement feasibility and validity. This exercise is presented in Appendix II (Tables 1-9), in which outcomes are organized in terms of subject areas.

When applicable, indicators were proposed on the basis of these outcomes. Two types of indicators are proposed: priority indicators for outcomes that are both important and measurable, and supplemental indicators for other outcomes. These two groups of indicators, with their respective definitions, numerators and denominators (if applicable) are listed from page onwards.

The present document supersedes the earlier draft paper entitled "IMCI Global Evaluation: Preliminary List of Topics for Indicators of Utilization, Coverage And Impact", dated September 1998.

Several issues that were identified in this exercise and that need further discussion are included in boxes following the corresponding indicators. These include questions on the validity and feasibility of some of the proposed indicators (additional validity considerations are included in Appendix II). We opted to leave these indicators in rather than exclude them, and to postpone the final decision until hearing from CAH staff and from outside experts, and until the first field trial of the community survey is carried out in Tanzania in early 1999.

Proposed List of Indicators for the Multi-country Evaluation Surveys

All indicators listed below refer to children under 5 years of age, unless otherwise stated.

PRIORITY COMMUNITY INDICATORS

CP1. *Child under 4 months of age is exclusively breastfed (exclusive breastfeeding rate).* Proportion of infants aged less than 4 months who were exclusively breastfed in the last 24 hours[1,2,3]

Numerator: Number of infants aged less than 4 months (less than 120 days) who were exclusively breastfed in the last 24 hours.

Denominator: Number of infants aged less than 4 months (less than 120 days) surveyed.

CP2. *Child aged 6-9 months receives breastmilk and complementary feeding (timely complementary feeding rate)*. Proportion of infants aged 6-9 months receiving breastmilk and complementary foods"

Numerator: Number of infants aged 6-9 months (180-299 days) who received breastmilk and complementary foods in the last 24 hours.

Denominator: Number of infants aged 6-9 months (180-299 days) surveyed.

CP3. *Continued breastfeeding rate at one year.* Proportion of children aged 12-15 months receiving breastmilk"

Numerator: Number of children aged 12-15 months (365-485 days) who received breastmilk in the last 24 hours.

Denominator: Number of children aged 12-15 months (365-485 days) surveyed.

CP4. *Low weight for age prevalence (underweight prevalence)*. Proportion of children who are below - 2 SD from the median weight for age of the WHO/NCHS reference population'

Numerator: Number of children whose weight is below - 2 SD from the median weight of the WHO/NCHS reference population for their age.

Denominator: Number of children weighed.

CP5. *Mean weight for age z-score*. Mean z-score of weight for age according to the WHO/NCHS reference population

Definition: Arithmetic mean of weight for age z-scores of surveyed children according to the WHO/NCHS reference population.

CP6. *Anemia prevalence.* Proportion of children aged 6-59 months with a hemoglobin level below 11.0 g/dl[4]

Numerator: Children aged 6-59 months with a hemoglobin level below 11.0 g/dl

Denominator: Children aged 6-59 months for whom hemoglobin levels were assessed.

Anemia prevalence and mean hemoglobin levels are being proposed as key indicators. Thus, surveys in the Multi-Country Evaluation should include collection of blood samples using HemoCue or a similar piece of equipment. Inclusion of these indicators is due to the growing recognition of the importance of anemia and of the emphasis IMCI gives to anemia control.

CP7. *Mean hemoglobin level*. Mean hemoglobin level for children aged 6-59 months.

Definition: Arithmetic mean hemoglobin level (g/dl) among children aged 6-59 months.

CP8 *Ownership of mother's card for children under 2 years.* Proportion of children aged under 2 years whose caretaker has received a mother's card (in settings where caretakers should receive a mother's card).

Numerator. Number of children aged under two years whose caretaker produces a mother's card or reports to have received one from a health worker.

Denominator: Number of children aged under two years surveyed.

In countries where mother's cards are distributed to caretakers, ownership of these cards will indicate the coverage of nutrition counselling. We are proposing that the interviewer should record separately cards that are actually seen from those that are reported by the caretaker but not seen. Where laminated cards are used for counseling but not for distribution, one may use the recognition of such a card as an indicator. In the pilot studies, one may also test additional indicators for nutrition counselling, based on caretaker's recall of specific messages, on whether or not the health worker observed a breastfeed, etc.

CP9 *Ownership of mother's card for children with nutritional problems*. Proportion of children aged 24-59 months who present with either very low weight or anemia whose caretaker has received a mother's card (in settings where caretakers should receive a mother's card).

