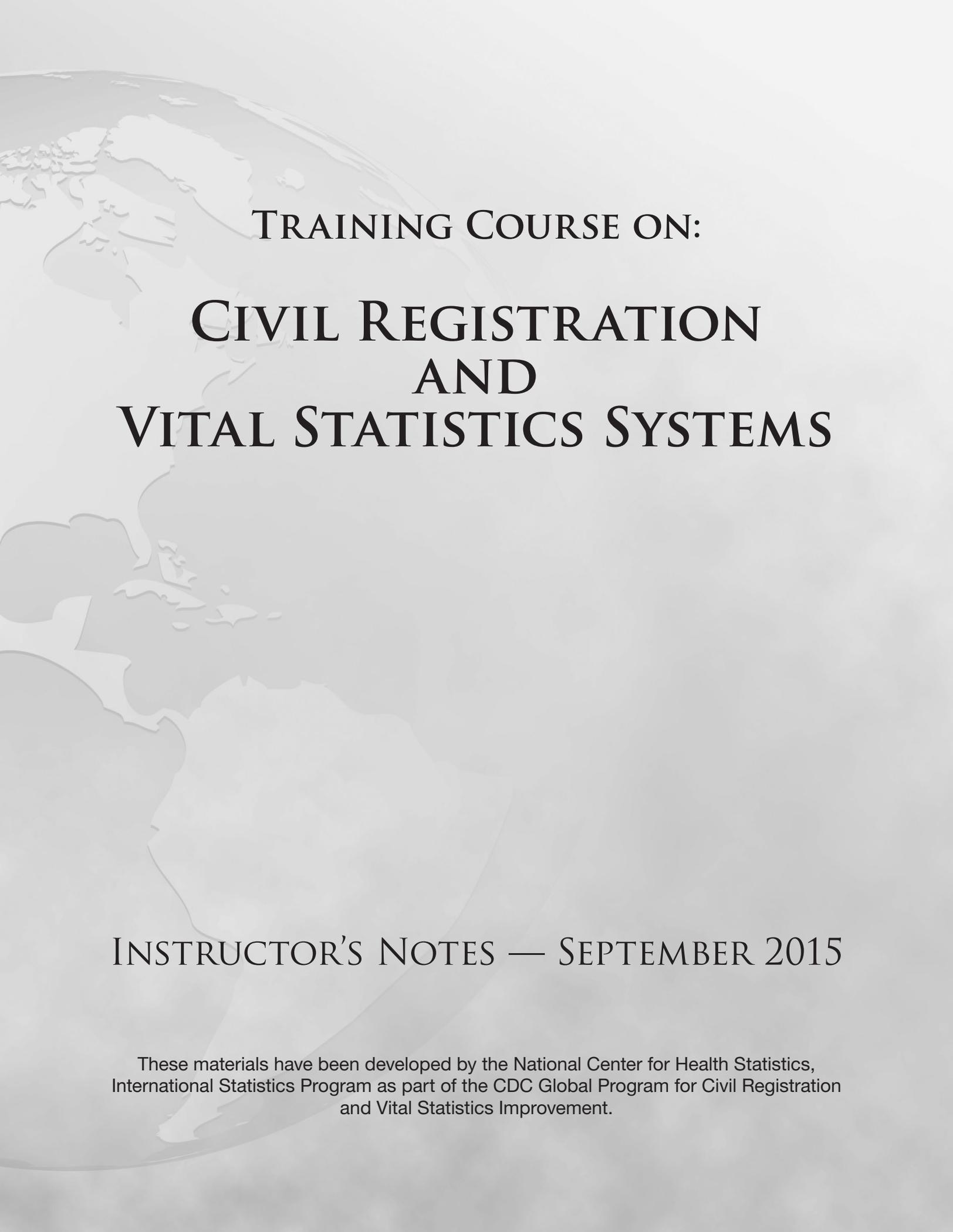


TRAINING COURSE ON:
**CIVIL REGISTRATION
AND
VITAL STATISTICS SYSTEMS**



INSTRUCTOR'S NOTES — SEPTEMBER 2015

INTERNATIONAL STATISTICS PROGRAM



TRAINING COURSE ON:

**CIVIL REGISTRATION
AND
VITAL STATISTICS SYSTEMS**

INSTRUCTOR'S NOTES — SEPTEMBER 2015

These materials have been developed by the National Center for Health Statistics, International Statistics Program as part of the CDC Global Program for Civil Registration and Vital Statistics Improvement.

CONTENTS

Introduction and Course Objectives	3
Course Content	4
Power Point Slide Sets	5
Course Customization	6
Course Preparation	7
Appendix A: Training Course on Civil Registration and Vital Statistics Course Matrix.....	8
Appendix A: Training Course on Civil Registration and Vital Statistics Course Matrix (cont.).....	9
Appendix B: Activity Materials – Instructor Guides	10
Analysis of Vital Statistics Data	
Analysis Activity Instructor Guide and South Africa Example	12
South Africa – Example Calculations: See data tables below	13
References.....	16
Data Uses and Dissemination: Data Comparison Activity Instructor Guide	
Overview of Exercise	18
Answer Guide.....	19
Data Uses and Dissemination: Vital Statistics Report Review	
Data Uses and Dissemination Answer Key	26

Introduction and Course Objectives

This training course on Civil Registration and Vital Statistics (CRVS) Systems has been prepared by the International Statistics Program at the U.S. Centers for Disease Control and Prevention's National Center for Health Statistics. The course is intended to provide information to epidemiologists, statisticians, demographers, and others working in public health about vital statistics data gathered from a national civil registration system. Even though CRVS systems may differ somewhat from country to country, there are internationally accepted principles and recommendations for national CRVS systems. Accordingly, the course contains a general description of the administrative process of civil registration and fundamentals of vital statistics generated from a national civil registration system. The intent is to provide background information for persons using vital statistics data so they understand how those data are obtained, ways to use and disseminate the data, and some problems and limitations of the data. The course does not cover the detailed legal and administrative issues that would be of use to persons working in a country's office of civil registration. Instead, a general overview is provided about the civil registration process with emphasis on issues that are related to vital statistics data collection.

The instructor should be familiar with CRVS in general and the CRVS system for the country(ies) of the participants. The instructor should also know how vital statistics are obtained from the civil registration system, how the data are used for public health purposes, and how the various calculations are done. References with information on civil registration and vital statistics that may be found on the Internet are provided in the slide sets and in the Participant Notes. References may be provided to the participants for additional reading on specific topics of interest.

The objectives of this course are as follows:

- To provide an overview of the major components of a national civil registration and vital statistics system;
- To describe the characteristics and functions of a civil registration system, as a source for vital statistics data;
- To explain how to use, present, disseminate, and assess vital statistics data for health purposes; and
- To describe ways to assess and improve civil registration and vital statistics systems.

Included in this instructor's guide is a description of the course content, guidance for using the materials, and guidance for completing the various activities included in the course. The content of this course has been compiled from a variety of published sources or created by the course designers. Materials may be reproduced, copied, and distributed to the public as long as relevant authors are acknowledged.

The course will be continuously updated as needs arise. Additional exercises, activities, and content may be added to the course. Updates will be made available as they are developed. Please contact Francis (Sam) Notzon (fnc2@cdc.gov; +1-301-458-4402) to request additional course material, to provide feedback, or to suggest additional course topics.

Course Content

This course includes the following materials:

- Instructor Guide (present document)
- Participant Notes
- Ten sets of Power Point slides, including one course introduction set, eight sets on CRVS topics, and a template for participant presentations on their country's CRVS system
- Optional in-class activities and exercises
- References and sources

This Instructor Guide provides a description of the course materials, suggestions for using the course materials, a list of references, a course matrix, and instructor guides for select activities. The course matrix (Appendix A) outlines the participant handouts, exercises and activities, and materials for each of the eight CRVS topics.

