

Meeting of the Inter-Agency Group for Child Mortality Estimation (IGME)

30 July 2008, UNICEF House, New York

Session 1: Welcome and Introduction

Kenneth Hill, the Chair of the Technical Advisory Group (TAG) of the Inter-Agency Group for Child Mortality Estimation (IGME), opened the meeting by welcoming participants.

Tessa Wardlaw, UNICEF's Chief of the Statistics and Monitoring Section welcomed the participants again and summarized the meeting objectives. She emphasized the relevance of the child mortality estimates produced by IGME for MDG monitoring. One of the main tasks for UNICEF and the other agencies is to produce 2007 child mortality estimates, which will be contained in the publication of SOWC released on December 2008. Tessa pointed out that CME database has been improved a lot and is nearly complete. It will be available to the public in the near future. The task is to include all of available data and 2007 estimates in the database by September 2008. In terms of methodological development, she indicated that the Loess-based method is now available in CME database, so that making comparisons is much more convenient than before. She also brought up the issue of incorporating the effects of HIV/AIDS in the child mortality estimation process, which should be under study and integrated in the future work. Finally, Tessa emphasized the importance of the work of this group in the context of the MDGs not only for the production of child mortality estimates, but also for the issue of creating capacity to produce these estimates at the country level.

Kenneth Hill then made an introduction on the IGME. The IGME was established to advance the work on monitoring progress made towards the achievement of MDG4 regarding the reduction of infant and child mortality. The IGME, led by UNICEF and WHO, includes as full members UNICEF, WHO, the World Bank, and the United Nations Population Division. The main objective of the IGME is to produce and disseminate global, regional and country estimates of levels and trends of child mortality.

The meeting was followed by open comments and questions on the IGME. Trevor Croft asked for a draft of the terms of reference for the Technical Advisory Group (TAG). Francois Pelletier requested that participants be informed earlier about the meeting and that country estimates to be discussed be made available at least three weeks prior to the meeting, assuring a more thorough review. Patrick Gerland pointed that there are issues in the CME database such as they are lacking of documents for the data. Neff Walker addressed that they need to think about the funding for IGME.

Session 2: Update on the Action Points from March 2008 Meeting

Edilberto Loaiza (UNICEF) made an update on the actions from March 2008 meeting. He indicated that UNICEF has now a full-time person (Danzhen You) to administer the CME database. For this process, UNICEF revised data for the “60+ countries” for which new data was obtained from household surveys (DHS and MICS) previous to the 2006 estimates and produce their respective 2007 estimates. The 2007 estimates for these countries will be available in September on the public domain of the CME database (www.childmortality.org). Agencies have also worked in the methodological issues to incorporate the effect of HIV/AIDS in the estimates of child mortality for countries with very high HIV prevalence. There is a growing interest for the regional workshops to create capacity at the country level on child mortality estimation. IGME will start this process with the first regional workshop in Asia in Bangkok, September, 2008. IGME has also developed additional work towards the production of specific estimates of child mortality (by sex, neonatal, perinatal, etc.).

Ed Bos (The World Bank) commented that the CME data should be available for the Asia workshop. Francois Pelletier asked to prepare a list of countries participating in the Bangkok workshop.

Session 3: Child Mortality Database

Kris Oswalt (CSF) made a presentation of the child mortality database (CMEInfo database), including the latest features and updates. The CMEInfo database is now more flexible and user-friendly than the previous version. Three main functions are newly added into the CMEInfo database since March 2008 meeting: Loess-based method, Uncertainty both for Spline and Loess-based methods, and conversion between IMR and U5MR based on Model Life Tables. Besides the three main changes, many other functions are added into the database. For example, new standard weight system; new functions to allow the database administrator edit the periods, dates and values in the database. All of the improvements make the database work much more smoothly, easily and look much more elegant.

As a platform, the current database was very impressive to the participants. Ties Boerma (WHO) stated that the database is an excellent work. The estimation process is strengthened by adding the Loess-based method and the possibility of producing uncertainty levels around estimates. Others agreed that the database is well designed and represents the potential for a wonderful platform.