Numerator. Number of children aged 24-59 months who present either very low weight (weight for age below - 3 z-scores of the NCHS/WHO reference) or anemia (hemoglobin below 11.0 g/dl) whose caretaker produces a mother's card or reports to have received one from a health worker.

Denominator: Number of children aged 24-59 months who present either very low weight (weight for age below - 3 z-scores of the NCHS/WHO reference) or anemia (hemoglobin below 11.0 g/dl).

CP10 *Child sleeps under impregnated bednet (impregnated bednet coverage)*. Proportion of children who sleep under insecticide impregnated bednets (in malaria risk areas).

Numerator: Number of children who slept under an insecticide-impregnated bednet the previous night.

Denominator: Number of children surveyed.

In the pilot study, we will be test whether caretakers will also be able to inform when the bednet was last impregnated.

CP11 *Under-five mortality rate*. Probability of dying between birth and exactly 5 years of age[7].

Numerator: Number of deaths among children aged under 5 years in a given period of time x 1000

Denominator: Number of live births reported in the same period of time

CP12. *Post-perinatal under-five mortality rate*. Probability of dying between 7 days and exactly 5 years of age.

Numerator: Number of deaths among children aged 7 days to 5 years in a given period of time x 1000

Denominator: Number of live births reported in the same period of time, minus number of deaths between birth and 7 days of age.

CP13. *Child 12-23 months of age vaccinated against measles before 12 months of age (measles vaccine coverage)*. Proportion of children aged 12-23 months vaccinated against measles before 12 months of age.

Numerator: Number of children aged 12-23 months vaccinated against measles before 12 months of age

Denominator: Number of children aged 12-23 months surveyed.

CP14. *Vitamin A supplementation coverage*. Proportion of children aged 12-23 months who received a high dose (amount to be defined locally) of vitamin A in the last 6 months (in areas with a vitamin A supplementation policy).

Numerator: Number of children aged 12-23 months who received a recommended dose of vitamin A within the last 6 months

Denominator: Number of children aged 12-23 months surveyed.

This question will be tested in the pilot study. Sample capsules will be carried by interviewers who will ask the caretakers whether the child received them. If possible, this information will be validated against written records.

CP15. *Sick child receives increased fluids and continued feeding (fluid and nutritional management of illness).* Proportion of ill children for whom the caretaker offered increased fluids and continued feeding.

Numerator: Number of children who were reportedly ill in the previous 24 hours and for whom the caretaker offered increased fluids and the same amount or more food.

Denominator: Number of children who were reportedly ill in the previous 24 hours.

There are doubts on whether this indicator should cover the previous 24 hours (with improved validity but substantial sample size implications) or be referred to the previous two weeks as most morbidity indicators now do. In the pilot study, information will be collected separately on each time period. Also, the question was raised on whether some children (such as those who vomit "everything") should be excluded.

CP16. *Child with fever receives appropriate treament (fever treatment with antimalarials).* Proportion of children with fever who received an appropriate antimalarial (in malaria risk areas).

Numerator: Number of children who were reported to have had fever in the previous two weeks and were treated with a locally recommended antimalarial.

Denominator: Number of children aged who were reported to have had fever in the previous two weeks.

CP17. *Caretaker knows at least two signs for seeking care immediately (kowledge about danger signs).* Proportion of caretakers who know at least 2 of 5 key signs for careseeking.

Numerator: Number of caretakers of children who know at least 2 of the following signs of when to bring the child to a health provider: child not able to drink or breastfeed, child becomes sicker, child develops a fever, child has fast breathing, child has difficult breathing, child has blood in the stools, child is drinking poorly.

Denominator: Number of caretakers of children surveyed.

SUPPLEMENTAL COMMUNITY INDICATORS

CS1. *Complementary feeding frequency*. Proportion of children aged 2-4 years receiving 5 feeds a day[5]

Numerator: Number of children aged 24-59 months who received 5 or more feeds in the last 24 hours.

Denominator: Number of children aged 24-59 months surveyed.

CS2. *Stunting prevalence.* Proportion of children who are below - 2 SD from the median height for age of the WHO/NCHS reference population'

Numerator: Number of children whose height (or length) is below - 2 SD from the median height (or length) of the WHO/NCHS reference population for their age.

Denominator: Number of children measured.