The Participant Notes provide a thorough description of each of the eight CRVS topics. It is recommended that the Participant Notes be distributed to participants prior to the course and that participants read relevant chapters prior to the presentation of a given topic. The Participant Notes also provide a copy of various handouts and examples that are referenced throughout the chapters and Power Point slide sets. As well, the Participant Notes include select activity materials. The instructor can use his/her discretion to decide which handouts and/or activity materials should be printed for distribution to participants during the course. It is advised that the Participant Notes not be modified. Rather, if certain sub-topics are to be the focus of a given course curriculum, the instructor should provide course participants with specifically selected readings from the Participant Notes.

The introductory Power Point slide set provides an orientation to the course objectives and content for participants. It should be modified as needed to reflect specific content for a given course curriculum. The remaining eight slide sets focus on various CRVS topics. The slides should be modified as needed to meet particular course needs. Additional information on the Power Point slides sets is provided below.

Several in-class exercises and activities have been prepared for this training course. They are described in the Power Point slides sets, Participant Notes and this Instructor Guide. Activities can be added, removed, or modified as needed to meet the course

needs. Field exercises and post-course deliverables can be an excellent mechanism for applying lessons learned during the course. As such exercises will need to be tailored to each particular course setting, CDC staff can be contacted to assist in developing an appropriate post-course exercise.

A folder of references and sources for the course, including various sample reports is available upon request.

Power Point Slide Sets

In addition to the introductory slide set, a separate slide set is available for each of the following CRVS topics:

- Overview of Civil Registration and Vital Statistics Systems
- Civil Registration Systems
- Birth Records
- Death Records
- Analysis of Vital Statistics Data
- Data Uses and Dissemination
- Assessing Vital Statistics
- Evaluating & Improving Civil Registration and Vital Statistics Systems

Instructor and participant versions of the slide sets are available. The instructor version contains notes with reference information to indicate where additional information on the topic may be found, detailed explanations for each slide, and slides with answers for various exercises and activities. In the participant version (available upon request), the notes and answer slides have been removed. Participants should refer to the “Participant Notes” for detailed information on each topic.

At several places in the slides, it would be helpful for participants to look at examples of forms, statistical reports and publications, and other documents that cannot be shown on slides. The notes section of the instructor version makes some suggestions for use of these documents. Examples of reference material to have in class are as follows:

- Copies of vital record forms – for specific country and other country examples
- Copies of vital record law and rules for specific country
- Copies of vital statistics reports/publications – for specific country and other country examples
- Copies of International Classification of Diseases, Tenth Revision, Volumes 1,2,3
- Copy of Verbal Autopsy Standards, Ascertaining and attributing cause of death

Discussion points, exercises, and activities are suggested at several points in the slides. These items could be done by the entire class collectively, or participants could break into small groups. If participants do break into groups, the instructor should briefly go over the exercise with the entire class prior to breaking into groups. At the end of the exercise, a short discussion with the entire class could be held or some participants could give summaries of their group discussions.

Review slides are provided at the end of each section. In addition, Word Choice Questions are also provided for review. It is suggested that the Word Choice Questions be presented to the participants the day following the end of a section for additional review of the material.

Lastly, a slide set template has been created to guide participants in the development of a presentation on their country's CRVS system. Developing this presentation will provide a good introduction to the major CRVS concepts for participants, even if certain items are unknown. Participants should be encouraged to collect and review published and online CRVS information for their country and, if possible, to connect with local CRVS staff to compile the requested information.

Course Customization

The instructor teaching the class should add/modify slides and content of this course as needed to customize the course to the needs of the participants. Aspects for potential customization include modifying content to meet: course objectives, the audience, length of training, and geographic representation.

To cover the course content and activities in full, at least ten training days are recommended. For a shorter training, it is recommended that the slide sets, activities, and discussions be modified to only include topics that are directly relevant to the course objectives and that participants review relevant materials before the training starts.

Suggested activities, exercises, and discussion questions have been included throughout the slide sets. Some activities and exercises are placed within the relevant content of the slide set; additional activities are included at end of the relevant slide set. Discussion questions are placed throughout the slide set to provide an opportunity to process material presented. These items can be removed or relocated as needed to meet the needs of the class. The instructor should review the placement of these items to provide breaks in lecture and to facilitate review of material.

Since the CRVS systems differ from country to country, the course should include information specific to the country where it is being taught or the country(ies) of participants are from. Participants should understand how the CRVS system works in their own country and how the system in their county resembles or differs from the ideal CRVS system. The instructor teaching the class should add/modify slides to this course to show information specific to the participants' country(ies). To aid in this

process, slide markers with gray text are included throughout the slide sets to indicate where country-specific information should be added. Whenever possible, local data and examples should be used. It is recommended that the instructor work with local CRVS staff/experts to customize the course content and if possible, to engage the local staff/experts in facilitating the course. Additionally it is recommended that site visits to national- and local-level CRVS offices be arranged to complement the classroom learning.

Course Preparation

Prior to the course, it is recommended that participants receive the following:

- course agenda,
- course objectives,
- Participant Notes, and
- pre-course reading assignments and associated materials.

Participants may also be asked to bring copies of vital record forms, a copy of their country's CRVS legislation and regulations, and/or copies of vital statistics reports and publications for their country. If participants are asked to prepare a presentation on their country's CRVS system prior to attending the course, the slide set template for the country presentation should also be sent to participants.

Appendix A: Training Course on Civil Registration and Vital Statistics Course Matrix

Topic	Handouts (for each participant)	Activities/ Exercises	Materials
Overview of Civil Registration and Vital Statistics Systems	N/A	N/A	-Examples of vital records from participant country(ies)
Civil Registration Systems	N/A	-Civil Registration Law Review -Flow Chart Activity	-Legislation from participant country(ies) -Examples of certified copies of vital records from participant country(ies)
Birth Records	-WHO/ICD Definitions (Appendix A in Participant Notes)	-Birth Record Review	-Examples of birth records from participant country(ies) and various other countries
Death Records	-WHO/ICD Definitions (Appendix A in Participant Notes)	-Death Record Review -ICD Coding Activity	-Examples of death records from participant country(ies) and various other countries -International Classification of Disease: hard copy volumes (1-3), online (http://apps.who.int/classifications/apps/icd/icd10online/), or CD -Printed copy of 2012 and/or 2007 WHO Verbal Autopsy Instrument (http://www.who.int/healthinfo/statistics/verbala_utopsystandards/en/) -Example of medical certification of cause of death form used in participant country(ies) or other countries
Analysis of Vital Statistics Data	-WHO/ICD Definitions (Appendix A in Participant Notes) -Exercise Worksheets for Select Indicators (included in Participant Notes -Activity Materials) -Life Expectancy Handout (Appendix B in Participant Notes) -Age-Adjusted Death Rate Handout (Appendix C in Participant Notes) -Analysis Activity Materials for Participants	-Total Fertility Rate Calculation -Direct Age Adjustment Calculation -Indirect Age Adjustment Calculation -Analysis Activity	-Definitions used by participant country(ies) -Examples of tabulations: Statistics South Africa - Mortality and causes of death in South Africa, 2008 Report, Appendix J and/or Jordan Mortality Report 2005, Tables 4.1-5.3, pp. 9-20, and Table 8.1-3, pp. 25-27 -Materials for Analysis Activity - South Africa Example or customized materials (see "Activity Materials" section of Participant Notes and Instructor Guide)

Appendix A: Training Course on Civil Registration and Vital Statistics Course Matrix (cont.)

