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United Nations Coordination Meeting on the Estimation of Adult Mortality

New York, 31 July 2008

Report of the Meeting

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Department of Economic and Social Affairs
Population Division

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DESA

The Department of Economic and Social Affairs of the United Nations Secretariat is a vital interface between global policies in the economic, social and environmental spheres and national action. The Department works in three main interlinked areas: (i) it compiles, generates and analyses a wide range of economic, social and environmental data and information on which Member States of the United Nations draw to review common problems and take stock of policy options; (ii) it facilitates the negotiations of Member States in many intergovernmental bodies on joint courses of action to address ongoing or emerging global challenges; and (iii) it advises interested Governments on the ways and means of translating policy frameworks developed in United Nations conferences and summits into programmes at the country level and, through technical assistance, helps build national capacities.

Note

PREFACE

The Population Division of the Department of Economic and Social Affairs (DESA) of the United Nations Secretariat has the task of estimating levels and trends of mortality for all the countries of the world. The work of the Population Division in this area has encompassed both the preparation of estimates of mortality indicators and the development of methods to estimate mortality, particularly when the data available are incomplete or deficient. As mortality levels decrease, deaths become increasingly concentrated at older ages as is the case in a majority of developing countries today. Given that the quality of data on mortality has not improved as much as mortality levels in those countries, it is pressing to develop and test appropriate methods to estimate mortality in adult ages. In addition, in high-mortality countries, many of which are significantly affected by the HIV/AIDS epidemic, accounting for the effect of the epidemic on adult mortality is essential. For those reasons, the Population Division of DESA has been working on the evaluation and improvement of methodology for the estimation of adult mortality.

As part of this ongoing effort, the Population Division of DESA organizes on a regular basis coordination meetings to discuss matters related to the estimation of adult mortality. The second United Nations Coordination Meeting on the Estimation of Adult Mortality took place at United Nations Headquarters in New York on 31 July 2008. The meeting included representatives of key institutions active in the study of mortality, including agencies, funds and programmes of the United Nations system, offices of the United Nations and the regional commissions as well as national statistical offices, universities and research organizations. The meeting reviewed progress made in methods to model and estimate adult mortality in countries with deficient data and identified future directions for research and collaboration. The meeting also provided an opportunity to discuss ongoing activities in the different institutions. This report presents a summary of the presentations and discussions at the meeting.

This report as well as other population information can be accessed via the Internet on the official website of the Population Division, www.unpopulation.org. For further information concerning this publication, please contact the office of Ms. Hania Zlotnik, Director, Population Division, Department of Economic and Social Affairs, United Nations, New York, NY 10017, USA; telephone number +1 212-963-3179; fax number +1 212-963-2147.

Explanatory Notes

The following acronyms are used in this report:

CELADE	Latin American and Caribbean Demographic Centre
DDM	Death Distribution Methods
DHS	Demographic and Health Surveys
DMEM	Database for Mortality Estimation and Monitoring
ECLAC	Economic Commission for Latin America and the Caribbean
GBE	Growth Balance Equation
GGB	General Growth Balance
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
IGME	Inter-agency Group for Child Mortality Estimation
IPC	International Programs Center
MDG	Millennium Development Goals
SEG	Synthetic Extinct Generations
TAG	Technical Advisory Group
UNICEF	United Nations Children's Fund
WHO	World Health Organization

UNITED NATIONS COORDINATION MEETING ON THE ESTIMATION OF ADULT MORTALITY

A. OPENING OF THE MEETING

Ms. Hania Zlotnik, Director of the Population Division of the Department of Economic and Social Affairs (DESA) of the United Nations Secretariat, welcomed participants to the meeting and outlined the recent history of the Coordination Meetings on Adult Mortality Estimation convened by the Population Division/DESA. Before 2000, several entities of the United Nations had been producing mortality estimates. With the adoption of the Millennium Declaration in 2000, estimates of child mortality had taken on new prominence as indicators for the achievement of Goal 4 of the Millennium Development Goals (MDG). As international attention focused on the trends in infant and child mortality, discrepancies among existing estimates were noted. In order to ensure better coherence between those estimates, UNICEF decided to convene a meeting of all entities working on the estimation of infant and child mortality. Thus was born the Inter-agency Group for Child Mortality Estimation (IGME), which had been meeting annually and whose objectives were to harmonize data sets and methodologies in order to produce consistent estimates of child mortality for the official assessment of progress made towards the achievement of the MDGs. In addition, in 2008 a Technical Advisory Group (TAG) of independent experts had been set up to advise IGME on how to improve the estimation of child mortality and assess data quality.

With respect to the estimation of the adult part of the mortality schedule, there were also a number of groups both within and outside the United Nations system producing estimates of adult mortality. Considering that it would be useful to bring them together to discuss advances made in estimating adult mortality, particularly in countries with deficient data, the Population Division/DESA convened in October 2006 an Expert Group Meeting on Current Issues in the Estimation of Adult Mortality. At that meeting, participants reviewed the scope of the problems involved in estimating adult mortality when data were deficient and sparse and considered new methods being developed or tested. Thus, a new two-dimensional model of mortality being developed by the Population Division/DESA was presented, as were the results of methods for the evaluation and adjustment of deficient data on deaths by age and sex. The group endorsed a proposal by the Population Division/DESA to develop a database for storing all types of data that could be the basis for the estimation of mortality.

Ms. Zlotnik noted that this second meeting would build on the results of the first one. More work had been going on relative to the evaluation of the performance of the two-dimensional mortality model presented in the first meeting and the results obtained would be discussed at this meeting. There would also be presentations on the development and evaluation of other promising methods. In convening these coordination meetings, the Population Division/DESA hoped to foster closer collaboration among the different groups working on improving the estimation of mortality over the whole lifespan and particularly in developing countries.

Lastly, Ms. Zlotnik informed participants about work under way to organize a High-level Event on the MDGs, convened jointly by the President of the General Assembly and the Secretary-General of the United Nations, which would take place on 25 September 2008. The Population Division/DESA has been assigned the task of organizing a roundtable session on Education and Health, which would bring together high-level officials, including Heads of State and Heads of Government, to present action plans for achieving the MDGs on education and health, including MDG 4 on the reduction of child mortality. She noted that it was necessary to inform policy-makers about the impact existing programmes were having on health and mortality differentials. Thus, although improving the health status of women and children had priority on the international agenda, families who depended on men for income were likely to suffer major setbacks if the male breadwinner fell sick or died. In some cases, a focus on women and children might underestimate men's vulnerability. For instance, a detailed study of the demographic effects of famines showed that mortality among adult men was generally higher than among women and children, partly because assistance programmes gave priority to feeding women and children.

Mr. François Pelletier, Chief of the Mortality Section of the Population Division, said that the challenges faced in estimating adult mortality were greater than those involved in estimating child mortality. A key objective of the Coordination Meeting was to address those challenges. He said the Coordination Meeting would focus on progress made since the 2006 meeting, especially in model development and methodological refinements. He reported that the development of the database proposed in 2006 had not advanced as much as had been expected but prototypes for the database were being developed and had reached advanced stages of development.

Regarding methodological advances, Mr. Pelletier indicated that several methods would be revisited. First, the Coordination Meeting would consider whether an adjustment for international migration could produce adequate estimates of completeness of deaths when applying Growth Balance Equation (GBE) methods. Then, the Meeting would focus on the quality of estimates derived from data on the survival of respondents' siblings as recorded in sample surveys. Because data on the survivorship of siblings had been collected in many countries, if reliable estimates could be derived from them, many gaps would be filled, particularly in countries of sub-Saharan Africa.

The Meeting would also focus on work carried out to assess the performance of the two-dimensional mortality model presented in the previous meeting. There would be three presentations on the model. The first would explain how the model had been extended to each sex and its goodness of fit when compared with the reliable data used to derive the model would be assessed. The second would focus on goodness of fit tests with respect to data not included in the specification of the model. The third would focus on the goodness of fit of the model at advanced ages in developing countries.

Lastly, one presentation would explore a new way of understanding the secular decline in mortality that most countries had experienced and its implications for the projection of future mortality levels and another would offer the epidemiological perspective in assessing adult mortality, with a focus on Latin America.

B. Review of the activities relevant to the estimation of adult mortality by representatives of participating institutions

World Health Organization

The representative of the World Health Organization (WHO), Ms. Mie Inoue, reported that WHO produced annual mortality estimates for all 193 member States of the World Health Organization. Life tables were prepared for each member State in order to estimate of overall number of deaths in the population as the first step in distributing those deaths by cause. The broader context for the production of mortality estimates was the estimation of the Global Burden of Disease, a project that combined mortality and morbidity estimates into summary measures of population health. While national life tables were updated annually, the estimates by cause of death were updated less frequently. New estimates by cause of death would be published in September 2008 for the world regions. Consultations with national authorities regarding country-specific estimates of deaths by cause were currently in progress.