CS3. *Wasting prevalence.* Proportion of children who are below - 2 SD from the median weight for height of the WHO/NCHS reference population'

Numerator: Number of children whose weight is below - 2 SD from the median weight of the WHO/NCHS reference population for their height (or length).

Denominator: Number of children weighed and measured.

CS4. *Mean height for age z-score.* Mean z-score of height for age according to the WHO/NCHS reference population

Definition: Arithmetic mean of height (or length) for age z-scores of surveyed children according to the WHO/NCHS reference population.

CS5. *Mean weight for height z-score.* Mean z-score of weight for height according to the WHO/NCHS reference population

Definition: Arithmetic mean of weight for height (or length) z-scores of surveyed children according to the NCHS/WHO reference population.

CS6. *Prevalence of night-blindness.* Proportion of children aged 24-59 months who are night-blind (in areas with vitamin A deficiency)[6].

Numerator: Number of children aged 24-59 months who are reported to be night-blind by their caretaker.

Denominator: Number of children aged 24-59 months surveyed.

CS7. *Prevalence of low serum retinol.* Proportion of children aged 12-59 months with serum retinol <70 µmol/l.

Numerator: Number of children aged 12-59 months with serum retinol <70 µmol/l.

Denominator: Number of children aged 12-59 months for whom serum retinol was assessed.

CS8. *Mean serum retinol in µmol/l.* Mean serum retinol level for children aged 12-59 months.

Definition: Arithmetic mean of serum retinol levels (in µmol/l) for children aged 12-59 months.

CS9. *Period prevalence of a history of fever.* Proportion of children under five with a report of fever in the two weeks preceding the interview[7].

Numerator: Number of children for whom the caretaker reports one or more episodes of fever in the previous 2-week period.

Denominator: Number of children surveyed.

CS10. *Prevalence of malaria parasitemia*. Proportion of children with a positive slide for malaria.

Numerator: Number of children with a blood slide positive for malaria.

Denominator: Number of children for whom blood slides were obtained.

CS11. *Proportional hospital morbidity due to malaria.* Proportion of hospital admissions with a diagnosis of malaria (modified from).

Numerator: Cases of malaria among children hospitalized in a year.

Denominator: Total number of children hospitalized in a year.

The interpretation of proportionate hospital morbidity data (admissions due to malaria, diarrhoea, ARI/pneumonia and measles) is likely to be affected by referral patterns. In areas where baseline referral is insufficient, IMCI implementation may increase hospital admissions. In areas where there are excessive hospital admissions - such as parts of Latin America - IMCI implementation may reduce their number due to improved case management in first level HFs. Also, concomitant changes in hospital referral due to the different illnesses targeted by IMCI could have paradoxical effects on proportionate hospital morbidity for any given disease. Caution is therefore needed in the interpretation of these indicators, but it was decided that they should be included to allow the estimation of time trends.

CS 12. *Period prevalence of diarrhoea*. Proportion of children who had diarrhoea at any time in the 2-week period prior to the survey[8].

Numerator: Number of children who had diarrhoea at any time in the 2-week period prior to the survey.

Denominator: Number of children surveyed.

CS 13. *Period prevalence of severe diarrhoea.* Proportion of children reported to have had "diarrhoea needing assessment" (see below) in the 2-week period prior to the survey.

Numerator: Number of children who had diarrhoea at any time in the 2-week period prior to the survey and who were reported to have had any of these signs: many watery stools, repeated vomiting, marked thirst, not eating/drinking well, fever, blood in the stools, or not getting better/getting sicker/very sick.

Denominator: Number of children surveyed.

CS14. *Proportional hospital morbidity due to diarrhoea.* Proportion of hospital admissions with a diagnosis of diarrhoea.

Numerator: Cases of diarrhoea among children hospitalized in a year.

Denominator: Total number of children hospitalized in a year.

CS 15. *Period prevalence of pneumonia.* Proportion of children reported to have had cough plus fast or difficult breathing in the 2-week period prior to the survey.

Numerator: Number of children who had cough at any time in the 2-week period prior to the survey and who were reported to have had fast or difficult breathing.

Denominator: Number of children surveyed.

CS16. *Proportional hospital morbidity due to ARI/pneumonia.* Proportion of hospital admissions with a diagnosis of ARI or pneumonia.

Numerator: Cases of ARI/pneumonia among children hospitalized in a year.

Denominator: Total number of children hospitalized in a year.

CS17. *Infant mortality rate.* Probability of dying between birth and exactly 1 year of age[9].