Topic	Handouts (for each participant)	Activities/ Exercises	Materials
Data Uses and Dissemination	<ul style="list-style-type: none"> -Checklist for International Comparisons of Health-Related Data (Appendix F in Participant Notes) -EPHR_MMR Table (Appendix G in Participant Notes) -Vital Statistics Report Review Activity Handout (See “Activity Materials” section of Participant Notes) 	<ul style="list-style-type: none"> -Data Comparison Activity -Table of Contents Activity -Report Content Activity -Vital Statistics Report Review -List of Users Activity 	<ul style="list-style-type: none"> -Materials for Data Comparison Activity (see “Activity Materials” section of Participant Notes and Instructor Guide) -Example vital statistics reports from various countries -Vital statistics reports for Vital Statistics Report Review Activity
Assessing Vital Statistics	<ul style="list-style-type: none"> -Mahapatra Framework Example_South Africa_2009_Deaths (Appendix K in Participant Notes) -WHO/ICD Definitions (Appendix A in Participant Notes) 	<ul style="list-style-type: none"> -Comparison of Vital Events Definitions -Data Quality Review 	<ul style="list-style-type: none"> -Definitions used by participant country(ies) -Example vital statistics reports from various countries
Evaluating and Improving CRVS Systems	N/A	<ul style="list-style-type: none"> -Designing Registration Improvement Education Program 	<ul style="list-style-type: none"> -Example of CRVS Assessment Tool -Target population descriptions for Designing Registration Improvement Education Program Activity

Appendix B: Activity Materials – Instructor Guides

Analysis Of Vital Statistics Data: Analysis Activity Instructor Guide & South Africa Example

Data Uses And Dissemination: Data Comparison Activity Instructor Guide

Data Uses And Dissemination: Vital Statistics Report Review – NVSS Example Answer Key

ANALYSIS OF VITAL STATISTICS DATA:

ANALYSIS ACTIVITY INSTRUCTOR GUIDE
& SOUTH AFRICA EXAMPLE



Civil Registration And Vital Statistics Systems



Analysis Activity Instructor Guide and South Africa Example **(for use if participant country data are not available)**

In small groups, based on the data sheet handout, compute and interpret the following summary statistics and rates for (if using South Africa example, use data for 2009):

- Crude birth rate
- Sex ratio at birth
- Percent of premature births
- Crude death rate
- Infant mortality rate
- Neonatal mortality rate
- Post-neonatal mort. rate
- Age-specific death rate
- Age-adjusted death rate (using either direct or indirect method—see worksheet)

Discuss how the various defects in basic data would affect the computed statistics.

This exercise is intended to provide further opportunities for the participants to familiarize themselves with the definitions of basic rates and their meanings and uses. Compile data listed below and provide as a handout. Adjust measures as necessary to fit data availability and desired complexity of the exercise.

Obtain the following data from the country where this course is taught or some neighboring countries:

- Tabulations of live births by sex and other characteristics
- Tabulations of deaths by age/sex and other characteristics
- Tabulations of infant deaths by age at death (neonatal and post-neonatal)
- Tabulations of fetal deaths
- Mid-year population by age/sex

Can reference Population Reference Bureau for data:

<http://www.prb.org/Publications/Datasheets/2011/world-population-data-sheet/data-sheet.aspx>

The following pages include an example of this activity using data from South Africa. This example may be used if data from the participant's country are not available. Participant handouts for the South Africa example are provided in the "Activity Materials" section of the Participant Notes.

South Africa – Example Calculations: See data tables below

- Crude birth rate among residents in 2009 (use Tables 1 and 2)
 - = total resident live births in 2009 / total population x 1,000
 - = $937,495 / 49,474,814 \times 1,000$
 - = 18.9 live births per 1,000 South Africa citizens in 2009
- Sex ratio at birth among residents in 2009 (use Table 2)
 - = # of resident male live births / # of resident female live births x 100 (or 1,000)
 - = $471,804 / 465,691 \times 100$ (or 1,000)
 - = 101.3 (or 1,013.1) male births per 100 (or 1,000) female live births among South African citizens in 2009
- Percent of premature births in South Africa in 2010 (use Table 3)
 - = # of preterm (<37 weeks) live births / # of live births x 100
 - = $84,800 / 1,059,000 \times 100$
 - = 8.0% of all live births in South Africa in 2010 were preterm births
- Crude death rate in South Africa in 2009 (use Tables 1 and 4)
 - = # of resident deaths / total population x 100,000
 - = $572,673 / 49,474,814 \times 100,000$
 - = 1,157.5 deaths in South Africa per 100,000 population in 2009
- Infant mortality rate in South Africa in 2009 (use Tables 2 and 4)
 - = # of infant deaths / # of live births x 1,000
 - = $37,974 / 937,531 \times 1,000$
 - = 40.5 infant deaths per 1,000 live births in South Africa in 2009
- Neonatal mortality rate in South Africa in 2009 (use Tables 2 and 4)
 - = # of neonatal (0-28 days) deaths / # of live births x 1,000
 - = $13,443 / 937,531 \times 1,000$
 - = 14.3 neonatal deaths per 1,000 live births in South Africa in 2009
- Post-neonatal mort. rate in South Africa in 2009 (use Tables 2 and 4)
 - = # of post-neonatal (29-364 days) deaths / # of live births x 1,000
 - = $24,531 / 937,531 \times 1,000$
 - = 26.2 post-neonatal deaths per 1,000 live births in South Africa in 2009

- Age-specific death rate in South Africa in 2009 (use Tables 1 and 4 and worksheet)
 - = # of resident deaths in specified age group / total population in same specified age group x 100,000
 - = see table below
 - *Note: must combine age groups to match across data sources.*

Age-specific death rate calculations

Age	Population	Deaths	Age-specific Death Rate Per 100,000
0-4	5,155,211	50,471	979.0
5-9	5,188,992	4,313	83.1
10-14	5,232,817	4,397	84.0
15-19	5,195,490	8,697	167.4
20-24	4,917,207	21,434	435.9
25-29	4,488,218	38,792	864.3
30-34	3,982,987	48,446	1,216.3
35-39	3,343,871	49,396	1,477.2
40-44	2,458,870	43,743	1,779.0
45-49	2,226,661	41,147	1,847.9
50-54	1,990,608	37,940	1,906.0
55-59	1,614,113	36,426	2,256.7
60-64	1,285,734	33,189	2,581.3
65-69	957,985	33,507	3,497.7
70-74	672,341	30,783	4,578.5
75-79	424,941	30,167	7,099.1
80+	338,768	58,536	17,279.1
Unspecified	-	1,289	-

- Age-adjusted death rate (using direct method)
 - 1) Need standard population weights. Use the WHO Standard Population Weights in Table A. Note that the age categories in Table A differ from the age categories we have from South Africa (Tables 1 & 4). Thus, we'll need to match categories across all data sources- see the matched categories in Table B.
 - 2) Calculate age-specific death rate for each age group. Calculate the rates in Table B. First, complete columns 2 and 3, combining categories as needed. Then, calculate the age-specific death rate in column 4.
 - 3) Multiply the age-specific death rate for each group by the weight. First list the appropriate weight in column 5 of Table B. Combine the weights as needed to match the age categories. Record the products in column 6.
 - 4) Sum the products. Sum the age-adjusted death rates for each age group in column 6 of Table B.

= 1,498.0 deaths in South Africa per 100,000 population in 2009

Table A

WHO Standard Population		
Age Group	Weight	World Avg. (%)
0	0.018	1.8
1-4	0.07	7.0
5-14	0.173	17.3
15-24	0.167	16.7
25-34	0.155	15.5
35-44	0.138	13.8
45-54	0.114	11.4
55-64	0.083	8.3
65-74	0.052	5.2
75-84	0.024	2.4
85+	0.006	0.6
All Ages	1.00	100.0

Table B

Age (years)	# of Deaths	Population	Age-specific Death Rate per 100,000	WHO Standard Population Weight	Age-adjusted Death Rate
0-4	50,471	5,155,211	979.0	0.088	86.2
5-14	8,710	10,421,809	83.6	0.173	14.5
15-24	30,131	10,112,697	298.0	0.167	49.8
25-34	87,238	8,471,205	1,029.8	0.155	159.6
35-44	93,139	5,802,741	1,605.1	0.138	221.5
45-54	79,087	4,217,269	1,875.3	0.114	213.8
55-64	69,615	2,899,847	2,400.6	0.083	199.3
65-74	64,290	1,630,326	3,943.4	0.052	205.1
75+	88,703	763,709	11,614.8	0.03	348.4
All Ages					1,498.0

References

Statistics South Africa. Mid-year population estimates, South Africa (2009), derived from interactive time series data. Pretoria: Statistics South Africa.

