Maternal Mortality Measurement by Census

Introduction
This package is a tool used for estimating Maternal Mortality Ratios. It serves as an application guide for the manual on Measuring Maternal Mortality from a Census. It contains worksheets that fall under 6 general categories namely Input, Average Deaths, Death Distribution Methods, P/F Ratios, Maternal Deaths and Determining Pregnancy Related Mortality.

This document serves as a guide for users of the application. It briefly explains the function of each worksheet or graph and also provides guidelines on how to use it, especially in the data input stage. A brief description for each worksheet or graph that falls under the above mentioned categories is presented below.

Inputs worksheet:
This worksheet contains three cells and five tables that are used for data input.

The cells are and their respective data are

- **B1 - Country Name**
- **B2 - Date of the previous census**
- **B3 - Date of the most recent census**

The tables are:

1. **Range A9:G32 - Population distribution by sex and 5-year age groups** for both censuses starting with the previous one on range B9:D32 and then the most recent on range E9:G32. At the top of each of these is the respective date.

   Use - Data should be entered only on ranges C11:D31 and/or F11:G31 when available. The worksheet will automatically calculate totals (column B,E and row 32) as well as format the age group values in column A including the open-ended age range.

   It is also very important to note that for population distribution data with the age group format 0, 1 - 4, 5 - 9, 10 - 14 etc. data should be pasted to row 11 such that the 0 age group will appear on row 11. If the format is 0 - 4, 5 - 9, 10 - 14 etc then the data should be pasted to starting at row 12 such that age group 0 - 4 is on row 12.

2. **Range A38:I63 - Deaths distribution by sex and 5-year age groups** for both census.

   Use - Data should be entered only on ranges C38:E62 and/or G38:I62 when available. Like the previous table, this will also calculate totals (Columns B,F and row 63) as well as format the age group values in column A.
Note that row 41 and columns D and I accommodate missing values (if the user’s data is formatted as such). Like the population distribution table, if the deaths distribution data’s age groups are formatted as 0, 1 - 4, 5 - 9, 10 - 14 etc. then data should be pasted starting at row 42. If the format is 0 - 4, 5 - 9, 10 - 14 then data should be pasted starting at row 43.

3. Range A69:C78 - Births in the 12 months before the censuses.

Use - Data should be entered only on ranges B71:B77 and/or C71:C77 for the previous and/or recent censuses respectively when available. Totals (row 78) as well as age groups (column A) need not be changed.

4. Range A82:C92 - Pregnancy related Deaths by 5-year age groups of women.

Use - Data should be entered only on ranges B84:B91 and/or C84:C91 for the previous and/or recent censuses respectively when available. Totals and age groups need not be changed. Note that here the age group values are of the format 12 - 14, 15 - 19, 20 - 24 etc. If the available data does not have values for 12 - 14, B84 and C84 should be left blank.

5. Range A98:C107 - Children Ever Born alive by 5-year age groups of mother.

Use - Data should be entered only on ranges B:100:B106 and/or C100:C106 for previous and/or recent censuses respectively when available. Totals and age groups need not be changed.

**Average Deaths**

This worksheet contains the overall title for the next 6 worksheets

**Male Deaths First Census Only** worksheet

This worksheet contains one table that calculates the average annual deaths (column G) for male when deaths distribution data is available for the first census only. The table is in the range A1:G30. When deaths data is available for the second census only or for both census, this table will be empty. The table uses male population data from both censuses (previous - column C and recent - column B) to calculate the average intercensal population (column F). The death rates from previous census (column E) is calculated using male deaths and male population data from the previous census. The average annual deaths is then the product of the average intercensal population and previous census death rates.

**Female Deaths First Census Only** worksheet

This worksheet is formatted in the same way as the one for male and calculates the average annual deaths for females.

**Male Deaths Second Census Only** worksheet

This worksheet also contains a table that calculates average annual deaths for male when deaths distribution data is available for the second census only. It is formatted exactly like the
Male Deaths First Census Only worksheet but uses data from the most recent census. The table will appear blank unless only deaths data from the most recent census is available.

**Female Deaths Second Census Only** worksheet
This worksheet is formatted in the same way as the one for male and calculates the average annual deaths for females using data from the most recent census.

**Male Deaths Both Censuses** worksheet
This worksheet also contains one table that calculates the average annual deaths for male only when deaths data is available for both censuses (previous and most recent). The table is in the range A1:J29. The table contains male population from most recent (column B) and previous (column C) censuses and most recent and previous census deaths in column D and E respectively. Most recent census death rates (column F) and previous census death rates (column G) are calculated using appropriate deaths and population data. The average death rate (column H) is the average of the death rates from the two censuses. The average annual deaths(column J) is then calculated as the product of the average intercensal population (column I) and the average death rates.