The primary information used to derive life table estimates and estimates by cause of death was contained in the WHO Mortality Database, a collection of data generated mainly from the civil registration systems of member States. About 100 member States reported civil registration data on deaths by age, sex and cause to WHO. The completeness of death registration was assessed by using growth balance methods. For 50 of the countries reporting, the data were used without adjustment. For the rest of the countries, it was necessary to adjust the data reported or to rely on mortality models. Data on adult mortality derived from censuses or surveys were also evaluated, but because of concerns about the reliability of adult mortality estimates derived from those sources, they were rarely used in the preparation of national life table estimates.

Ms. Inoue noted that the estimation of cause-specific mortality had to rely on models even more than the estimation of overall mortality. She suggested that the group might consider incorporating cause-specific mortality into its agenda. WHO welcomed collaboration in this area from other agencies and research institutions.

Economic Commission for Latin America and the Caribbean (ECLAC)

Mr. Dirk Jaspers, representing the Demographic Centre for Latin America and the Caribbean (CELADE) of the Economic Commission for Latin America and the Caribbean, noted that the quality of the data available for the estimation of adult mortality in countries of Latin America and the Caribbean varied widely. Whereas some countries, such as Argentina, Chile, Costa Rica, Cuba and Uruguay, had civil registration systems that produced data of good quality, the poorer countries in the region, including Bolivia, Haiti and Nicaragua, could not produce adequate data from their civil registration systems and, in those cases, adult mortality had to be estimated using models. Generally, the performance of civil registration systems in the region had not improved markedly since the 1970s. Therefore, countries characterized by incomplete or deficient mortality statistics in the 1970s still fit the same characterization.

CELADE used growth balance methods to assess the quality of death registration data. Because of the increasing openness of populations to international migration, Mr. Jaspers considered that the results yielded by the growth balance methods were not as reliable as in previous decades.

In the 2000 round of censuses, the censuses of several countries in the region had included a question on deaths in the household over the year preceding the census. Analysis of the data yielded by such questions showed that the data collected by some countries were adequate and allowed the derivation of reliable estimates of adult mortality. However, in some countries, the data yielded by the census were of poor quality and could not be used to derive adequate estimates of adult mortality.

CELADE worked closely with national statistical offices to produce demographic estimates. When the national statistical offices had the expertise needed to produce estimates of adult mortality, they produced a first set that was then discussed with CELADE experts and modified as necessary. In some countries, however, the national statistical offices did not have the expertise necessary to produce the estimates. In those cases, CELADE experts were responsible for producing national estimates.

Mr. Jaspers highlighted some salient features of mortality by age in Latin America and the Caribbean. In many countries of the region, mortality among young adults, especially among young men, had been increasing. Most of that increase was associated with rising levels of accidents and violence. Among older adults, mortality remained low compared to that in other regions of the world. In the Latin American or Caribbean countries with the lowest levels of mortality, the estimation of age-specific mortality at ages 80 and over was becoming increasingly important and CELADE was working to produce such estimates.

United Nations Population Division/DESA

Mr. Pelletier reported that the Mortality Section of the Population Division/DESA had produced an inventory of sources of mortality data for each and every country of the world. The inventory had been incorporated in the files included on the CD-Rom edition of the *World Mortality Report 2007*. Work was under way to extract mortality information from the individual data files of major demographic survey programmes. In addition, work to update and expanding the set of data allowing the estimation of child mortality by sex was progressing and a report on the issue would be prepared. In addition, the Section was working with the Population Estimates and Projections Section of the Population Division/DESA to build and populate a database containing all the data available for the estimation of mortality (adult and child) and with the University of California at Berkeley to develop a similar database that would operate through the internet and allow the collaboration of experts in other institutions.

Mr. Gerhard Heilig, Chief of the Population Estimates and Projections Section of the Population Division/DESA, discussed the challenges involved in deriving mortality estimates from the varied sets of data available for each country. The aim of analysts preparing past estimates and future projections for each country of the world was to estimate past levels and trends of child and adult mortality in order to use them in reconstructing the population of each country. The process involved checking the consistency of the mortality estimates derived from the analysis of mortality data with the size and structure of the population as enumerated by various censuses and with the estimated levels and trends of fertility and, as appropriate, international migration.

Mr. Heilig noted that it was especially difficult to obtain reliable estimates of mortality in countries affected by conflict or other major crises. When the crises were of short duration, such as the tsunami that affected several countries in Asia, the temporary spikes in mortality were smoothed out in the five-year estimates used by the Section in reconstructing past population trends. Mr. Heilig noted that in projecting mortality over the medium-term future, crossovers in projected mortality levels were not allowed.

The Population Division had embarked in the systematic assessment of past estimates of fertility and mortality. To do so, the first step was to put together all the primary data that could serve as basis for the derivation of such estimates. For that reason, the Population Estimates and Projections Section was developing a new database, named DEMODATA, to store a wide range of demographic data and indicators in a unified format. The database would contain not only the numeric data but also a comprehensive set of meta-information describing each data point. In addition to the primary data necessary for the derivation of estimates, the database would store documentation and the estimates used.

University of California at Berkeley

Mr. John Wilmoth, Associate Professor at the Department of Demography of the University of California at Berkeley (UC-Berkeley), reported that UC-Berkeley and the Max Planck Institute for Demographic Research continued to maintain the Human Mortality Database, a database containing detailed mortality data obtained primarily from developed countries and the full set of life table estimates derived from those data. UC-Berkeley had initiated collaboration with the Population Division/DESA to develop another database, named the Database for Mortality Estimation and Monitoring or DMEM. DMEM would provide the infrastructure to produce reliable and well documented mortality estimates for developing countries. It would store the primary data needed to derive national-level mortality estimates. Unlike the Population Division's DEMODATA, which was oriented to the production of official United Nations estimates, DMEM would serve the research community by making its contents available and by letting interested researchers collaborate in populating it. DMEM and DEMODATA were being developed using similar standards so that data could be easily shared between the two. The goal was for a consortium of institutions to be able to enter data into DMEM through an interactive web mechanism.

Participants remarked that health planners needed not only national estimates but also sub-national estimates of mortality and inquired whether DMEM would include sub-national data. They also suggested the incorporation of data relative to small population cohorts and from the demographic surveillance sites that were functioning in countries lacking adequate data at the national level. Mr. Wilmoth replied that, while the data structure of DMEM was flexible and could accommodate data for any geographical level of aggregation, in the short term, the focus would be on the compilation and analysis of national-level data.

United States Census Bureau

Mr. Thomas McDevitt, representing the International Programs Center (IPC) of the United States Census Bureau, said that his institution considered data from all possible sources when estimating mortality. For example, for Bhutan, child mortality estimates based on models were combined with adult mortality estimates derived from data on deaths reported by households included in a population census. Countries experiencing high levels of migration and lacking complete data on deaths posed particular estimation challenges. The same challenges were present when one dealt with sub-national populations.

The IPC made special efforts to estimate the impact on mortality of natural disasters or wars, even if these effects were of short duration. Because the projection software used by IPC projected populations over one-year or even half-year time intervals, the impact of such events could be placed in the precise time period in which they occurred.

Mr. McDevitt commented on the special problems arising when mortality had to be estimated for small populations, where random effects could make levels change erratically. The IPC published mortality and population estimates for countries with populations of at least 5,000 inhabitants. Because of random variation, estimates of mortality for very small populations might be implausible even when multiple years of data were combined and smoothed.

Lastly, Mr. McDevitt said that IPC did not yet publish for all countries population estimates disaggregated at ages above 80. A high priority for IPC was to expand the range for disaggregated five-year age groups in the population estimates up to age 100.

C. NEW COMPONENTS IN DEATH DISTRIBUTION METHODS

The first two presentations focused on the impact of international migration on the performance of death distribution methods (DDM). It was recalled that the first death distribution method, the general growth balance method (GGB), used the deaths registered between two censuses and the enumerated population at those censuses to estimate the completeness of death registration relative to the completeness of census enumeration. It compared the death rate at age $x+$ with estimates of the same death rate calculated as the difference between the entry rate to age group $x+$ (birth rate at age x) and the growth rate of that age group, for every age x multiple of five. If the assumptions of the method were met, a plot of one set of estimates against the other would be approximately linear and the estimated slope would be the inverse of the adjustment factor for the number of registered deaths.

In the second death distribution method, called the synthetic extinct generations method (SEG), age-specific growth rates for the population aged x, for different values of x, were used to convert registered deaths above age x to an estimate of the population aged x. The average ratio of the estimated to the observed population for each age x over the range of variation of x provided an estimate of the adjustment factor for deaths.

Both the GGB and the SEG methods assessed completeness of death registration relative to that of the enumerated population. Both methods assumed that the population was closed to international migration and that the completeness of death registration was constant by age as was the completeness of enumeration of the population at different ages. The SEG method further assumed that the completeness of enumeration was the same for the two censuses used to estimate population growth rates.

The assumption that the population was closed to migration was rarely met in the developing countries for which the death distribution methods were employed. Mr. Kirill Andreev, Population Affairs Officer at the Population Division/DESA, examined the performance of the GGB method in populations with relatively high migration levels and evaluated existing and proposed adaptations to adjust for migration. In the process, a modified application of the GGB method was developed and tested using data for countries experiencing significant net international migration.