Statistics South Africa. Mortality and causes of death in South Africa, 2009: Findings from death notification. Statistical release P0309.3.
<http://www.statssa.gov.za/publications/P03093/P030932009.pdf>

Statistics South Africa. Recorded live births, 2009. Statistical release P0305.
<http://www.statssa.gov.za/publications/P0305/P03052009.pdf>

Hannah Blencowe, Simon Cousens, Mikkel Z Oestergaard, Doris Chou, Ann-Beth Moller, Rajesh Narwal, Alma Adler, Claudia Vera Garcia, Sarah S Rohde, Lale Say, Joy E Lawn. National, regional and worldwide estimates of preterm birth rates in the year 2010 with time trends for selected countries since 1990: a systematic analysis and implications. *The Lancet*. 379(9832):2162-72.

DATA USES AND DISSEMINATION:

DATA COMPARISON ACTIVITY INSTRUCTOR GUIDE



Civil Registration And Vital Statistics Systems



Overview of Exercise

This exercise reviews information presented in the slide set on “Data Uses and Dissemination.” Participants are asked to compare data presented in the European Perinatal Health Report¹ using the criteria for comparing vital statistics that they learned during the lecture. Handouts for participants have been included in the “Activity Materials” section of the Participant Notes. In the interest of time, six countries have been selected for comparison in this exercise. These countries were selected on the basis of generating an interesting comparison and assessment. Any additional countries can be added as desired. Participants can complete the exercise on their own or in small groups. A group discussion of findings should be facilitated after participants complete the exercise.

First distribute Table 6.1 on Maternal Mortality Ratios for participants to review. Discuss the footnotes in the table as a “warm up” for how to identify the relevant criteria for comparing vital statistics (the table may have already been distributed and discussed during the lecture). Then distribute the “Information on Data Sources” table. It will be helpful for the instructor to review the layout/ general content of the table before the participants begin using it.

IF TIME PERMITS: After participants have worked through the exercise and discussed their findings, distribute the supplemental information (EPHR_MMR Supplementary Information) about maternal mortality ratio. Review and discuss with the participants. This information can also be provided to the participants electronically.

Handouts (see “Activity Materials” section of Participant Notes)

- Participant Handout (Activity description) (in Activity Materials in Participant Notes)
- Worksheet_Data Comparison Activity (in Activity Materials in Participant Notes)
- Checklist for International Comparisons (Appendix F in Participant Notes)
- Data Table: Table 6.1 Maternal Mortality Ratio (European Perinatal Health Report) (Appendix G in Participant Notes)
- Information on Data Sources table (in Activity Materials in Participant Notes)
- Table 3.1 Lower limits of registration of stillbirths and live births (in Activity Materials in Participant Notes)
- WHO-ICD Definitions Handout (Appendix A in Participant Notes)

Optional: EPHR_MMR Supplementary Information

¹EURO-PERISTATA Project, with SCPE, EUROCAT, EURONEOSTAT. European Perinatal Health Report. 2008. Available: www.europeristat.com

Answer Guide

Review of Table 6.1 footnotes:

Data comparison issues are highlighted in the footnotes of the table. These footnotes are listed below with the particular data quality characteristic of interest:

* Brussels, Italy, and Sweden provided data on maternal death without the number of live births. The number of births was estimated by the number of live births from 2004, which was 16 200 for Brussels, 539 066 for Italy, and 100 158 for Sweden.

(Methodology)

† Data on maternal deaths were provided for one year only by Germany (2004), Greece (2003) and Italy (2002), and for five years by Luxembourg (2000-2004). **(Time period)**

‡ Germany provided data on maternal deaths by number of women (pregnancies) rather than by the number of live births. **(Consistency)**

§ Cyprus, Ireland, and the Slovak Republic provided no data on maternal deaths. **(various)**

** Hungary provided data on maternal deaths for the years 2003 and 2004, but did not provide the number of live births for 2003. The number of live births for 2003 was estimated using the number of live births for 2004. **(Time period, methodology)**

†† Slovenia provided data on maternal deaths for the years 2001 and 2002. **(Time period)**

Checklist for international comparisons of health-related data:

- A. Comment on the strengths and weaknesses of the information presented.
- B. What are the implications of these strengths and weaknesses on the interpretation of the results?

Participants should present their findings on the basis of the criteria for comparing international health-related data (see Checklist for international comparisons of health-related data for reference). Relevant strengths and weaknesses (A) and their implications (B) for the six selected countries are listed for each criterion below. A copy of these notes may be provided to participants as deemed appropriate. The participants have been given a worksheet to help compile their thoughts.

Data Quality

– Consistency

Information on consistency in how deaths were recorded is provided in the “Information on Data Sources” table, “Recorded Deaths” column. Information on the lower limits of registration of live births is provided in Table 3.1. Lower limits presented in Table 3.1 should be contrasted with WHO recommendations (see WHO/ICD Definitions Handout). Participants should note any similarities and differences across countries in how deaths are recorded and the lower limits for registration of live births.

- ▶ Recorded Deaths – There are three methods described for how deaths are recorded: cohort deaths (deaths occurring in some pre-defined group; group definitions not provided)(Malta, Norway); deaths that occurred during the year (Czech Republic); and deaths that were registered during the year (Poland); not specified (Netherlands); all types (UK England and Wales). No one type is better than another, but the different types will each yield different numbers within a given country. The timeliness of reporting in a country’s CR/VS system will affect the degree to which the numbers within a country differ by each recording method. Implications: The impact of the differences on comparability is likely minimal, but should be taken into consideration.
- ▶ Live Births – As participants will see on the WHO/ICD Definitions Handout, no lower limits of birth weight or gestational age are specified in the definition of live births. However, many countries have specified lower birth weight or gestational age limits. According to Table 3.1, only the UK England and Wales specify no limit for live birth registration; ≥ 22 weeks or ≥ 500 g are the most commonly specified limits (Malta, Netherlands); Poland uses this birth weight limit only (≥ 500 g); Czech Republic uses the same birthweight limit (≥ 500 g), but also adds the condition “or any birth weight surviving first 24 hours”; Norway uses ≥ 12 weeks gestational age. Implications: The number of live births provides the denominator in the calculation of maternal mortality ratio. Thus, differences in how live births are defined will affect the denominator used in each country; the more restrictive the limits (i.e. higher birth weight or gestational age), the lower the denominator will be for the country. However, the numbers will be small relative to the total number of live births, so the overall impact is likely minimal.

– Methodology

Information on methodology is provided in the “Information on Data Sources” table, in the following columns: “Source Name,” “Institution,” “Data Type,” “Participation,” “Collection Procedures,” “Expansion Plans/Use of Data,” and “Other Comments on Data Source.”

- ▶ Source and Data Type – Five countries for this comparison use population level data from a national registration system (via statistical offices, certificates, or national registries). Netherlands use population data from a

Commission on Maternal Mortality. Implications: Data can be considered comparable on these factors, with the exception of data on maternal mortality from the Netherlands, which may include more detailed information than the general country registration systems.