Participants also made some suggestions for the database to improve. In summary, the following issues were raised:

1. Help menu should be added into the database. The need to develop a manual and a tutorial.
2. Need standard format for the metadata (input and output).

3. Need short, clear and standardized title for estimate.
4. Feature to download data and estimates for all of countries at once.
5. Produce estimate for several countries together.
6. Upload documents into the database for the empirical data.
7. The database is able to record any change made by the administrator.
8. About graph: (a) There should be a way to identify which data sources are included or not included in the graph, which data sources are based on direct or indirect methods; data from same sources may use the same color to differentiate from other sources and use different patterns to differentiate between each other. (b) The graph should be active in the downloaded file, so that users are able to make editing.
9. Need a way for the IGME to work together, to review new data, to make decision and to keep posted if there is any change. A big workspace for the group and a “register” was proposed by Kris Oswalt. Individual working space should also be available as well.
10. Users to be able to adjust the estimate trend, for example, making the trend flat after a certain year. Kris Oswalt proposed to make editing functions available in the estimation table, so that the trend can be changed manually.
11. The database should be able to make estimations by sex, which is already a function in the database, but there is a need to discuss and decide the data entry format and output format to identify gender and other subgroup (urban/rural, education, etc.).
12. Additional functions to allow users to work smoothly and easily, for example, able to edit, delete and add data (period, date, value, estimate, uncertainty interval, series title, series type, etc.).
13. Develop features to incorporate HIV/AIDS effects into the database.
14. Allow manual adjustment for those countries that need extra adjustment.
15. Create country-specific workspace for the regional workshop.

The following two issues were discussed without a confirmation:

1. About uncertainty estimation: Gareth Jones (Consultant) asked if uncertainty estimates include the data points with zero weight. Simon Cousens (LSHTM) said no. Ken thought the data points with zero weight should be reflected in uncertainty. Simon Cousens did not seem to totally agree with this. The solution should be figured out in the near future by IGME and relevant changes should be made in the database if needed. UNICEF will follow up on this issue.
2. About empirical data and the database: currently only direct and indirect estimates are included in the database. The empirical data (for example, children ever born and surviving data) are not included. Some participants suggested that the empirical data should also be included, so that users can use different Model life tables. A couple of participants also suggested that the database should be a separate platform from the estimation platform. Others commented that the data format for the empirical data can vary substantially and therefore it might be difficult and challenging to include all the empirical data. The CME interface

should be adjusted based on a final agreement, which the IGME should make in the near future. Further discussion and assessment is needed.

The group agreed to launch the CME database to the public for the countries with clean data by September. Tessa Wardlaw (UNICEF) emphasized the importance of the MDG object to launch the database. The session was closed after Kenneth Hill (Harvard) concluded that the database is very impressive and well-designed and there is still a great step forward.

Session 4: Child Mortality Estimates

Simon Cousens (LSHTM) presented the two Loess-based methods to estimate uncertainty of child mortality estimates: conventional Loess-based method and multi-level Loess-based method. He indicated that there is an implementation issue in the previous Loess-based model since Murray et al. only describes incorporation of two sources of uncertainty: random noise in data points through re-sampling parameter values using point estimates and variance-covariance matrix and (one aspect of) model uncertainty through use of a range of alpha values.

The Loess approach has assumed independence of data points. In practice, the assumption of independence between data sources may be violated in those cases when using multiple data points from a single source (e.g. DHS). One approach is to fit a multi-level model for the Loess approach: $\log(y_{ij}) = \beta_0j + \beta_1x_{ij} + \beta_2z_{ij} + e_{ij}$, where $\beta_0j = \beta_0 + u_j$ and $u_j \sim N(0, \sigma_u)$. In general, the multi-level model produces similar results in point estimate to the conventional model. Uncertainty ranges within period of observed data increases but the pattern is less clear outside period of observed data.

There are two main conclusions.

- 1) Conventional Loess-based method produces narrower confidence intervals, whereas multi-level Loess-based method yields wider uncertainty intervals that seem more accurate.
- 2) The conventional model is more affected by between-survey trend; while the multilevel model is more affected by within-survey trend, which might be misleading for the general trend of child mortality.