Mr. Andreev used the examples of Canada and Kazakhstan to show the effect of non-zero migration on adult mortality estimates. The Canadian data on deaths were considered to be complete and age reporting accurate. Estimates of net migration by age and sex were provided by Statistics Canada. By applying the various death distribution methods to the data for Canadian males for the period 1989-1998, Mr. Andreev found that when not adjusted for international migration, the methods underestimated or overestimated adult mortality by between seven per cent and nine per cent (figure I). Applying an adjustment for international migration, using either a method proposed by Bhat[1] that incorporated observed age-specific migration or another proposed by Hill and Queiroz[2] that used a modification of the Rogers-Castro model, produced estimates of adult mortality that were very close to the observed level.

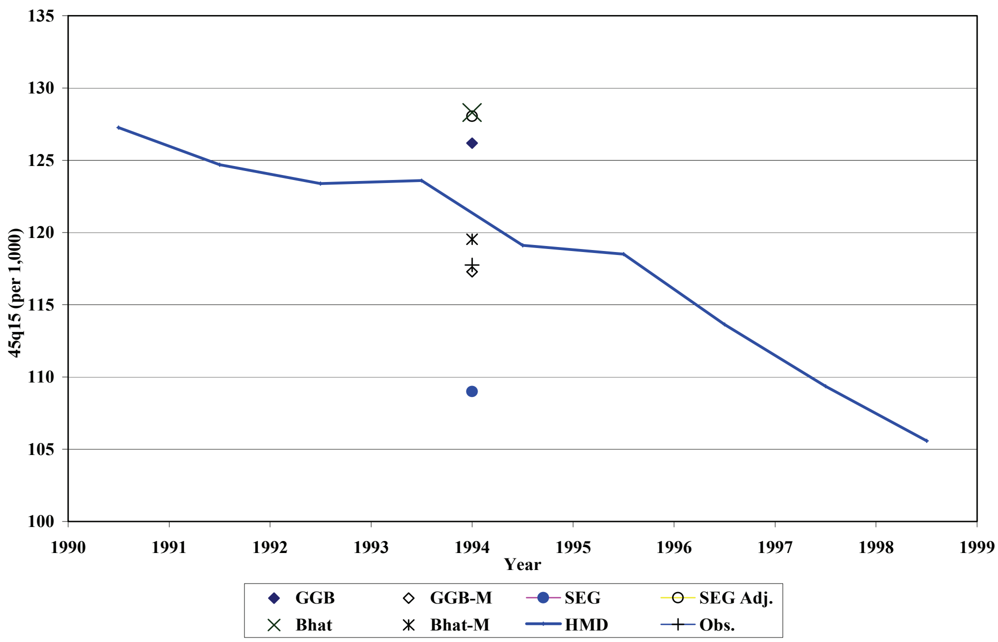
In the case of Kazakhstan, a country that experienced heavy emigration during the 1990s, an application of the GGB method between the 1989 and 1999 censuses implied that adult deaths were over-counted and that adult mortality estimates had to be adjusted downward by 16 per cent. This result contradicted prevailing views that adult mortality in Kazakhstan was underestimated because of under-registration of adult deaths. The underestimation of the adjustment factor in cases of heavy

[1] Bhat, P. N. Mari (2002). General growth balance method: a reformulation for populations open to migration. *Population Studies* (London), vol. 56, No. 1, pp. 23-34.

[2] Hill, K. and B. L. Queiroz (2004). Adjusting general growth balance method for migration. Presented at the Adult Mortality in Developing Countries Workshop, Berkeley, California, July 2004. Accessed at http://www.ceda.berkeley.edu/events/AMDC_Papers/Hill_Queiroz-amdc.pdf on 2 September 2008.

emigration was a typical result of the application of the GGB method when no account was taken of the effect of migration.

Figure I. Effect of unaccounted migration on adult male mortality levels and on the relative completeness of death registration, Canada, 1989-1998



Legend	
No migration	
GGB	General growth balance method
SEG	Synthetic extinct generations method
SEG Adj.	SEG with GGB adjustment
Bhat	Bhat
HMD	$_{45}q_{15}$ from annual Human Mortality Database life tables
Obs.	Observed $_{45}q_{15}$
With migration	
GGB-M	GGB with migration
Bhat-M	Bhat adjustment for migration

Mr. Andreev reviewed possible extensions of the original GGB method to account for migration. The ideal would be to use independent estimates of age-specific net migration to correct the primary data. However, such estimates were rarely available, especially for countries having deficient vital registration systems. A second possibility was to fit the GGB regression only to age groups with low levels of net migration as, for instance, ages higher than 40 or 50. This approach was not recommended for most countries because it depended on the quality of demographic data at older ages, which was often suspect. A third approach was to use a parametric model for age-specific migration, such as the Rogers-Castro migration model.[3] Mr. Andreev noted that problems involving statistical identification of parameters

[3] Rogers, A. and Castro, L.J. (1981). *Model migration schedules*. International Institute for Applied Systems Analysis, Laxenburg, Austria.

could arise if a parametric model were used, making it impossible to separate the effects of migration on the parameters of the GGB regression equation.

Mr. Andreev then presented a new model that used a special form of the Rogers-Castro model to ensure that the effect of migration was identifiable in the GGB regression model. Several simulations had been made to assess how the new model performed in the presence of various data errors, including severe underreporting of deaths and underreporting of the population in one of the censuses. The results obtained were encouraging: the model was able to recover the simulated levels of adult mortality and to account for migration at the same time.

Mr. Andreev concluded that, if the shape of age-specific migration rates was significantly different from the shape of the age-specific death rates, it was possible to adjust for migration if age reporting was acceptable and the assumptions regarding under-registration of deaths and underreporting in censuses underlying the GGB method were satisfied. He recommended that all data sets on deaths and population counts be assessed to establish if the necessary conditions are satisfied. He also stressed that the original GGB method would underestimate the adjustment for observed death rates in countries having experienced significant emigration.

Mr. Ken Hill, Professor at the Center for Population and Development Studies of Harvard University, examined the effects of net migration on both the GGB and SEG methods. He presented the results of simulations with known data errors and migration patterns. He conducted separate simulations for a population with high mortality and one with lower mortality as well as separate simulations for a general population and an urban population.

With a net immigration rate of about 1.5 per cent per annum, errors in adjustment factors yielded by the GGB and SEG methods ranged from 15 per cent to 35 per cent, depending on the age groups used to fit the regression line (table 1). The GGB method tended to underestimate completeness of death registration and thus overestimated mortality, while the SEG method tended to overestimate completeness and thus underestimated mortality. Both methods produced an opposite result when there was net emigration. Adjusting the SEG method for changes in census coverage generally gave similar results to the GGB method.

TABLE 1. EXAMPLE OF THE EFFECT OF NET MIGRATION ON ESTIMATES DERIVED WITH THE GENERAL GROWTH BALANCE (GGB) AND SYNTHETIC EXTINCT GENERATIONS (SEG) METHODS

Indicator	Net immigration rate of about 1.5 per cent per annum				
	True Value	GGB 15-55	GGB 5-65	SEG 15-55	SEG 5-65
Completeness of death registration	1.000	0.650	0.750	1.23	1.31
Completeness of second census relative to first census	1.000	0.918	0.929	n/a	n/a
${}_{45}q_{15}$	0.309	0.420	0.378	0.260	0.246
${}_{25}q_{60}$	0.860	0.951	0.924	0.796	0.774

Mr. Hill suggested that when no information on migration or other data were available, simply averaging estimates from the GGB and SEG methods based on age groups 30+ to 65+ produced errors in ${}_{45}q_{15}$ that were generally below 10 per cent. Adult mortality estimates obtained this way were almost always underestimates regardless of the direction of the migration flow. The average error in the estimates when multiple errors were present in the data was around three per cent. However, it was not possible to identify migration unambiguously in the presence of other errors, especially changes in census coverage. He cautioned that, if non-negligible levels of migration were suspected, the GGB method fitted to age groups 15+ to 55+ would give poor results due to the higher impact of migration on younger age groups.

Mr. Hill also examined whether prior knowledge of migration levels could improve the performance of the methods. He found that even when an estimate of net migration was available, the GGB method was still highly sensitive to other errors in the data and it was thus difficult to adjust the method internally for migration. He suspected that the SEG method would be similarly sensitive. He concluded that the best course appeared to be to average the results of the GGB and SEG methods. The errors from this averaging would typically be less than 10 per cent, but overall they usually underestimated mortality. He did not find this a very satisfactory solution and was increasingly pessimistic that the death distribution methods would prove to be a reliable means of estimating adult mortality in countries with incomplete and deficient data on adult deaths by age.

Participants considered that it was useful to spell out the conditions under which the death distribution methods could yield acceptable results and to provide guidelines regarding the effects of typical errors affecting the primary data. Participants stressed that it was important to have independent information regarding migration levels, census coverage and the extent of age misreporting. The difficulties in separating the effects of migration from other data errors meant that the methods might only be applicable to large national populations where the net migration rate was known to be negligible, such as in China, India or Indonesia. It might also be possible to apply the methods to older ages, for example 50 and over, ages at which net migration rates were usually quite low. However, age misreporting was recognized as a serious problem at older ages.