- ◆ Discuss: While no data from these countries was sourced from a hospital, what would be the implications of using hospital data in a comparison? Biased sample; does not include home births (in Netherlands, 1/3 of births occur at home)
- ▶ Participation – Participation in the data registration system is compulsory in Czech Republic, Malta, Poland, UK England and Wales, and Norway. Participation is voluntary in the Netherlands. Implications: Countries where participation is compulsory will likely have higher participation rates; countries where participation is voluntary may have under coverage/registration. To get a sense of the under-coverage, compare findings from the Commission on Maternal Mortality to those of civil registration.
- ▶ Collection Procedures – Data for this comparison were generally extracted from national cause-of-death data systems, which record deaths coded according to ICD-10. Medical data are generally provided by medical staff (Malta, Poland, Norway). In Czech Republic and UK England and Wales, it is unclear from the report if medical staff are involved in the completion of medical information for registration and certification, though their involvement can be assumed if these countries follow standard medical certification of cause of death procedures and if births and deaths take place within a medical facility. No information is provided for the Netherlands. Implications: Data are likely comparable to the extent that medical personnel are trained to properly certify cause of death and register births.
- ▶ Expansion Plans/Use of Data – Additional notes indicate a desire to update certificates in Poland. On the other hand, additional notes indicate a robust, linked system being used in UK England and Wales. Implications: Information on maternal mortality in Poland may be limited and under-reported. Information on maternal mortality in the UK England and Wales is likely robust.
- ▶ Other Comments – Of note from the “other comments on data sources” is that notification to the Commission on maternal mortality in the Netherlands is by caregivers. Implications: Unless medical records are also consulted, information may be subject to recall bias, biases resulting from proxies, and information provided by non-medical professionals.

– Coverage

Information on coverage is provided in the “Information on Data Sources” table, in the “Coverage” and “Completeness” columns. National level coverage and completeness $\geq 90\%$ is ideal. It is important to consider that maternal mortality tends to be under reported; thus while completeness for death registration within a country may be high, the identification of the death as a maternal death may be lower.

- ▶ Coverage – Coverage is national for all six countries. Implications: Data are likely representative of the full country and comparable across countries on this factor.
 - ◆ Discuss: What would be the implications of using data from the regional level or a sample in a comparison?
- ▶ Completeness – Completeness is 100% for Czech Republic, Malta, Poland, and UK England and Wales. Completeness is unknown for the Netherlands and Norway. Implications: Data are likely representative of the full country and comparable across countries on this factor. However, under-reporting of maternal deaths may be present.

– Time period

Information on time period is provided in the “Information on Data Sources” table, in the “Date” column. Table 6.1 aims to cover the 2003-2004 time periods. As indicated in the information provided on the maternal mortality ratio comparison in the report (pages 95-97), because the number of maternal deaths is so low in most countries, data from two years are used for calculations.

- ▶ Czech Republic, Malta, Poland, the Netherlands and Norway data cover 2003-2004. Data from the UK England and Wales covers 2004-2005. Implications: Data are generally comparable across time periods.
 - ◆ Note: additional discussion can be facilitated around time period for other countries by referencing the foot notes in Table 6.1.

Choice of Countries

- **Comparability** (Note: In this example, income is the only indicator provided on which to compare choice of countries. However, it is important to consider the limitations of this indicator, given that income may not be comparable across countries where health care and other social services are publically funded.)

As an indicator of comparability across countries, income per person for each country (2004, USD) is provided in the “Information on Data Sources” table. Participants should use this information to comment on economic comparability across countries.

- ▶ Czech Republic and Malta are comparable, with approximately \$19,000 income per person. The Netherlands and UK (figure is for all of UK, not just England and Wales) are comparable, with an income in the low \$30,000's.

Poland has the lowest income with \$13,000, and Norway has the highest with over \$46,000. Implications: If income can be used as a proxy for strength of a health system, these figures indicate that the health experience in these countries likely varies a great deal. However, the rank in income does not match the rank observed for MMR across countries. While other factors are likely contributing to the differences observed, differences in quality of care may not be as great as differences in income would imply. Health care costs may be lower in lower income countries, thus access to care may be the same (though access to advanced technology or medical practice may be more limited).

Presentation & Interpretation

With a few exceptions (noted below), the criteria for Presentation & Interpretation should be judged from a review of Table 6.1.

– Presentation

- ▶ Ranking - Data are not ranked by maternal mortality ratio; ranking data might help improve interpretation. It is unclear how the countries are ordered. Using a figure, such as a bar graph, would also help improve interpretation.
- ▶ Selection of indicator - MMR is a major marker of the performance of the health system in a given country and serves as a sentinel event that raises questions about the administration of effective treatment and the provision of substandard care. For these reasons, it is a useful indicator for comparison. However, the fact that maternal mortality is a rare event and tends to be under-reported poses a challenge to the interpretation and comparability of the measure. A notable example is the 0.0 ratio observed for Malta. This does not necessarily mean that Malta has a lower maternal mortality ratio; with about 4000 live births a year, if Malta had the average European MMR – about 6.6 per 100 000, we would expect to 0.5 maternal deaths per year or one every two years, and there is a large probability that no maternal deaths would occur at all in any given year or even two-year period. Furthermore, the small numbers yield wide CIs, which make estimates difficult to compare.

– Explanation

- ▶ Variation explained – In the table itself, no explanation is provided for the variation in data. A footnote explaining the 0.0 ratio for Malta would improve interpretation and understanding.
- ▶ Overall mean – It would be useful to include the overall mean MMR for Europe, to provide a frame of reference for comparison across countries. The larger number of maternal deaths would also provide an MMR with a smaller confidence interval.

– *Underlying differentials*

- ▶ For most countries in Table 6.1, no additional data are provided to determine if differences within countries are present. One exception is for Belgium, where data for Flanders and Brussels are presented separately.
- ▶ However, it's important to note that the numbers are so small that to further subdivide the numbers would yield even smaller (and perhaps meaningless) numbers. You could group the countries into logical regions for more reliable/comparable rates.

– *Context*

- ▶ Standardization – Data used in the calculation of MMR are not standardized. Thus, they can be used outside of this international comparison.
- ▶ Collection methods – Data used in this comparison were extracted from routine data sources within countries; thus, no changes to definitions used within countries were made for this comparison.

C. What additional information about the data would you like to have?

A few examples:

- ▶ Information for missing data items.
- ▶ Clarification on collection procedures in Czech Republic and UK England and Wales. Are medical staff involved in the completion of medical information for registration and certification? Also, in the Netherlands, what methods are used by the Commission? How are home births (~1/3 of births) recorded?
- ▶ Additional information on the comparability of the countries. What explains the difference between ranks in income and ranks in MMR?
- ▶ Death certificates for each country to see how maternal mortality information is captured. Also, information on the degree of under-reporting of maternal mortality in each country, as available.
- ▶ The percentage of births that take place at home for each country to help estimate the degree of potential under-reporting.
- ▶ Overall mean MMR for Europe, to provide a frame of reference for comparison.
- ▶ Information on the underlying differentials for data within countries. Are there segments of each population that are more or less likely to be included in the data? (e.g. the gypsy or Roma population, particularly in Romania)

DATA USES AND DISSEMINATION:

VITAL STATISTICS REPORT REVIEW



Civil Registration And Vital Statistics Systems



Data Uses and Dissemination Answer Key

Vital Statistics Report Review

Answer key (based on review of NVSS Deaths 2007 and NVSS Births 2006)

Review the vital statistics report and answer the following:

1. A good vital statistics report should include the sections listed below. Does this report include each of these sections?
 - A. Preface & letter of transmittal - **Abstract, but no letter**
 - B. Table of contents & lists of tables and figures - **TOC on last page; List of "Detailed" Tables (p. 17 for Deaths 2007; p. 25 for Births 2006); no list of figures**
 - C. Introductory & explanatory notes - **inside cover**
 - D. Summary highlights - **cover / inside cover**
 - E. Mid-year population estimates (data used in computations) - **Deaths 2007: p. 125 / Table III; Births 2006: p. 95 / Tables III and V**
 - F. Statistics: natality / mortality
 - G. Annex / appendix
 - e. Details of national tabulation program - Intro / Methods / start of Technical Notes
 - f. Outlines of essential tables - Deaths 2007: p. 17 (list); Births 2006: p. 27 (table)
 - g. Technical notes & definitions -
 - h. Confidence interval calculation / table - Deaths 2007: p. 130; Births 2006: p. 96
2. What is the report's date of publication? **Deaths 2007: May 20, 2010; Births 2006: January 7, 2009**
3. What is the time period covered by the data?
Deaths 2007: Deaths that occurred in 2007 and were received as of October 28, 2009

Births 2006: (not in report: final files to NCHS by June 30th following data year, so June 30, 2007)

4. What is the difference between the date of publication and the date the data were reported? What can explain this difference?