It is hard to tell which method is better at this point. Cousens also added data series, step by step, to make estimates and produce uncertainty intervals and to see the changes of uncertainty with increasing sources. No obvious “asymptotic” pattern was observed.

Neff Walker (JHU) suggested removing some recent data points to see the uncertainty for the future and make comparisons. Patrick Gerland (UNPD) asked how the Loess-based models deal with the dependency of direct and indirect estimates from the same survey. Simon Cousens (LSHTM) indicated that the models assume independency for those series, which is not the best way. Kenneth Hill (Harvard) commented that the Loess-based models over-smooth the pattern of mortality because of the nature of the method. Francois Pelletier (UNPD) raised the question on how to distinguish normal noise-data

from real bad-data. Trevor noticed that the uncertainty decreases when adding more data series into the estimate process. Dirk Jaspers (CELADE) asked the way that Cousens added data series: if the data series are randomly chosen. The answer is yes.

There is no conclusion about which Loess-based model is better and how to solve the over-smooth problem and to change the independency assumption of direct and indirect estimates from one survey.

Neff Walker (JHU) then gave a presentation on how HIV/AIDS biases child mortality estimates. He stated that there are two mechanisms through which HIV/AIDS imposes effects on levels of mortality estimates: unreported child deaths due to death of the mother and changes in prevalence and treatment that make projections of child mortality more difficult.

The unreported child deaths due to death of the mother are caused by the correlation between child and maternal death. The error is greater with longer recall periods. Most of the correlations would be on the 10-14 period. The issue is only important in very high HIV prevalence (above 10%). There are 10 countries with HIV prevalence above 10%. Neff stated that this kind of adjustment probably is not so important for point estimates but helpful for trend fit, and it would not require a lot of work for past data sets.

Neff continued to state that when AIDS explains a large proportion of U5M, then projecting without accounting for HIV prevalence and treatments trends can be very dangerous both for LOESS and SPLINE. He took an example of projections for Botswana: the trend just kept going up with Spline method and past trends for Botswana does not go up with AIDS mortality with Loess method.

He then gave four suggestions: (1) Identify countries where AIDS prevalence curves (and U5M deaths) are included in the estimation process; (2) Make these curves available in U5M database (from UN/Country estimates); (3) Allowing the overlaid of U5MR curves with estimated AIDS mortality curves and perhaps HIV prevalence curves; (4) Perhaps not algorithmic, but these data should help with projecting either by person or by adjusting knot size.

John Wilmoth (UCB) asked if the fertility assumption for the HIV/AIDS women is the same with non HIV/AIDS women. Neff said the assumption is not the same. Gareth Jones (Consultant) suggested applying the method to other countries. Jeremiah Sullivan (consultant) commented that more surveys should be conducted and obtained for this object. Ken asked the difficulties to make HIV/AIDS adjustment and concluded that they should try to do adjustment for other countries with high HIV prevalence. Neff Walker (JHU) brought up the question whether they trust HIV numbers and how much confidence the group has on the treatment of HIV/AIDS. Trevor Croft suggested a group working closely for country-specific adjustment. Patrick Gerland (UNPD) raised the question on how to incorporate HIV/AIDS into the CME database. Finally, Edilberto Loaiza (UNICEF) asked if AIDS adjustment could be included in the production of the

2007 estimates. Kenneth Hill suggested not to include them for 2007 estimate at this point.

Session 5: Technical Issues and Future Directions

5.1 Technical Advisory Group

Kenneth Hill started the afternoon session by reporting on the first TAG meeting, which took place on July 29, 2008. The TAG is constituted by a group of technical experts in the area of child mortality estimation. Members of the TAG are independent experts providing technical advice to the IGME. During the first meeting of the TAG the following topics were discussed:

(1) Uncertainty types related to child mortality estimate: Uncertainty is usually related to sampling errors, data errors and model errors. Improvements in the uncertainty levels are related to the reduction of these three errors;

(2) The measurement of child mortality in the next round of MICS: Traditionally, MICS has measured child mortality using the “Brass” questions to produce indirect estimation. The question for the team managing MICS4 is on the inclusion of birth histories in the next round of measurement (full or truncated). The TAG will provide an assessment of these options by November 2008.