Attention was also drawn to the political messages that could be taken from these presentations. It was unacceptable that in most countries civil registration systems had not improved in the past 40 years. Many policy-makers and funding organizations were under the impression that sufficiently reliable data existed to provide them with credible estimates of mortality. They were therefore disinclined to invest in improving civil registration systems. The situation was particularly dire in low-income countries where civil registration systems were poor or nonexistent and where older generations still had no sense of their ages.

D. Sibling histories and adult mortality levels

Mr. Bruno Masquelier, Researcher at the Institut de démographie of the Catholic University of Louvain, presented an analysis of adult mortality estimates based on the survival status of adult siblings reported in Demographic and Health Surveys (DHS) in Africa. Adult mortality analysis in sub-Saharan Africa relied heavily on surveys that collected retrospective data on the survival of parents or siblings. More than 50 DHS had included a module on maternal mortality that recorded, for each respondent, a full listing of the respondent's siblings, that is, all children born to the respondent's natural mother and their survival status. For siblings that had survived to age 15, further questions were posed about the date of birth, survival status since age 15 and, if deceased, age at death and time since death. These data allowed direct calculation of mortality rates that could permit the analysis of mortality trends. However, questions remained as to the adjustment for selection biases and about the overall quality of the data.

There were three main selection biases affecting mortality estimates from sibling data.[4] First, there was an under-representation of sibships with high mortality because, if there was no surviving member of the sibship, no information could be collected from that sibship and therefore mortality would be underestimated. Second, sibships with low mortality might be overrepresented because sibships with multiple surviving members could be covered more than once[5] leading to an underestimation of mortality. Third, in the classical method of calculating mortality estimates from sibling data, the respondent was not included in the calculation of exposure to mortality, causing an upward bias in the mortality estimates. Earlier analyses showed that these three biases would cancel each other provided there was no association between mortality and sibship size.

Gakidou and King[6] had developed a correction method to account for differential mortality by sibship size. They introduced weights depending on the size of the sibship, including the number of surviving siblings and respondents, and made some extrapolations to account for the fact that some sibships died out completely before the survey. Mr. Masquelier identified a problem with the method when applied to DHS data: it worked well if any of the surviving siblings could be interviewed, but in the DHS only women aged 15-49 provided data on their siblings. Hence, the missing information related not only to families that completely died out but also to sibships without a surviving female aged 15-49. Thus further evaluation of the applicability of the weighting system was needed.

Mr. Masquelier performed his analysis using a combination of micro-simulations and real data. He showed that the application of the Gakidou and King method to DHS data led to an under-estimation of adult female mortality, as illustrated in figures II-A and II-B below, showing the results of 324 micro-simulations.[7] Since the micro-simulations tracked siblings, they could be used to reproduce the situation covered by the typical DHS in which only females aged 15 to 49 provided information about siblings, and subsequently to compare the different methods of estimation. Differences between annual mortality rates calculated from the DHS (excluding respondents and without weighting), the weighted method proposed by Gakidou and King, and the simulation results were small for males (figure II-A). For females, however, the rates estimated from the Gakidou and King method were substantially below the rates from both the classical method and the simulation results (figure II-B). Preliminary results showed that the classical way of estimating the mortality rates performed better than the weighting methods if there was no association between mortality and sibship size.[8]

Mr. Masquelier addressed next the issue of clustering of adult deaths within families. This clustering could cause greater heterogeneity in the distribution of deaths than would be observed if deaths were distributed randomly across families. By fitting a random intercept model to data from the Kenya 1998 DHS, he found that the variance of the random effect, an indication of the amount of heterogeneity, was positive and statistically significant. He addressed the issue with a multilevel model, extending the model with a random effect for district. Significant contextual variation was found at the district level. Little information was available on the siblings who were not interviewed, but he suggested that it was safe to assume that the ethnic group declared by the respondent also applied to her siblings. Thus, an effect for ethnic group was added and strong ethnic inequalities were observed. The effect of ethnic group

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[4] Trussell, J. and G. Rodríguez (1990). A Note on the Sisterhood Estimator of Maternal Mortality. *Studies in Family Planning* 21:344–46.

[5] The DHS did not identify duplicated sibships, that is, when two sisters were interviewed in the same survey. Mr Masquelier had identified duplicated sibships through a matching procedure in a few DHS surveys and preliminary analyses showed that between five and seven per cent of sibships were duplicated in the DHS files.

[6] Gakidou, E. and G. King (2006). Death by survey: Estimating adult mortality without selection bias from sibling survival data. *Demography* (Washington, D.C.), vol. 43, No. 1, pp. 569-585.

[7] The micro-simulations were run using the SOCSIM software based on stable populations (with a growth rate of 0.02), a mortality based on the General Pattern of the United Nations model life tables (with life expectancies at birth varying from 35 to 70 years) and a fertility pattern based on Coale and Trussell as presented in Coale A. J. and J. Trussell (1974). Model fertility schedules: Variations in the age structure of childbearing in human populations. *Population Index* 40: 185–258. (For SOCSIM documentation see http://www.demog. berkeley.edu/~socsim/).

[8] The correlation between sibship size and mortality could be introduced in the micro-simulations.

reduced the variation at the sibship level by about 30 per cent, and reduced the variation by district to a non-significant level.

Figure II-A. Ratio of adult mortality rates among males 15-49 estimated from sibling histories by using different methods to mortality rates obtained from micro-simulation

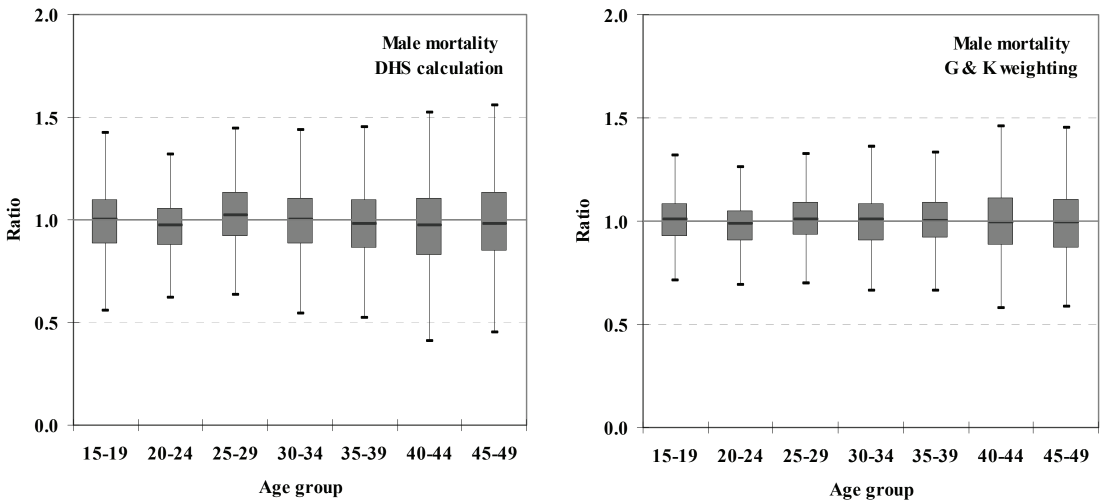
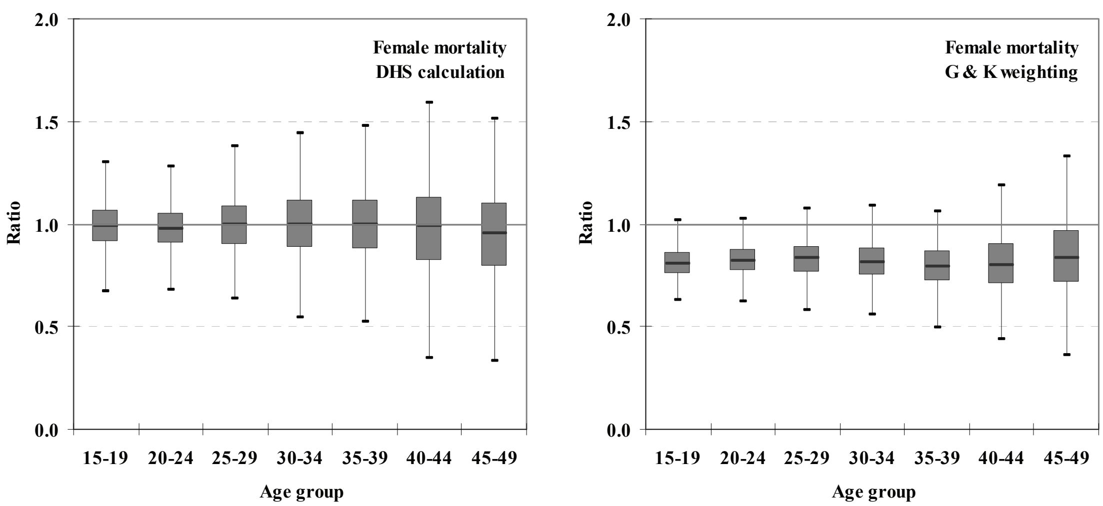


Figure II-B. Ratio of adult mortality rates among females 15-49 estimated from sibling histories by using different methods to mortality rates obtained from micro-simulation



In addition, Mr. Masquelier examined the reliability of reported data on siblings, including differences in the reports on brothers and sisters, underreporting of siblings older than the respondent, underreporting of siblings by older respondents, and misreporting of siblings' ages.[9] Based on analysis of the sex ratio of reported siblings, he found underreporting of sisters in many countries of western Africa, and under-declaration of brothers in some countries of eastern and southern Africa. Based on comparisons

[9] See also Stanton C., A. Noureddine and K. Hill (2000). DHS maternal mortality indicators: An assessment of data quality and implications for data use, *Studies in Family Planning*, 31, 2, pp.111-123.

of the median year of birth of the siblings to the median year of birth of respondents, he found limited underreporting of siblings born before the respondent. However, he did find evidence of underreporting of siblings by older respondents, particularly those with less education. Lastly, a local survey in the United Republic of Tanzania that recorded the age of respondents as reported by themselves and also by their sisters found that, as women got older, their sisters made larger errors in reporting the age of respondents and those errors were generally in the direction of reducing the age of respondents.