Deaths 2007: Oct 28, 2009 - May 20, 2010 (6+ months from close of data; 2+ years from event)

Births 2006: Jan 2007 - Jan 2009 (2 years)

5. What is the source of the data? Are there any missing/excluded data? If so, how are missing data handled?

Deaths 2007:

SOURCE: information from all death certificates filed in the 50 states... (p. 117);

MISSING DATA: 200 deaths in Louisiana...fetal deaths are excluded; deaths of nonresidents are excluded for Puerto Rico, Virgin Islands, American Samoa, and Northern Marianas. Deaths that occurred to a resident of any place other than Guam or the US are excluded in Guam.

HOW MISSING DATA ARE HANDLED: many variables are imputed (i.e. sex and race). Less consequential variables may remain blank; there is a comprehensive Instruction Manual that describes computer edits after NCHS receives data.

What is the source of the data? Are there any missing / excluded data? If so, how are missing data handled?

Births 2006:

SOURCE: p. 86. Data are based on 100 percent of the birth certificates filed in all states and the District of Columbia...

MISSING DATA: Information on the percentage of records with missing information for maternal and infant characteristics included in this report is shown by state in Table III....

HOW MISSING DATA ARE HANDLED: Missing data (e.g. date of last menstrual period) are imputed in these case; see separate sections in the "Technical Notes" for more information. All birth data are electronically submitted except for some of the smaller US territories.

6. Does the report include delayed and late registrations? Deaths 2007: yes, as described in source of data

Births: generally, late/delayed birth records are not included, though they may be included in a separate linked birth/infant death file (usually 30-40 records max)

7. Does the report describe any methodological changes in how the vital events data were collected / coded / reported? If so, describe the changes.

Deaths 2007: p. 117: US Standard Certificate of Death revised in 2003; 23 states +DC used revised certificate; minor changes implemented for cause-of-death classification (pp. 118-120)

Births 2006: p. 86: The US Standard Certificate of Live Birth was revised in 2003; 19 states + Puerto Rico used 2003 revisions; some data not comparable; exclusive data not shown; various state changes.

8. The United Nations calls for “detailed annual tabulations for vital events cross classified by demographic and socioeconomic characteristics.” What demographic and socioeconomic classifications are available in this report?

Deaths 2007: age, race/ethnicity, sex, marital status (p11), educational attainment (p12), state of residence (p12) (note: race categories are bridged to a single race whenever they are received as multiple races)

Births 2006: age of mother and father (p12), race/ethnicity, sex, state, date of event (p 10/11), education (p12), marital status (p11), maternal lifestyle (p13+), various characteristics (p27)

9. Annual vital statistics reports should include a variety of tabulations. Find an example of each of the following:

- ◆ Time trends
- ◆ Geographical differentials
- ◆ Frequency distributions of vital events

10. Who are the likely users of this report? Do you think this report meets their needs? (not comprehensive technical notes- i.e. how were data modified after NCHS received records)

11. Are original data files available to the public? If so, how can you access them? - Deaths 2007 (p. 3/134); Births 2006 (p.3)

ASSESSING VITAL STATISTICS:

ANACoD

ANALYSING MORTALITY LEVELS & CAUSE-OF-DEATH DATA



Civil Registration And Vital Statistics Systems



Activity Guide (Instructor Version)

It is suggested that the activity guide (instructor and participant versions) be printed on colored paper to distinguish it from the “anacod version 1.0 Guidance” document, which is also recommended for printing.

About this mortality tool

The “Analysing mortality levels and causes-of-death” (ANACoD) electronic tool provides a step-by-step approach to enables users to quickly conduct a comprehensive analysis of data on mortality levels and causes of death. The tool automatically reviews the data for errors, tabulates the information, presents the results in the form of easy to use tables and charts, and provides the opportunity to compare the findings with those from other groups of countries.

Disclaimer

This tool is freely available for public use. However, requests for permission to translate or draw material from the tool should be addressed to WHO, Department of Health Statistics and information Systems, 20 Avenue Appia, 1211 Geneva 27, Switzerland, or emailed to healthstat@who.int. Responsibility for interpretation of the results of the use of the ANACoD tool lies entirely with the user. WHO cannot be held responsible for any misuse of the tool. Any use of the data currently integrated in the tool should be referenced as indicated therein.

In case of problems

For any questions on how to operate the tool, kindly send an email to mafatd@who.int stating the nature of the problems encountered, the Excel version used and your contact details and affiliation.

Suggested citation for the tool

World Health Organization (2013). Analysing mortality levels and causes-of-death (ANACoD) Electronic Tool, Version 1.1. Department of Health Statistics and Information Systems, WHO, Geneva, Switzerland.

References

AbouZahr C, Mikkelsen L, Rampatige R, Lopez A. Mortality statistics: a tool to improve understanding and quality. Health Information Systems Knowledge Hub, University of Queensland. Working Paper 13. Nov 2010.

World Health Organization (2013). Analysing mortality levels and causes-of-death (ANACoD) Electronic Tool, Version 1.1. Department of Health Statistics and Information Systems, WHO, Geneva, Switzerland.

Guided Interpretation of Tables and Figures

For each step, it is suggested that the participant click and review the information included in the "Guidance" button at the top right of the each Excel worksheet (also available in the "ANACoD version 1.0 Guidance" handout). The following information provides supplementary guidance to interpreting the various tables and figures generated by ANACoD. Where noted, additional guidance on some points is provided in the University of Queensland Working Paper 13 on Mortality statistics: a tool to improve understanding and quality.

QUICK START

After downloading the zipped folder from the web site (<http://www.who.int/healthinfo/anacod/en/>), unzip and move the files to a directory on your hard drive. (Excel file provided for course: ANACoD version 1.1 2013Feb_blank.xls; save to your Desktop). The ANACoD tool is an Excel-based application with a size of about 7 MB once unzipped. Users are expected to have some basic Excel skills to operate the tool efficiently.

Use Excel to open ANACoD. Some Excel versions, particularly the latest ones will prompt a message to request macros to be enabled. Kindly ensure you have the macros enabled as instructed otherwise the tool will not work.

INPUT DATA (Steps 0-1)

Step 0: Input Data

Go to sheet "step0-Input data". Where the fields are marked in grey, it indicates that you need to select or input data. Start by:

- Selecting the country in row 4 (Colombia)
- Entering the year in row 5 (use format "XXXX") (2009)
- Selecting the source of data in row 6 (Civil registration)
- Selecting the ICD level used in row 7 (ICD-10, 4-character codes)
 - ▶ Note that the "Income group" in row 8 auto-populates.
- Entering the source of population data in row 11 (any text format) (national registration office)

You need to have a cause-of-death data set prepared as in the format shown in sheet "step0-Input data", row 19. The population data should be in the format as shown in row 13 of the same sheet. For the course, this Excel file is provided: Country Data_Anacod.xlsx. The file has two worksheets: "Population" and "Deaths."

- From the “Population” worksheet, copy Cells 2B-3W and paste into the corresponding cells in Rows 14 and 15 of the ANACoD tool (step0).
 - ▶ Shortcut to copy cells: Click in cell 2B; click Ctrl+Shift+↓; then click Ctrl+Shift+→. Cells 2B-3W should all be highlighted. Click Ctrl+c to copy the cells.
 - ▶ In the ANACoD tool (step0), click in cell E14. Click Ctrl+p to paste the cells.
 - ▶ Cells 14D and 15D should automatically populate.
- From the “Deaths” worksheet, copy Cells 2B-4728Y and paste into the corresponding cells starting with Cell 20C in the ANACoD tool (step 0).
 - ▶ Shortcut to copy cells: Click in cell 2B; click Ctrl+Shift+↓; then click Ctrl+Shift+→. Cells 2B-4728Y should all be highlighted. Click Ctrl+c to copy the cells.
 - ▶ In the ANACoD tool (step0), click in cell C20. Click Ctrl+p to paste the cells.