**Female Deaths Both Censuses** worksheet
This worksheet is formatted in the same way as the one for males and calculates the average annual deaths for females using data from both censuses.

**Death Distribution Method**
This worksheet contains the title for the overall title for section that contains the next 9 worksheets and 6 graphs.

**GGB Male** worksheet
This worksheet contains the General Growth Balance method for evaluating completeness of death recording. It contains seven tables of the safe form but for different open ended age ranges i.e. 65+,70+, 75+,...95+. Below each table are values for the orthogonal regression slope for age groups 5+ to 60+ or 65+, Intercept based on averages for age groups 5+ to 60+ or 65+ Estimated relative completeness (previous census to most recent census) as well as 45q15.

For the table, here is what each column contains
Column A - 5 year age groups
Column B - Previous census population
Column C - Date of the previous census
Column D - Most recent census population
Column E - Date for the most recent census
Column F - Average annual deaths (selected depending on availability of deaths data)
Column G - Previous census population (x+)
Column H - Most recent census population (x+)
Column I - Deaths (x+)
Column J - Average Birthdays, $P_{\text{obs}}^{(x)}$ or $B(x)$
Column K - Person Years Lived AAPYL$(x+)$
Column L - Population growth rate, $r(x+)$
Column M - Observed death rates for open age segments $x+$, $d_{\text{obs}}^{(x+)}$
Column N - Difference btn entry rates and growth rates, $b(x)-r(x+). \quad b(x) = B(x)/AAPYL(x+)$
Column O - Observed ASMR
Column P - Observed $5q_x$
Column Q - GGB Adjusted $5q_x$
Column R - Fitted $b(x)-r(x+)$ values.

GGB Female worksheet
This worksheet also evaluates the completeness of death recording for females using the General Growth Balance method. It is formatted exactly like the GGB Male worksheet described above.

SEG Male worksheet
This worksheet evaluates the completeness of death recording for males using the Synthetic Extinct Generation method. It contains seven tables of the safe form but for different open ended age ranges i.e. 65+, 70+, 75+...95+. Below each table are values for $45q_{15}$, average completeness for age groups 5+ to 55+ and 5+ to 60+ or 65+, ratio of life table deaths $30d_{10}^{\text{T}}/40d_{20}^{\text{T}}$ for estimating $e(x)$ for open interval and the estimated $e(x)$ for open interval.

Here is a description of each column in the table
Column A - 5 year age groups
Column B - Previous census population
Column C - Date of the previous census
Column D - Most recent census population
Column E - Date for the most recent census
Column F - Average annual deaths (selected depending on availability of deaths data)
Column G - Average Intercental birthdays, $P_{\text{obs}}^{(x)}$ or $B(x)$
Column H - Age specific growth rate, $5f_x$
Column I - Cumulative growth rate
Column J - Life Table deaths $5d_x^{\text{T}}$
Column K - Expected Population $P(x)$ for population $x$
Column L - Estimate of completeness $c(x) = P(x)/P_{\text{obs}}^{(x)}$
Column M - Observed ASMR
Column N - GGB adjusted ASMR
Column O - Observed $5q_x$
Column P - GGB adjusted $5q_x$

SEG Female worksheet
This worksheet also evaluates the completeness of death recording for females using the Synthetic Extinct Generation method. It is formatted exactly like the SEG Male worksheet described above.

**SEG Adj Male worksheet**
This worksheet performs the same function as the SEG Male worksheet. The only difference is that in the SEG Adj Male worksheet, the Previous census population is adjusted for the estimated relative completeness of the previous census to the most recent census.

**SEG Adj Female worksheet**
This worksheet performs the exact function as 3A, but for females. Both 3A and 3B are formatted in the same way.

**Male - completeness data worksheet**
This worksheet formats the estimated completeness and values, \( c(x) \) (from both SEG and Adj SEG worksheets). The formatted data is then used as data source for both Male SEG completeness and Male SEG Adj completeness graphs. The worksheet contains:

- **Range A3:A21** - 5 year age groups (The worksheet adjusts to the open ended interval which is determined by data entered in the **Inputs** worksheet). Any within the A3:A21 range but beyond or at the open ended age range will appear with a value = 0.

- **Range B3:B21** - completeness, \( c(x) \) values for SEG. Values will appear as 0 for cells beyond or at the open ended age range.

- **Range C3:C21** - completeness, \( c(x) \) values for Adjusted SEG. Values will appear as 0 for cells beyond or at the open ended age range.