Mr. Masquelier concluded that the issues of weighting and selection bias required further review. In addition, data collection practices could be improved, both by identifying sisters already interviewed and by asking all household members about the survivorship of their siblings and not just women aged 15 to 49.

The discussion touched on several issues related to the collection and quality of sibling data. Participants remarked that some surveys already collected sibling data from male respondents as well as female respondents. They cautioned that asking all household members about the survivorship of their siblings would likely cause interviewers to repeat data for several respondents and the quality of the data might decline. Mr. Masquelier indicated that he had developed a matching procedure that could identify probable duplicate sibships both within the same household and within the same survey cluster.

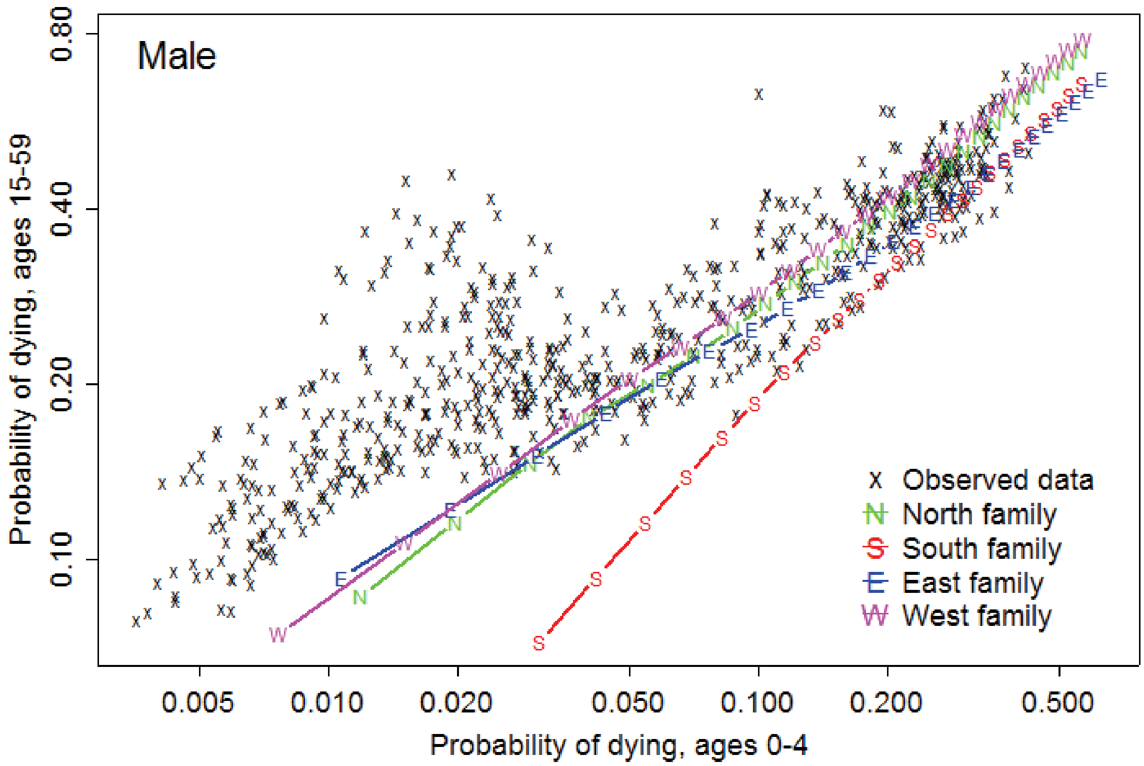
Attention was called to the accuracy of the estimates obtained. Participants remarked that estimates of adult mortality based on sibling histories generally seemed to be low compared to historical experience. While weighting could correct for biases arising from correlation of sibship size and mortality, it could not correct for underreporting. The variance of the adult mortality estimates based on sibling data was underscored. Experience using the Gakidou-King methods of estimation had shown that the variance of the estimates obtained was high and they therefore were no different statistically from other estimates derived from the same data. Concerns about the effects of the HIV/AIDS epidemic on estimates derived from sibling data were raised. Mr. Masquelier replied that, in regard to the effect of AIDS, estimates derived from sibling data had an advantage over those derived from orphanhood data because mortality caused by AIDS was less likely to be correlated among siblings than among parents and children.

E. Model life table systems

Mr. John Wilmoth reported on the further development of a two-dimensional mortality model first presented at the Expert Group Meeting on Current Issues in the Estimation of Adult Mortality in 2006. Mr. Wilmoth first restated the necessity of having both flexible and parsimonious model life table systems. Model life table systems were necessary for estimating age-specific mortality in countries lacking adequate data on deaths classified by age. Model life table systems were based on empirical models derived from observed life tables. Most model systems typically had one or two “entry parameters”, so that a known measure of mortality, often child mortality, could be used to select an appropriate model life table. The model life table systems currently in widest use were the Coale-Demeny model life tables, the United Nations model life tables for developing countries, and the WHO modified logit life table system. Each system implied particular relationships between child and adult mortality.

Mr. Wilmoth compared the relationship between under-five mortality and adult mortality (expressed as the probability of dying between exact ages 15 and 60 or ${}_{45}q_{15}$) in a set of life tables contained in the Human Mortality Database to the relationship implied by the Coale-Demeny model life tables. While the Coale-Demeny models captured this relationship well at higher levels of child mortality, at lower levels of child mortality the models significantly underestimated adult mortality especially for males (figure III).

Figure III. Relationship between adult mortality levels (${}_{45}q_{15}$) and child mortality levels (${}_{5}q_{0}$): Coale-Demeny models vs. observed data from the Human Mortality Database, males



Mr. Wilmoth presented two versions of the new two-parameter model relating age-specific mortality for each five-year age group (m_x) to under-five mortality (${}_{5}q_{0}$). The first was a log-linear model, expressed as:

$$\log(m_x) = a_x + b_x h + v_x k + \varepsilon_x$$

where $h = \log({}_{5}q_{0})$ and k was chosen to match the level of adult mortality.

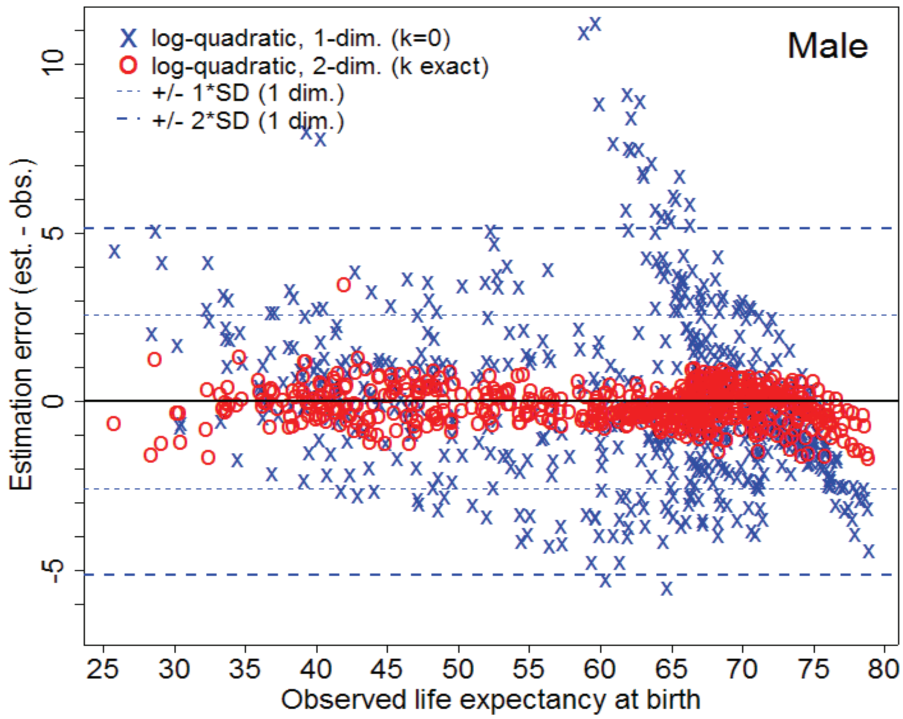
The second variant of the model had a log-quadratic form:

$$\log(m_x) = a_x + b_x h + c_x h2 + v_x k + \varepsilon_x$$

Both versions of the model were fitted to a set of 616 life tables from the Human Mortality Database. The model was fitted to the life tables for females and for males separately. The log-quadratic version produced a slightly better fit to the data when k=0, especially at the tails of the distribution.