Note that the oldest age-group for both the population and cause-of-death data could either be 85 years and above or 95 years and above. The tool will eventually aggregate them all to 85 years and above.

Note that the tool analyses only one year of data per country. For e.g. you are able to analyse data for country named “CCC” for year 2010. If you wish to analyse more than one year of data, you would need to run the tool several times and each time with the corresponding mortality and population data per year. The tool handles only mortality data as coded to either the 3 or 4 characters of the ICD-10.

For further information on the analyses contained in each sheet, click on the button “Guidance” located on the top right of each sheet.

If you notice you have entered the data wrongly and wish to start all over again, click on the button “Clear data” on the top right of the sheet “Step0-Input data”. Only this sheet is intended for users to input data. The remaining sheets automatically generate results of all the step-by-step analyses.

Step 1: Basic check of input data

After inputting the data, click on sheet “Step1-check first”. Wait for a few seconds before results will be shown in all the remaining sheets.

A summary of the analyses can be printed from sheet “Summary”.

1. Population – The demographic table and population pyramid for the country/ year are automatically generated by ANACoD. We will discuss these further in Step 2.

2. Death

- 2.1) Check total number of deaths (years) - Table 2.1 is checking to see if the total number of deaths reported from “all causes” from a country (rows 33-34) equals the sum of all the deaths that were reported by the individual ICD 10 codes (rows 36-37). All numbers in the third row of Table 2.1 (rows 39-40) should sum to “0”. If something does not equal “0”, Table 2.1 will give an indication of in which age group the country data are not consistent.

Are the number of deaths from “all causes” consistent with the sum of all deaths reported by individual ICD 10 codes for this country? Yes.

2.2) Distribution of total death

Table 2.2: The number of deaths for “all ages” in Table 2.2 should equal the number of deaths for “all ages” listed in Table 2.1. However, the deaths for which age is missing or unknown (MUN column in Table 2.1) are distributed proportionally across all age categories in Table 2.2. Thus, the age-specific number of deaths in Table 2.2 may vary slightly from those in Table 2.1.

The age distribution of reported deaths figure is another way of presenting the “Percentage of total deaths” column in Table 2.2. The distribution of total death is further explored in Step 4.

The percentage of total deaths listed in Table 2.2 and age distribution of reported deaths (Figure 2.2) can quickly be reviewed for expected patterns:

- Higher percentages in the 0 and 65+ age groups;
- Higher percentages for males compared to females in the 15-64 age groups, due to a higher number of deaths attributed to external causes for males;
- Higher percentages for females compared to males in the oldest age groups.

Deviations from these expected patterns may indicate errors in age or sex information.

Review Table/Figure 2.2 for this country. Do the data follow the expected patterns? **Yes.**

- 2.3) Age-specific mortality rate – This table and figure are calculated from data entered in Step 0 and population data for the country. The age distribution of deaths is further explored in Step 4.

A graph of the log mortality rates facilitates a quick visual test for abnormalities across age groups. Standard patterns observed in a graph of log mortality rates include:

- Generally higher rates of male mortality compared to female mortality across all ages;
- Lines that increase smoothly and linearly with age after about age 35.

Do the data in Table/Figure 2.3 follow expected patterns? *Yes.*

- 2.4) Deaths (in years) labelled with codes not valid for underlying cause of death according to ICD10 If data are entered correctly, all cells should contain a “0” or “0%,” indicating that there are no deaths with ICD10 codes that should not be used for causes of deaths or that all codes used exist in ICD10. Click the “ICD10” button or the “ICD 10 list” sheet to see a list of valid ICD codes for underlying causes of death. Click the button “Go” to see column AB in sheet ‘step0-Input data,’ where non valid codes are (or would be) flagged. Are there any cells without a “0” or “0%”.

No. If errors were detected, they should be corrected in Step 0.

- 2.5) Cause, age, sex specific check

Are any deaths indicated in the upper left table, cells F111-117? Deaths in this column would indicate clearly incorrect causes of death, based on implausible sex/cause of death combinations. *No. If there were deaths listed in this column, an attempt should be made to query and correct the specific death certificate. (for this exercise, no corrections will be made to the original data)*

Are any deaths indicated in the lower left table, cells F122-132? Deaths in this column would indicate likely incorrect causes of death, based on diseases unlikely to cause death. *Yes- 8 deaths. An attempt should be made to query and correct the specific death certificates. (for this exercise, no corrections will be made to the original data)*

Are any deaths indicated in the table to the right, cells O110-139? Deaths in this column would indicate likely incorrect causes of death, based on implausible disease/age combinations. *Yes. An attempt should be made to query and correct the specific death certificates. (for this exercise, no corrections will be made to the original data)*

Mortality Levels Analysis (Steps 2-5)

Step 2: Crude death rates

The population pyramid presented at the top of the worksheet in Step 2 aids in understanding the population's age-sex structure, and thus helps in the interpretation of the CDR. Populations that have a high proportion of the population in age groups where mortality rates are highest (i.e., below 4 years and 60+ years) can be expected to have a higher CDR. The lower limit for the CDR in any country is around 5 per 1000; CDRs below 5 per 1000 should be considered suspicious. If the age distribution shown in the population pyramid suggests that a country should have a higher CDR, and the observed CDR based on a country's mortality data is suspiciously low, under-reporting of deaths and incomplete civil registration are expected. This observation may be further confirmed by the estimates of completeness of civil registration data, which are also included in Step 2. See the UQ Working Paper 13 for an additional explanation about trends in crude death rates.

Population Pyramid - What does the population pyramid tell us about the CDR for this country?

- a. *The highest proportion of the population is in the 0-4 age group.*
- b. *This age group experiences high mortality rates.*
- c. *The CDR should be on the higher side for this country.*

Completeness of civil registration data – UN standards define a “good” level of completeness as $\geq 90\%$. How does this country rate? *With 78% completeness, this country does not meet the UN criteria for “good completeness.” We expect that deaths are under-reported in this country.*

Observed – the crude death rates, % annual rate of population growth, and life expectancy at birth are generated from data entered in Step 0 and UN population data sources.

- a. *Crude death rate per 1000 population: What is the crude death rate (CDR) for males, females, and both sexes in this population? Is this plausible? 5.0, 3.6, and 4.3 per 1000, respectively.*
- b. *A CDR under 5 per 1000 is below the lower limit of expected CDRs.*
- c. *This observation is not consistent with the population pyramid which suggests that the CDR will likely be high, given the high proportion of the population in the 0-4 age group.*
- d. *It is likely that deaths are under-reported and death registration is incomplete in this country.*

- e. *This observation is also supported by the only 78% completeness of civil registration data.*

These figures are used to compare expected crude death rates to observed crude death rates.

Expected crude death rates at different levels of life expectancy and population growth

Using the observed life expectancy at birth and % annual rate of population growth, determine the expected CDRs for males and females in the country. Do the observed CDRs (based on the mortality data entered) under- or over-estimate the expected CDRs? *Expected CDR for males: 10.2; expected CDR for females: 8.3.*

- a. *The observed CDRs under-estimate the expected CDRs*
- b. *This observation is consistent with observed CDRs under 5.0 and registration completeness of 78%.*

Step 3: Age- and sex-specific death rates

The tables show the calculated age-specific mortality rate (ASMR) for males and females. These calculations are also presented in the ASMR graph (top left figure). See the UQ Working Paper 13 for an additional explanation about dealing with fluctuations in the ASMR due to small population numbers.

Using Figure 3 in the 'ANACoD version 1.0 Guidance' document as a reference, comment on the relative age patterns (not the comparison of the absolute levels of mortality) of the country's male and female ASMR patterns.