(3) The impact of HIV/AIDS on child mortality estimation was also discussed in the TAG meeting. Members agreed that HIV/AIDS mortality should be incorporate into child mortality estimates;

(4) Data quality issues around the most recent estimates obtained from DHS data were discussed;

(5) Some time was devoted to the discussion of producing child mortality estimates by sex;

(6) The group discussed possibilities around funding issues.

(7) It was decided that the next meeting will be held in Geneva on 15-16 December

John Wilmoth (UCB) suggested exploring other possibilities (Google) to get additional funding. And he also brought up the question why the complete title for IGME is “Inter-agency Group for Child Mortality” rather than “Inter-agency Group for Mortality”. Kenneth Hill responded that the members of IGME have different objectives and they agree that the group will include adult mortality also in the future, but at this point they mainly focus on child mortality. The members of IGME confirmed this point.

5.2 Capacity Building

Ed Bos (the World Bank) then updated the participants on regional workshops. Considering the limitations of the available mortality data, there is need for a common understanding of the strengths and weaknesses of different types of data and their usefulness in national and global decision making by stakeholders who generate and use data at the country level. It is also imperative to improve data availability and quality in countries for more accurate estimates. It is against this backdrop that a workshop on

Improving national capacity to track maternal and child mortality towards the attainment of the MDGs is planned for the Asian region in September 2008. Country experts from 23 countries in the South Asia, South-Eastern Asia and Oceania regions will attend the workshop. Unlike the African workshop in 2007 on maternal mortality which entailed mainly presentations and group sessions, the Asian workshop will place emphasis on training country experts on the methods for estimating maternal, infant and under-five mortality. The workshop is a joint UNICEF, The World Bank, WHO and UNFPA activity.

Dirk Jaspers (CELADE) asked the possibility to have workshops in other regions. Countries from other regions might be interested in this kind of workshop. Ed Bos answered that the main issue is the funding. If they have enough funding, they would like to explore the possibility to have workshops for other regions. Trevor Croft asked how much the workshop will cost. Neff concluded that 5,000 US dollars per person should be planned. A discussion about the participants of the workshop is stimulated by Dirk Jaspers (CELADE) who suggested inviting UN local officials to attend the meeting. Patrick Gerland suggested focusing on national institutes rather than official individuals due to the mobility of individuals.

5.3 Data Quality Assessment

Jerry Sullivan (Consultant) presented the results of his analysis of DHS data quality that uses as example 11 countries that conducted recently 2 surveys and that showed more than 16% of decline in U5MR. He summarized that the most important quality issues concerning the mortality data collected in the DHS birth histories are of four kinds: 1) errors in the recorded dates of birth of children, 2) underreporting of deceased children, 3) sampling problems and 4) misreporting of age at death.

As to the errors in dates of birth (birth transference), Jerry stated that this errors are mainly due to the fact that interviewers learn to reduce their workload by incorrectly recording some births that actually occurred after the health cutoff date as occurring prior to that date. In DHS surveys, this birth transference is always more pronounced for deceased than for surviving children. Interviewers appear to be particularly anxious to avoid asking the health questions about deceased children. The excessive transfer of births to deceased children to earlier time periods creates the potential for biasing the standard DHS mortality estimates. For estimates corresponding to the 5-year period immediately before the survey, there is potential for negative bias while, for the penultimate 5-year period (5-9 years), there is a potential for positive bias.

The assessment of underreporting was done by comparing U5MR estimates from each pair of surveys for a common reference period. The time period chosen for rate calculation was typically a 10-year calendar period prior to the first of a pair of surveys. Also, to keep the analysis free of potential bias from compositional differences in mothers' age at birth, the analysis will be restricted to mortality rates for children who were born to women less than age 40 at the time of birth. Underreporting of deceased children in a survey will be indicated by the percent to which the rate from one survey is

exceeded by the rate from another. Sullivan found that it was within the second survey or more recent survey where the shortfall occurred in 5 of the 11 pairs of DHS surveys.