Mr. Wilmoth compared predicted life expectancy from the log-quadratic model when k was set to zero to that predicted when k was selected to match ${}_{45}q_{15}$. Adding the k parameter significantly reduced the error in the estimated life expectancy, especially for males (figure IV).

Figure IV. Estimation error of life expectancy predicted by the log-quadratic model with *k*=0 and *k* exact, by observed life expectancy at birth, males



Lastly, Mr. Wilmoth traced the mortality experience, as expressed by the relationship between ${}_5q_0$ and ${}_{45}q_{15}$, for each of the developed countries included in the Human Mortality Database. For most of the countries of Northern, Western and Southern Europe, as well as for the non-European developed countries, this relationship stayed well within the bounds implied by a narrow range of the parameter *k*. For countries of Eastern Europe, particularly those of the former USSR, the relationship between ${}_5q_0$ and ${}_{45}q_{15}$ changed markedly in recent years because adult mortality increased, particularly for males, implying increasing values of the *k* parameter.

Ms. Sarah Zureick of the Department of Demography of the University of California at Berkeley presented tested the performance of the two-parameter log-quadratic model in fitting life tables that were not part of the Human Mortality Database, which had been used to derive the model. The life tables used for testing the fitting abilities of the model were drawn from the Human Life Table Database[10] and the WHO database, which included 1,802 life tables that had been used to fit the WHO modified logit model.[11]

Ms. Zureick noted that the Coale-Demeny and United Nations "regional" models were developed using older data that did not capture well the more recent experience of mortality change. The log-quadratic model significantly improved the prediction of life expectancy and ${}_{45}q_{15}$ on the basis of child mortality when compared to the Coale-Demeny and United Nations model life tables in tests run fitting the life tables from the Human Mortality Database. Ms. Zureick also presented comparisons of goodness of fit of the two-parameter log-quadratic model and the WHO modified logit model, which had

[10] Human Life Table Database. http://www.lifetable.de.

[11] Murray, C. J. L., B. D. Ferguson, A. D. Lopez, M. Guillot, J. A. Salomon, O. Ahmad (2003). Modified logit life table system: principles, empirical validation, and application. *Population Studies* (London), vol. 57, No. 2, pp. 165-182.

been developed more recently and had been based on a wider variety of life tables, including those reflecting the experience of the 1990s. In most tests, the two-parameter log-quadratic and WHO modified logit model performed similarly. The exception was when the two models were used to fit the subset of WHO life tables that did not overlap with those in the Human Mortality Database. In those cases, the WHO modified logit model performed somewhat better than the two-parameter log-quadratic model. Such an outcome was expected because the WHO modified logit model had been derived from the full WHO database.

Participants generally concurred with the usefulness of the proposed models for estimating current and past levels of mortality for countries with incomplete data on adult mortality. However, it was noted that, for high-mortality countries, the new models produced similar fits to those yielded by the regional model life tables. There was concern that just as the old models performed poorly in cases where mortality was below the levels upon which the models were based, the proposed new models might not fit well the age structure of mortality when mortality levels fell below those included in the life table set used to generate the models. It was further pointed out that the two-parameter log-quadratic model might not perform well at older ages and that, in fact, the modified logit model had to be adjusted in order to fit old-age mortality in an acceptable way.

Participants recalled that one advantage of the Coale-Demeny life tables was that they also reflected other relationships between other aspects of mortality, such as the male-female differentials in mortality. That characteristic made them particularly useful in projecting future mortality levels.

Mr. Wilmoth argued that, for countries with high mortality, the proposed two-parameter log-quadratic model had the advantage of being easier to generate and work with than the regional life tables. In addition, the value of the second parameter in the model could be selected so that the model replicated any empirically derived estimate of adult mortality, thus adding flexibility to the use of the model and reducing the restrictions imposed by having to select only one of a discrete number of regional families of life table models. He added that the new model had not been proposed specifically for projecting mortality, but that it was possible to envision how it might be used for projection purposes. One could project the trend in ${}_5q_0$ and make an assumption about the path k might take, perhaps by having it remain constant or making it converge to zero.

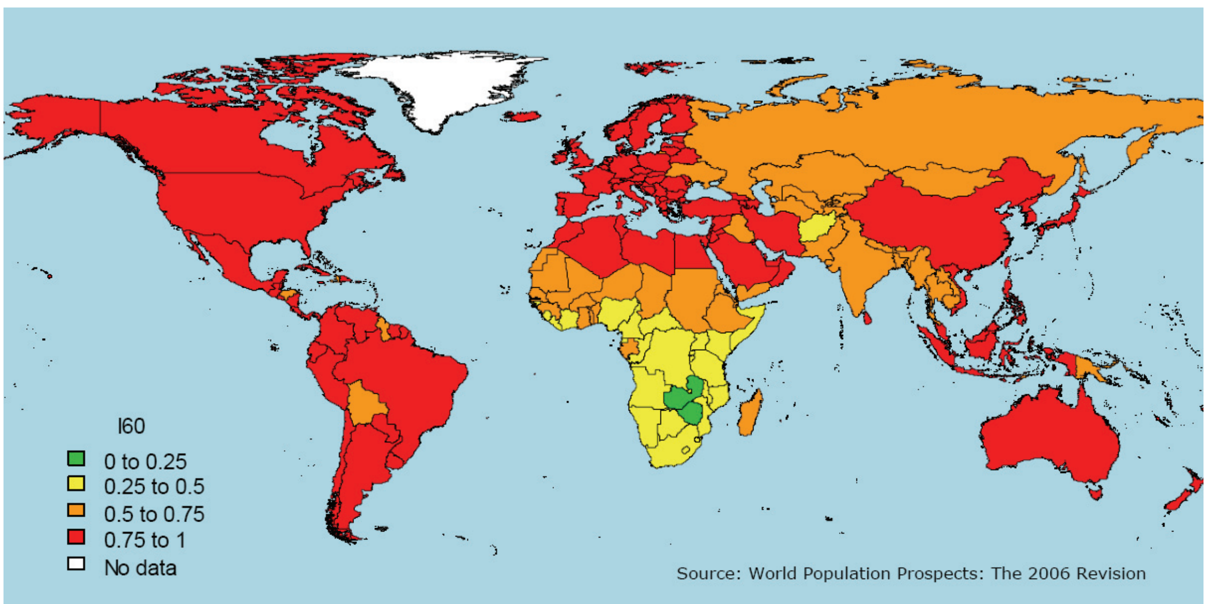
Some participants remarked that the life tables for developing countries included in the WHO database might not be accurate enough or might even be produced using models. The representative of WHO noted that those concerns were well founded and added that WHO was working on the reconstruction the 1,802 life tables from primary data on population and deaths by age and sex. She added that life tables included in the WHO database were generally not derived solely from models. However, as some participants remarked, some of the life tables included in the WHO database were those used to construct the United Nations model life tables, which had been derived by adjusting the primary data for under-reporting of deaths.

Lastly, it was pointed out that the two-parameter log-quadratic model had been derived from life tables referring mainly to the historical experience of developed countries, which might turn out to be quite different from that of developing countries both during the recent past and in the future. Mr. Wilmoth commented that attempts had been made to include life tables for Latin American countries in the Human Mortality Database but the data available for those countries did not have the quality of data relative to developed countries and had therefore not been added to the Database. He thought that adding life tables of unknown quality to the data set used to derive the model would not be useful.

G. OLD-AGE MORTALITY

Ms. Cheryl Sawyer, Population Affairs Officer at the Population Division/DESA, talked about the estimation of mortality beyond age 60 in developing countries. Generally, the estimation of adult mortality in developing countries had focused on the age range 15 to 60, in the form of ${}_{45}q_{15}$. Focusing on that age range was justifiable in countries with high mortality, where a large proportion of deaths occurred before age 60. Furthermore, in most populations having high mortality, age reporting among older persons was relatively poor and it was difficult to ascertain the effects of age misreporting on estimated mortality rates. However, in most developing countries outside of sub-Saharan Africa, mortality had declined to relatively low levels and in many of those countries, at least half of all deaths above age 15 took place at ages 60 or higher. In many countries of Latin America, Eastern and South-eastern Asia, and Northern Africa, the probability of surviving from birth to age 60 under the mortality levels prevalent in 2000-2005 was 75 per cent or higher (figure V). Thus, accurate estimation of mortality rates at ages 60 or over was crucial both for the accurate projection of the older population and to estimate overall life expectancy.