- **Cells B23 and C23** - Average completeness for \( c(x) \) and Adj \( c(x) \) respectively

- **Range E3:E21** - Same as B3:B21 except the 0 values become blanks

- **Range F3:F21** - Same as C3:C21 except the 0 values become blanks

- **Range G3:G21** - Same as D3:D21 except the 0 values become blanks

**Female - completeness data worksheet**
This worksheet is exactly like 4A above but is for female data.

**SEG constants worksheet**
This worksheet contains the ratio \( \frac{d^{LT}_{10}}{d^{LT}_{20}} \) and corresponding \( e(x) \) values associated with different levels of mortality in the Coale-Demeny West Model Life Tables.

**Male - consistency graph**
This is a graph of $b(x) - r(x)$ vs $d_{ obs}^{obs}(x+)$ as calculated in GGB Male. Note that $b(x) - r(x)$ is labeled as Left Hand x+ and $d_{ obs}^{obs}(x+)$ as Right Hand x+.

**Female - Consistency graph**
This graph is similar to 6A above but draws data from GGB female instead.

**Male SEG completeness graph**
This is a graph of the male completeness $c(x)$ as well as the average completeness.

**Female SEG completeness graph**
This is a graph of the female completeness, $c(x)$ as well as the average completeness.

**Male SEG Adj completeness graph**
This is a graph of male adjusted completeness, Adj $c(x)$ as well as the average adjusted completeness

**Female SEG Adj completeness graph**
This is a graph of female adjusted completeness, Adj $c(x)$ as well as the average adjusted completeness

**PF Ratios**
This worksheet serves as an overall title for next 3 worksheets which evaluate the completeness of births using the Brass P/F ratio

**PF-Ratios Single Survey worksheet**
This worksheet contains one table that shows the application of the P/F Method as seen in the UN Manual X. The table takes on the range A1:I15 and calculates the P/F ratio as seen on column I. This table will appear blank unless the data available in the Inputs worksheet is from one survey only.

**PFR - 2 surveys 5 yrs worksheet**
This worksheet performs the same function as the above worksheet (PF-Ratios Single Survey). It also contains one table in the range A1:Q16 and this table will be empty unless the data available in the Inputs worksheet is from two different censuses and they are about 5 years apart (or less than 7.5 years apart).

**PFR - 2 surveys 10 yrs worksheet**
This worksheet performs the same function as PFR - 2 survey 5 yrs. The table in the range A1:Q18 will appear blank unless the data available in the Inputs worksheet is from two censuses and the two censuses are about 10 years apart (or greater than 7.5 years apart).
Maternal Deaths

**Preg related deaths vs births** worksheet
This worksheet calculates the Pregnancy Related Mortality Ratios (PRMR) using Female deaths and Children Ever Born from the most recent census. It contains one table in the range A1:H12.

**Proportion Deaths and Births** graph
This is a graph of proportion deaths and proportion births for 5-year age groups between 15 and 49 years old.

**Determining Preg-related Mort**
This worksheet serves as an overall title (Determining Pregnancy-Related Mortality) for the next 4 worksheets and 1 graph.

**Mortality Adjustments**
This worksheet contains 7 tables which summarize values of slope, intersection, relative completeness and coverage for GGB, SEG and Adj SEG for both Male and Female, for the 7 different open ended age ranges (65+, 70+, 75+,.....95+). A table will appear blank if its respective open ended age range is beyond the one determined by the data in the Inputs worksheet. e.g if the open ended age range t is 85+ then tables for 90+ and 95+ will appear blank.

**Age-Spec Mortality Rates** worksheet
This worksheet contains tables that calculate the probability of dying for both males and females using population and deaths data from the Inputs worksheet. There are 7 different tables corresponding to the 7 different open ended age ranges i.e. 65+,70+,75+,.....95+. Below each table there are $45q_{15}$ values for both males and females. A table will appear blank if its corresponding open ended age range is above the one determined from the data in the Inputs worksheet.

**Final Fertility** worksheet
This worksheet calculates a fertility adjustment factor using female population between 15 and 49, their respective Age-Specific Fertility Rates (obtained from PFR worksheets). The Final adjustment value (Cell E16) is then used as a Births adjustment factor in determining Maternal Mortality Ratios.

**Summary MMRatio** worksheet
This worksheet calculates the Maternal Mortality Ratio (MMRatio) as well as Proportion Maternal from observed deaths, observed maternal deaths and observed births. There are 7 tables corresponding to the 7 different open ended age ranges. A table will appear blank if its corresponding open ended age range is above the one determined from the data in the Inputs worksheet.
**ASMR graph**
This is a graph of the Adjusted Age-Specific Mortality Rates (ASMR), whose values (on the y axis) are represented on a log-scale for each of the age groups (x-axis) whose data is available in the **Inputs** worksheet.