As for the sampling procedures, the DHS surveys start with identifying an appropriately sampling frame (usually from the national statistical office), and include updating the frame, selection of sampling areas, mapping of sampling areas and selection of households to be included in the sample. The weakest link in this chain is probably the representative ness of the sampling frame. The assessment of sampling issues was done by comparing the distributions of the population at risk to under-five mortality; i.e., birth distributions by urban/rural residence and by geographic regions for the five year period preceding a survey.

The analysis confirms previous studies that misreporting of age at death (digit preference in the reporting of age at death in favor of age five at the expense of ages less than five) is not of great concern in DHS surveys: at least for the 22 surveys investigated in his report, this issue is not sufficient to be further considered.

The discussion mainly focused as to whether the adjustments of death omission and sampling errors are reasonable. Francois Pelletier (UNPD) agreed with the adjustment of birth transference, but had some concerns with respect to the adjustments for death omission and sampling errors. He took Mozambique as an example and stated that the results from the 1997 census were available to elaborate the sampling frame for the 2003 DHS, though this was not the case for the 1997 DHS. The census prior to that survey was undertaken in 1980 and therefore the sampling frame for the 1997 survey was actually based on the cartography of the 11 provincial capitals and the electoral list from the 1994 elections. This kind of sampling is probably less reliable and some provinces or areas with higher mortality levels may not have been well represented. In the end, there might not be a systematic way to adjust sampling errors and also omission errors. Jon Pederson suggested looking at social-economic characteristics. Simon Cousens asked what the death distribution looks like with “gold” standard data. He thought underreporting is more common for deaths that occurred in the first day following birth. Hill suggested looking at the historical vital registration data from England and Wales. Mie Inoue (WHO) emphasized the importance of criteria for data quality assessments. Finally, Ken Hill suggested producing adjustment for birth transference, but not for omission. For those countries heavily affected by omission, the suggestion was to give a weight of zero to the corresponding values.

5.3 Decomposing Child Mortality

Cheryl Sawyer (UNPD) presented on the topic of sex-specific mortality estimates. She first stated the work carried out by UNPD on this topic since the Geneva IGME meeting in March 2008:

- (1) calculate 5-year direct and indirect estimates by sex from DHS;
- (2) assemble more comprehensive datasets;
- (3) start testing estimations methods.

Data were used from DHS (direct and indirect estimates), MICS (indirect estimates), all other surveys or census (direct or indirect as available), and vital registration data provided by WHO. Cheryl used the ratio of $5q0\text{ male}/5q0\text{ both}$ to test sex-specific mortality, and fit curves to the ratio by Loess, Spline and linear models (in all models, points were weighted according to UNICEF weights). She also used the predicted ratio to disaggregate $5q0\text{ both}$. Then she took two examples (Egypt and Viet Nam) to show that the fitted line can vary greatly with Loess and Spline models. Cheryl questioned the possible advantage of using Loess or Spline models instead of a linear fit. She also questioned what to do if there are not enough data points to fit a trend (simple average or developing regional models might be a choice). Then she pointed out that country analysis, regional models and index of female disadvantage will be future directions. UNPD planned to produce a report on child mortality by sex.

Ken Hill suggested that indirect estimates by sex be computed using total parity, rather than sex-specific parity. He also suggested fitting the models by level of $5q0$, rather than time, and considering the ratio of $5q0\text{ male}/5q0\text{ female}$ rather than $5q0\text{ male}/5q0\text{ both}$.

Tom McDevitt (US Census Bureau) was invited to present on the US Census Bureau modalities of work when producing child mortality estimations. In his presentation, Tom compared the USCB estimates of U5MR with those produced by UNPD and concluded that there are obvious differences of U5MR produced by the two organizations.

Session 6: Summary and Closing

The meeting reached the last session after a productive day with Ken Hill closing remarks. He summarized that several major issues were discussed during the meeting. One is about the database. Participants agreed that the database should be able to keep track of changes, include supporting documents, justify final estimates and have convenient data format. About the HIV/AIDS, he indicated the importance and need to incorporate this element in the production of yearly child mortality estimates as well as the inclusion of this issue in the CM database. Regarding data quality issues, he concluded that adjustment for birth transference should be done and included in the CME database, but no adjustment for omission would be made since there is no reliable information (give zero weights to the affected data points).