Numerator: Number of deaths among children aged under 1 year in a given period of time x 1000

Denominator: Number of live births in the same period of time

CS18. *Proportionate measles mortality.* Proportion of underfive mortality due to measles.

Numerator: Number of child deaths due to measles, in a year.

Denominator: Total number of child deaths in a year.

Sample sizes, even in large surveys, are unlikely to be sufficient for the statistical assessment of trends in cause-specific mortality. However, it was decided that these variables should be included as they will help interpret the plausibility of IMCI impact.

CS19 *Proportionate diarrhoea mortality.* Proportion of underfive mortality due to diarrhoea.

Numerator: Number of child deaths due to diarrhoea, in a year.

Denominator: Total number of child deaths in a year.

CS20. *Proportionate ARI/pneumonia mortality.* Proportion of underfive mortality due to ARI/pneumonia.

Numerator: Number of child deaths due to pneumonia, in a year.

Denominator: Total number of child deaths in a year.

CS21. *Proportionate malaria mortality.* Proportion of underfive mortality due to malaria.

Numerator: Number of child deaths due to malaria, in a year.

Denominator: Total number of child deaths in a year.

CS22. *DPT vaccine coverage.* Proportion of children aged 12-23 months immunized against diphtheria, pertussis and tetanus (DPT) before 12 months of age.

Numerator: Number of children aged 12-23 months who received 3 doses of DPT vaccine before 12 months of age

Denominator: Number of children aged 12-23 months surveyed.

CS23. *Polio vaccine coverage.* Proportion of children aged 12-23 months immunized with oral polio vaccine (OPV) before 12 months of age.

Numerator: Number of children aged 12-23 months who received 3 doses of OPV before 12 months of age

Denominator: Number of children aged 12-23 months surveyed.

CS24. *Tuberculosis vaccine coverage.* Proportion of children aged 12-23 months immunized against tuberculosis (BCG vaccine) before 12 months of age.

Numerator: Number of children aged 12-23 months who received a dose of BCG vaccine before 12 months of age

Denominator: Number of children aged 12-23 months surveyed.

CS25. *Careseeking for diarrhoea.* Proportion of children with diarrhoea in the previous two weeks who were taken to a provider, by type of provider.

Numerator: Number of children with diarrhoea in the previous two weeks who were taken to a provider, by type of provider

Denominator: Number of children with diarrhoea in the previous two weeks.

Use of this indicator is not intended to imply that every child with diarrhoea should be taken to a provider, but it will be useful for showing time trends in careseeking patterns. A more useful indicator would be careseeking for episodes of diarrhoea needing assessment, but this will only be measurable in large surveys.

CS26. *Careseeking for cough.* Proportion of children with cough in the previous two weeks who were taken to a provider, by type of provider. (Given sufficient sample size, this indicator may be also calculated for children with cough/ARI needing assessment).

Numerator: Number of children with cough in the previous two weeks who were taken to a provider, by type of provider

Denominator: Number of children with cough in the previous two weeks.

The same comments on careseeking for diarrhoea apply. Validity questions have been raised on how accurately caretakers can inform on the presence of danger signs such as fast/difficult breathing.

CS27. *Careseeking for fever.* Proportion of children with fever - in the absence of diarrhoea or cough - in the previous two weeks who were taken to a provider, by type of provider. (Given sufficient sample size, this indicator may be also calculated for children with fever plus danger signs).

Numerator: Number of children with fever - in the absence of diarrhoea or cough - in the previous two weeks who were taken to a provider, by type of provider

Denominator: Number of children with fever - in the absence of diarrhoea or cough - in the previous two weeks.

CS28. *Appropriate care-seeking.* Proportion of children who were ill and taken to any provider within the previous two weeks for whom the first (or only) provider who was sought was an appropriate provider (to be defined locally).

Numerator. Number of children who were ill and taken to any provider within the previous two weeks for whom the first (or only) provider who was sought was an appropriate provider.

Denominator. Number of children who were ill and taken to any provider within the previous two weeks.

CS29. *Compliance with recommended treatment or referral.* Proportion of children who were seen by a health worker within the previous two weeks for whom the caretaker reports to have complied with advice on treatment, feeding and/or referral.

Numerator. Number of children who were seen by a health worker within the previous two weeks and whose caretaker reports to have complied with advice given on treatment, feeding and/or referral.

Denominator: Number of children who were seen by a health worker within the previous two weeks and whose caretaker received advice on treatment, feeding and/or referral.