Figure V. Probability of surviving to age 60 (l_{60}), 2000-2005



Ms. Sawyer proceeded to examine how well the two-parameter log-quadratic model predicted old-age mortality. The indicator of old-age mortality used was the probability of surviving from exact age 60 to exact age 80 (${}_{20}q_{60}$). Focusing on the values of ${}_{20}q_{60}$ by sex from the life tables in the Human Mortality Database, she compared the observed values to those predicted based on ${}_{5}q_{0}$ and values of k ranging from -2 to 2. For males, the model captured the variation in ${}_{20}q_{60}$ fairly well, but for females the range of k required to capture the variation in ${}_{20}q_{60}$ was greater than the range required to capture the variation in ${}_{45}q_{15}$.

The performance of the model was then tested by using it to fit empirical life tables for developing countries having reasonably reliable data on deaths by age. For many Latin American countries, the values of k that fit ${}_{45}q_{15}$ given ${}_{5}q_{0}$ would significantly underestimate ${}_{20}q_{60}$. In the case of China, ${}_{45}q_{15}$ and ${}_{20}q_{60}$ followed similar trends over time, but at different implied levels of k, meaning that the two-parameter model fitted on the basis of ${}_{5}q_{0}$ and ${}_{45}q_{15}$ would not estimate ${}_{20}q_{60}$ correctly. In the case of India, ${}_{45}q_{15}$ and ${}_{20}q_{60}$ followed different trends over the time period examined. Thus, whereas the male ${}_{45}q_{15}$ had stagnated or increased in recent years, ${}_{20}q_{60}$ had continued to decline. Once more, the two-parameter log-quadratic model would not be sufficiently flexible to fit both indicators correctly. Ms. Sawyer concluded that fitting both adult and old-age mortality merited more attention in the development of mortality models, but noted that errors in the primary data might not warrant setting as a goal the achievement of a perfect fit of the national estimates.

The discussion echoed the concerns expressed about the reliability of estimates of old-age mortality derived from the primary data of developing countries, data that were known to be deficient in many respects. It was not clear whether the fact that the model did not fit national data was a reflection of the model's shortcomings or of those of national estimates.

H. Methods for estimating background and senescent mortality

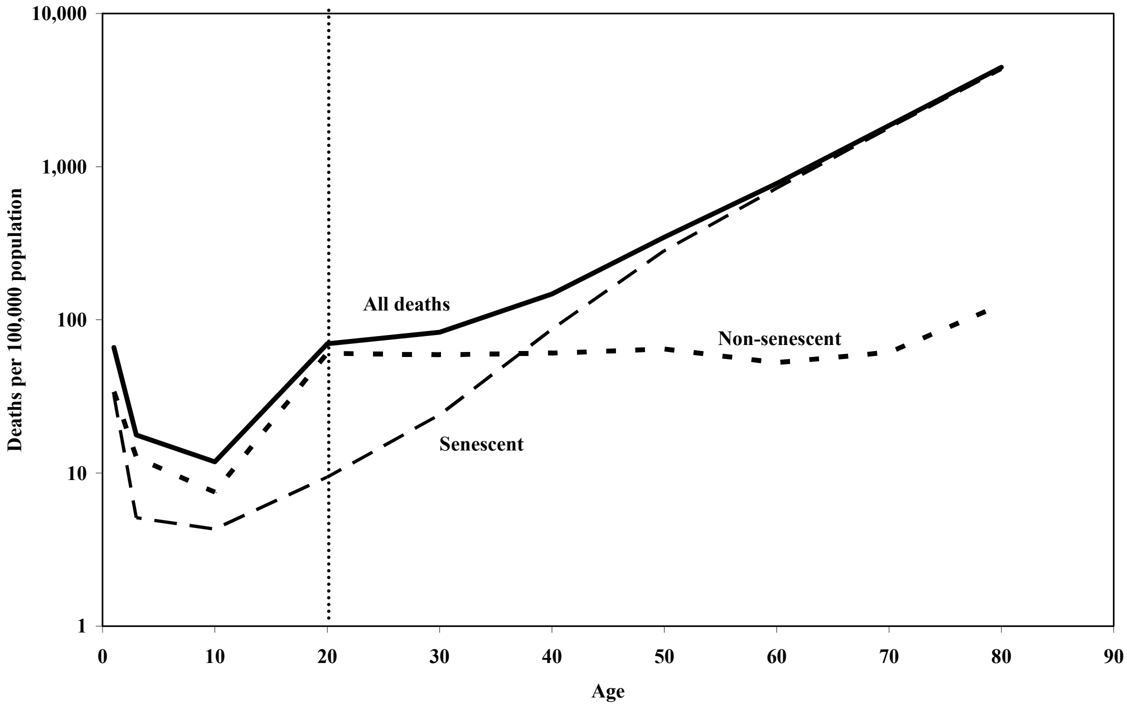
Mr. John Bongaarts, Vice-President of the Population Council, presented an analysis of trends in the two main components of mortality, namely, senescent mortality, which he described as being the result of biological ageing, and non-senescent mortality, also called background mortality, which represented the deaths unrelated to ageing, such as those caused by infectious disease, accidents or violence. Senescent mortality could be postponed through medical intervention, but it could not be avoided. Background mortality could be reduced through effective public health and safety measures as well as through appropriate medical interventions. Most of the historical increase in life expectancy was due to declines in background mortality, particularly among the young. In developed countries, nearly all current mortality was due to senescence. Thus, trends in senescent mortality were crucial in projecting the future life expectancy in those countries.

Mr. Bongaarts presented three methods for decomposing mortality rates into estimates of senescent and background mortality. The first involved estimating the two components using data on causes of death. Such a decomposition was possible using the 2005 data for the United States of America (figure VI). However, reliable data on deaths by cause of death and age were not available for most countries and trend data of that type were even scarcer. Therefore, it was useful to consider other approaches to the estimation of senescent and background mortality.

A second approach consisted in fitting a parametric model of the age pattern of adult mortality to observed sex- and age-specific mortality rates. One of the parameters of the model was the level of background mortality, assumed to be constant with age. The model was fitted to the observed force of mortality at time *t*. Fitting the model to data referring to each year by sex produced a time series of estimates of background mortality by sex. Then, background mortality was subtracted from observed mortality to obtain estimates of senescent mortality. Because this method sometimes yielded implausible trends in background mortality, including values that were negative or exceeded some of the estimated age-specific mortality levels, Mr. Bongaarts suggested a third method of estimation based on the fact that the background mortality estimated by parametric models was very highly correlated with the observed overall mortality of young adults. Mr. Bongaarts therefore recommended using an estimate of background mortality derived by regressing the observed death rate at age 25 against time.

Using the third method, Mr. Bongaarts derived estimates of background mortality, senescent death rates, senescent life expectancy, and the distribution of senescent deaths by age for 19 countries over the period 1960-2000. Between 1960 and 2000, senescent life expectancy rose at an average pace of 1.45 years per decade in the 19 countries considered. The shape of the distribution of senescent deaths by age remained relatively invariant while the entire distribution shifted over time to higher ages as longevity increased.

Figure VI. Estimated senescent and non-senescent death rates by age, United States, 2005



Source: Adapted from Kung and others (2008)[12] by Bongaarts.

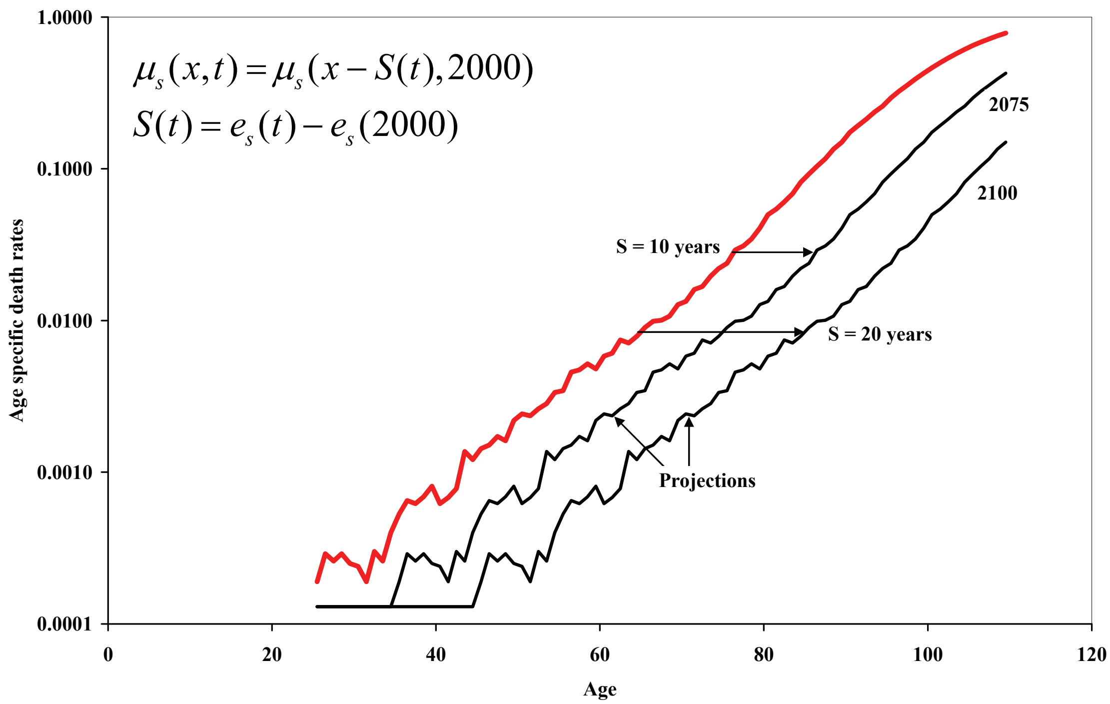
The conventional measure of life expectancy at birth (e_0) was lower than the senescent life expectancy (e_s), because the conventional life expectancy included background mortality. The conventional life expectancy had risen at a faster pace than the senescent life expectancy between 1960 and 2000 due to declines in background mortality and the difference between the two measures had also decreased. In the long run, the conventional life expectancy would converge to the senescent life expectancy as the background mortality declined to zero.