As to the fitting method, he read a note from Ties Boerma indicating his preference for using the Loess-based model in the initial steps. Ken Hill indicated that he is not comfortable with the Loess method since the choices of alpha values are arbitrary and the model usually over-smoothes the trends. Jon Pedersen suggested to examine historical data to see what alpha values can be selected in the Loess model.

The meeting was ended after Ken Hill concluded that this was a very productive meeting and thanked the agencies and participants involved.

ACTION PLAN

Child mortality database

To be launched in September before the Bangkok workshop. It should include information on the 60+ countries and on the countries who will participate to the workshop. Requirements for the database includes: i) uploading latest data, latest estimates, and metadata; ii) deciding how much of original data such as child ever born/child surviving should be included in the data base; iii) a help menu should be added into the database; iv) standardization of terminology such as the naming of estimates, and of the formats of input and output in terms of data, metadata; v) in the estimation menu, add possibility to estimate multiple countries, to adjust outputs, to include HIV/AIDS effect, to estimate sub group, to record any change made by the administrator; vi) facilities to work smoothly while editing and manipulating data and estimates, including the possibility to download data and estimates for all of countries at once; vii) about graph: (a) There should be a way to identify which data sources are included or not included in the graph, which data sources are based on direct or indirect method; (b) The graph should be active in the downloaded file, so that users are able to make editing; viii) a working space for IGME as a whole and for each member

Child mortality estimates

Uncertainty estimates from the conventional Loess-based method and multi-level Loess-based method which takes into account dependence of data points: the two main conclusions are i) the conventional Loess-based method produces narrower confidence interval, whereas multi-level Loess-based method produce wider uncertainty interval that seems more accurate; ii) the conventional model is more affected by between-survey trend; while the multilevel model is more affected by within-survey trend, which might be a misleading for the general trend of child mortality. IGME needs to figure out whether to include the data points with zero weight. Relevant changes should be made in the database if needed. UNICEF will follow up on this issue.

HIV/AIDS imposes effects on estimate through two mechanics: unreported child deaths due to death of the mother and changes in prevalence and treatment. It was suggested not to adjust for 2007 estimate at this point, but four ways to go from now are: i) identify countries where AIDS prevalence curves (and U5M deaths) are included in the estimation process; ii) make these curves available in U5M database (from UN/Country estimates); iii) allows estimated AIDS mortality curves and perhaps HIV prevalence curves to be overlaid with U5M curves; iv) Perhaps not algorithmic, but these data should help with projecting either by person or by adjusting knot size. A group should work closely for country-specific adjustment.

TAG

The most important are of concern is reducing uncertainty: sampling errors, data errors and model errors. As a first study, the TAG will provide an assessment about whether to include full or truncated births histories in MICS4 by November 2008. The next meeting will be held in Geneva on 15-16 December where a proposal for a request for funding to Norway government or possibly Google.org will be the outcome.

Regional workshop

UNICEF, The World Bank, WHO and UNFPA are jointly organizing the workshop for the Asian region entitled *Improving national capacity to track maternal and child mortality towards the attainment of the MDGs*, planned in September 2008, will place emphasis on training country experts on the methods for estimating maternal, infant and under-five mortality; child mortality estimate database should be ready by the time of the workshop and the platform used during the workshop with country specific workspace.

Data quality assessment

Based on the study done by Jeramiah Sullivan, it was agreed that U5MR would be adjusted for birth transference, but not for omission. For the omission, further investigation is needed

Child mortality decomposition by sex

UNPD presented on the progress on the topic of sex-specific mortality estimates since Geneva meeting in March 2008; the ratio of $5 q_0 \text{ male} / 5 q_0 \text{ both}$ was used to test sex-specific mortality, and curves were fitted to ratio by Loess, Spline (weight points according to UNICEF weight) and linear models and it was shown that the fitted line can be varied greatly with Loess and Spline models; country analysis, regional models and index of female disadvantage will be future directions.