Information will be recorded separately on compliance with referral, drug prescriptions and nutritional counselling. Although it would be important to have disaggregated information on each of these, it may be necessary to pool all of the compliance indicators into a single one, due to sample size restrictions. Additional sources of information may have to be used - for example, health facility-based substudies on compliance with referral. There are also validity issues on how well caretakers may report on compliance. Validation substudies may be required.

CS30 *Vitamin A supplementation for very low weight children*. Proportion of very low weight children who received a high dose (amount to be defined locally) of vitamin A in the last 6 months.

Numerator: Number of children whose weight is below - 3 SD from the median weight of the WHO/NCHS reference population for their age and who received a recommended dose of vitamin A within the last 6 months

Denominator: Number of children whose weight is below - 3 SD from the median weight of the WHO/NCHS reference population for their age.

Methodological notes on the indicators

1. **Time periods.** Time periods for mortality and hospital admissions refer to one calendar year periods, to avoid the effect of seasonality when interpreting these indicators.

2. **Use of mean levels of continuous variables.** For these variables (anthropometric indices, retinol, hemoglobin, etc), it is proposed that we use mean levels in the study sample, in addition to the proportion below a given cutoff value. Mean levels are more stable and require smaller sample sizes, and, if the distribution is approximately normal, can be translated into proportions that will be more precise than the observed proportion that could be directly measured with the same sample size.

3. **Adaptation of age ranges.** It was necessary to adapt the age range of several existing indicators to match the underfive target population for IMCI. For example, vitamin A deficiency indicators (serum retinol, night blindness) are normally presented for children aged up to 71 months.

4. **Growth monitoring.** Indicators of growth monitoring were not included. A possible indicator would be:

   > Proportion of children who were weighed in a HF in the last *x* months, and whose weight was recorded in a growth chart.

5. **Helminths**. Assessment of the prevalence of intestinal helminthic infections requires quantitative methods. This indicator has not been proposed at present.

6. **Careseeking indicators that are measurable at HF level.** Several careseeking indicators may be assessed also though HF surveys. For example, a WHO/AFRO publication suggests - as an indicator of early careseeking for malaria - the proportion of children seen in a HF with fever for whom the fever started within the last 24 hours. Similar indicators could be developed for diarrhea, ARI needing assessment, etc. If available, information on the validity of such indicators would be very useful.

7. **Health services utilization indicators.** Further work is needed on indicators of utilization, several of which are more appropriately measured at health facility level rather than through community surveys. The previous version of the list of indicators ("IMCI Global Evaluation: Preliminary List of Topics for Indicators of Utilization, Coverage And Impact", dated September 1998) describes a number of possible utilization indicators.

8. **Time period for careseeking indicators.** Assessment of careseeking practices is an essential aspect of the Multi-Country Evaluation. Two basic approaches are possible:

a) One could ask the caretaker about consultations in the preceding time period (usually 1-3 months) and then inquire about the reasons that led to the attendance, the type of provider sought, and the order in which they were sought.

b) One could ask the caretaker about illnesses in a shorter period (usually not more than 2 weeks to avoid recall problems) and about careseeking behavior for each illness, including whether outside care was sought, the type of provider sought, and to the order in which they were sought.

Approach (a) has the advantage of requiring a smaller sample size since the recall period is longer, but it will not provide information on careseeking rates since the denominator is consultations, not illness episodes. Approach (b), though requiring a larger sample, will provide information on careseeking rates as well as on the type and order of provider. For this reason, approach (b) has been favored in the present paper.

REFERENCES

[1] UNICEF Multiple Indicator Cluster Survey I and II.

[2] WHO/UNICEF Indicators for Assessing Breastfeeding Practices in Households

[3] WHO Catalogue of Health Indicators (Draft).

[4] WHO/UNICEF/UNU. Indicators for assessing iron deficiency and strategies for its prevention. Geneva: WHO, 1996.

[5] Based on IMCI training materials and on WHO Guidelines for Infant Feeding. Weekly Epidemiol Rec 1995;70:119-20.

[6] WHO. Indicators for assessing Vitamin A deficiency and their application in monitoring and evaluating intervention programmes. WHO/NUT/96.10.

[7] WHO/AFRO. Information systems for the evaluation of malaria control programmes. A practical guide. AFRO/CTD/MAL/94.3.

[8] WHO/CDR. Household survey manual. Diarrhoea and Acute Respiratory Infections. WHO/CDR/94.8.