Mr. Bongaarts argued that the senescent life expectancy was the most suitable indicator for projecting future trends in life expectancy. The pace of increase in e_s suggested that the rate of increase in e_0 would be slower than in the past. Declines in background mortality would have little further impact on life expectancy in low-mortality countries because it was already very low. Consequently, the life expectancy forecast by projecting e_s was lower than that based on a projection of historical trends in e_0.

In order to project mortality using the senescent life expectancy, the first step was to extrapolate trends in background mortality and senescent life expectancy. Then, the distribution of senescent deaths could be shifted to older ages by a specified increment expressed in years (as illustrated for Sweden in figure VII). Lastly, the resulting senescent death rates would be recombined with background mortality to obtain an age-specific mortality schedule.

[12] Kung, Hsiang-Ching, Donna L. Hoyert, Jiaquan Xu, Sherry L. Murphy. 2008. "Deaths: Final Data for 2005". *Vital Statistics Reports* 56 (10).

Figure VII. Hypothetical projection with shifting model, Swedish females



Mr. Bongaarts concluded by highlighting two advantages of his proposed methodology. First, the proposed third method for deriving background mortality was simple and robust. Second, projecting senescent mortality was preferable to extrapolating e_0, because future gains in longevity in low-mortality countries would come almost exclusively from postponement of senescent deaths.

Participants asked whether modifiable risk factors, such as tobacco or alcohol use or changed in diet, affected senescent mortality. Mr. Bongaarts confirmed that deaths from related to those causes were indeed part of senescent mortality and noted that deaths from lung cancer, for instance, increased steeply with age. He thought it was possible to estimate the effect of smoking on mortality and then project senescent mortality without that effect. Participants remarked that a new development regarding senescent mortality was the increasing incidence of diabetes at younger ages in many parts of the world associated with unhealthy diets.

Participants concurred with the observation that extrapolating trends in e_0 could lead to projected levels of life expectancy that were too optimistic. Nevertheless, in countries such as Japan, e_0 continued to increase rapidly even after reaching very high levels. Mr. Bongaarts argued that recent increases in life expectancy in Japan stemmed from the rapid postponement of deaths to older ages, a tempo effect that would cease eventually.

Participants remarked that the projection of mortality focusing mainly on senescent life expectancy was appropriate only for countries that already had low levels of mortality. Countries experiencing higher mortality would still expect to achieve significant declines in background mortality in addition to those in senescent mortality.

I. AN EPIDEMIOLOGICAL PERSPECTIVE ON ADULT MORTALITY IN LATIN AMERICA AND THE CARIBBEAN

Mr. Carlos Castillo-Salgado, Adjunct Associate Professor at the Bloomberg School of Public Health of Johns Hopkins University, presented an epidemiological perspective on the health and mortality of adults in Latin America and the Caribbean. He called attention to recent changes in the epidemiological profile of the region, changes that he characterized as highly polarizing. In the past, the region experienced high mortality from infectious disease at young ages, coupled with adult mortality that was relatively low compared to that of developed countries. However, in recent years, the combined number of deaths from both road traffic accidents and violence had become more important than deaths from infectious and parasitic diseases. He added that these premature deaths were concentrated mostly among the male adult population and affected primarily young men. He noted that high blood pressure and obesity as well as alcohol and tobacco use were becoming the main drivers of adult mortality in Latin America and the Caribbean. In Mexico, for instance, diabetes had become the leading cause of death. Because diabetes led to earlier deaths than other non-communicable diseases, its incidence was altering the age profile of mortality. In addition, deaths caused by lung cancer were rising among women. These changes were extremely worrying and suggested that young adult cohorts might not enjoy as long a life as their parents had.

Mr. Castillo-Salgado also commented on the deficiencies of data collection systems in the region. In many instances, reporting systems were giving higher priority to satisfying the requirements of international organizations than to the needs of health planners. There was a need for better surveillance at the local and state levels. Without it, interventions could not be properly targeted. For instance, to combat malaria in the region, one needed to focus mainly on just 20 *municipios* in Brazil, which accounted for 70 per cent of all malaria cases in Latin America.

During the ensuing discussion, participants underscored that diabetes was becoming a huge drain on national health systems and not only in Latin America. There was speculation about the causes of the epidemiological changes observed in Latin America. Mr. Castillo-Salgado pointed out that, in terms of diet, both the increasing urbanization of countries in the region and the effects of globalization had led to changes in activity patterns in the population and major changes in the availability and price of unhealthy foods. In addition, many Governments of countries in the region allowed the health sector to remain weak and had virtually no coordination mechanism to ensure that measures supporting public health interventions were effectively implemented.

J. CLOSING OF THE MEETING

Mr. Pelletier closed the meeting by thanking participants for their useful contributions and active participation in the Meeting. He added that the Population Division/DESA would benefit from the methodological advances discussed at the meeting and their implications for the estimation of levels, trends and the decomposition of mortality.

Ms. Zlotnik suggested that future coordination meetings might be devoted to assessing how the United Nations projections of mortality were capturing some of the trends identified by the Meeting. It would be useful to discuss whether different projections of mortality were necessary, especially in order to raise awareness about the fact that the currently projected declines in mortality would not materialize automatically, especially if Governments continued to neglect the health challenges that experts had already identified. National authorities would do well to focus on developing coherent health policies and strengthening health systems so as to meet the needs of individuals throughout their life span. In closing, Ms. Zlotnik thanked participants for their contributions and commended the staff of the Population Division/DESA who had organized the Meeting.

UN/POP/MORT-CM/2008/INF.1

31 July 2008

English only

UNITED NATIONS COORDINATION MEETING ON
THE ESTIMATION OF ADULT MORTALITY
United Nations Secretariat
Department of Economic and Social Affairs
Population Division
New York, 31 July 2008

Venue: Conference Room DC2-2330
2 United Nations Plaza

ORGANIZATION OF WORK

Thursday, 31 July 2008

Morning session: *9:30-12:30*

1. **OPENING OF THE MEETING:** Ms. Hania Zlotnik

2. **OVERVIEW :** Mr. François Pelletier

3. **BRIEF SUMMARY OF MORTALITY ESTIMATION ACTIVITIES**
Participants from CELADE, WHO, the US Census Bureau and UNPD are asked to provide a brief overview of work and a statement of priorities in the area of mortality estimation from the perspective of their home institutions.

Morning break: 10:30-10:45

4. **NEW COMPONENTS IN DEATH DISTRIBUTION METHODS**

a) Extending the General Growth Balance method to account for migration.
Mr. Kirill Andreev

b) The impact of migration on death distribution methods: Can we adjust?
Mr. Ken Hill

Discussion and questions

5. **SIBLING HISTORIES AND ADULT MORTALITY LEVELS**

Analysis of adult mortality based on data on adult siblings:
A biographic multilevel approach.
Mr. Bruno Masquelier

Discussion and questions

Lunch break: *12:30-14:00*

Afternoon session: *14:00-17:00*

6. MODEL LIFE TABLE SYSTEMS

a) A flexible two-dimensional mortality model for use in indirect estimation: Motivation and derivation**.**
Mr. John Wilmoth

b) A flexible two-dimensional mortality model for use in indirect estimation: Performance tests and comparisons.
Ms. Sarah Zureick

Discussion and questions

7. OLD AGE MORTALITY

Mortality among the elderly in developing countries: Issues for consideration.
Ms. Cheryl Sawyer

Discussion and questions

Afternoon break: 15:30-15:45

8. ALTERNATIVE METHODS FOR ESTIMATING BACKGROUND AND SENESCENT MORTALITY

Trends in senescent life expectancy.
Mr. John Bongaarts

Discussion and questions

9. AN EPIDEMIOLOGICAL PERSPECTIVE TO ADULT MORTALITY

The epidemiology of adult mortality in the XXI Century:
A challenge for public health.
Mr. Carlos Castillo-Salgado

Discussion and questions

10. CONCLUDING REMARKS: Mr. François Pelletier and
Ms. Hania Zlotnik

COORDINATION MEETING ON THE ESTIMATION OF ADULT MORTALITY
Population Division
Department of Economic and Social Affairs
United Nations, New York
31 July 2008

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