- a. *As expected, rates for both females and males are higher in infancy and early childhood, and lowest between ages 5 and 14.*
- b. *The expected exponential increase is present for both males and females.*
- c. *There is a slight bump in mortality rates for males between ages 20 and 35 years, which may indicate a particularly high level of violent and accidental deaths.*

Note the table listing male:female mortality ratio, which is calculated by dividing the male ASMR by the female ASMR. Using Figure 5 in the 'ANACoD version 1.0 Guidance' document as a reference, comment on the country's patterns in ratio of male to female ASMR. Note that the country's infant mortality rate was 16 per 1000 live births in 2010 (WHO Global Health Observatory).

- a. *As expected, males have a consistently higher mortality rate than females (shown by a ratio > 1.0 at all ages), which indicates that there is not likely sex discrimination in death registration.*

- b. Like in Figure 5 for countries with an infant mortality rate < 20 , the country has a bump between ages 10-14 and 45-49, indicating an increase in deaths among males, likely due to accidents and other violent deaths.*
- c. However, the magnitude of the bump is greater in the country, compared to Figure 5, which indicates that there may be an abnormally high number of male deaths in these age categories for this country.*
- d. For ages > 49 , the ratio for the country is a little lower than the figure, but the general pattern observed is as expected.*

Observe the patterns in the graph showing the log of age-specific mortality rates for the country compared to other country groupings. Recall from Step 1/2.3 above that a graph of the log mortality rates facilitates a quick visual test for abnormalities across age groups. The line should increase smoothly and linearly as age increases after about age 35.

- a. The country's line is generally lower than that of other upper-middle income countries for both males and females, which may indicate general under-reporting across all age groups.*
- b. The country has a peak in mortality that exceeds that of other upper-middle income countries for males at ages 15-34 years old, likely due to accidents and other violent deaths.*
- c. An increase in deaths in 0-4 years and a linear increase in deaths after age 40 are as expected.*

Step 4: Review the age distribution of deaths

Step 4 facilitates a comparison of the age distribution of reported deaths for the country of interest to that expected patterns observed from other countries in the same income group (the University of Queensland Working Paper 13 discusses comparisons to countries with similar levels of infant mortality).

Expected patterns in age-specific mortality rates include:

- Generally higher rates of male mortality compared to female mortality across all ages; for low income countries and countries with high infant mortality rates, female rates may be more comparable to male rates;
- A peak in both male and female mortality in the 0-4 age group and the oldest age groups; the peak in the 0-4 age group is generally less pronounced in high income countries and countries with low infant mortality rates; and the peak in the oldest age groups is less pronounced in low income countries and countries with high infant mortality rates;
- A peak in male mortality between the ages of 15 and 44, accounting for an increase in external causes.

A departure from the expected patterns may indicate selective bias in age-specific death reporting.

Compare this country's figure of age distribution of reported deaths to the figure for the corresponding income level. Do the figures show similar patterns? What might be possible reasons for departures from the expected pattern? *This country should be compared to other upper middle income countries.*

- a. *Male deaths are generally higher, especially in the 15-64 age groups, which is consistent with previous findings. Female deaths are higher in the oldest age group, as expected. Female deaths are also higher in the lowest age group, which is not generally expected for this income group. Reasons may be under-reporting of female child deaths or preferential treatment of male children.*
- b. *As expected, there is a peak in deaths in the youngest and oldest age groups.*
- c. *This country has the expected peak, though there is a more pronounced peak in male deaths between 15 and 34 years. This observation is consistent with observations in Step 3, which indicates a possibility of abnormally high accidental and other violent deaths.*

These observations also hold true for the comparison to countries with a similar infant mortality level, using Figure 8 in the University of Queensland Working Paper 13 (16 per 1000 live births in 2010; WHO Global Health Observatory). The general similarities suggest that age and sex reporting in this country is likely acceptable.

Step 5: Child mortality rates

Infant and Under-Five Mortality Rates from the reported data are automatically calculated in Step 5. To interpret the Under-Fiver Mortality Rate, Step 5 refers users to www.childmortality.org to generate a graph comparing the country's Under-Five Mortality Rate, as measured by various data sources, including the census, surveys, and vital registration data. If access to the internet is available, complete the following steps to generate the graph for Columbia:

- Go to www.childmortality.org; click on "Country Data" in the upper-right menu; select "Colombia."
- In the upper-left of the screen, select the "Under-Five Mortality Rate" drop down menu; select "Under-Five Mortality Rate". The graph should appear.
- Check if the trend line (a solid blue line) is showing in the graph. If it is not showing, select the "View" drop down menu in the upper-right of the screen; check "Trend Line".
- Hover over the data points to identify the source of data for each line in the graph. How does the "vital registration" data line compare to the other data lines? Does this observation suggest that the is under-, over-, or appropriate reporting? *The vital registration line is consistently lower than most other data points/sources after*

1980, though improvement is seen after 1998. This indicates that child deaths are likely under-reported in Colombia, though the extent of under-reporting has improved in recent years.

For additional information on ways to measure incompleteness of death reporting, see Step 5 in the ANACoD guidance document and the UQWP13.

Causes Of Death Analysis (Steps 6-10)

Step 6: Distribution of death according to the Global Burden of Disease list

In Step 6, from the data entered in Step 0, ANACoD shows the number of deaths assigned to the various ICD codes by sex and by age. A second table starting in row 173 shows the redistribution of deaths from 1) unknown age (despite incorrect title indicating redistribution of deaths from unknown sex), and 2) ill-defined diseases. In rows 184-186, this table shows the proportion of total deaths distributed to Groups 1, 2, and 3 after redistribution for both unknown age and ill-defined diseases.

Using Table 2 in the ANACoD Guidance document as a reference, compare the distribution of the country data to the expected distribution according to life expectancy.

- Use an independent data source (i.e., not the civil registration data) to determine Colombia's life expectancy. The WHO Global Health Observatory is recommended: <http://apps.who.int/gho/data/node.main.3?lang=en>. *Colombia's life expectancy for both sexes was 79 years in 2012.*
- Are there any groups with significant differences between the expected and observed distributions? If so, are these differences consistent with previous findings? *The distributions are similar. However, as expected based on previous findings of a peak in deaths from external causes among males 15-45 years, Colombia shows an increase in deaths in Group 3, external causes (18% versus the expected 11%).*

Step 7: Age pattern of broad groups of causes of death (Distribution of major causes of death)

- Compare the figures automatically created for the distribution of broad cause of death groups by age for males and females to the expected patterns shown in the figures for the corresponding income level. Do the observed data follow the expected data? Explain potential reasons for any differences observed.*
- While the pattern for communicable diseases among males in Colombia appear to follow the general expected pattern, being more common in the younger ages and again in the oldest ages, the distribution is lower than expected among 15-50 year olds. This may indicate a bias in reporting certain infectious diseases (e.g., HIV/AIDS).*

- c. *Non-communicable diseases from Group II also follow the same general pattern as expected, being most common in the older ages, with a slight peak between 5 and 15 years. However, they are a little lower than expected between about 15 and 55 years.*
- d. *This observation might be explained by corresponding deviations in external causes from Group III, which are higher than expected among males 15-55 years. This observation is consistent with findings from previous steps and may be an indication of real increases in deaths due to external causes among males in this age group.*
- e. *Comparing females, we see a similar issue as for males: the pattern for communicable diseases (Group I) appears to follow the general expected pattern for the youngest and oldest age groups, though the distribution is much lower than expected among 15-50 year olds; again, this may indicate a bias in reporting certain infectious diseases (e.g., HIV/AIDS).*
- f. *Non-communicable diseases from Group II follow the same general pattern as expected, though the proportions remain consistently higher than expected for those under 35 years, likely accounting for some of the possible under-reporting from Group 1.*
- g. *Finally, the observed data follow the general expected pattern for external causes from Group III, though again we see higher than expected proportions among females about 20 to 35 years of age, which, like males, may be an indication of real increases in deaths due to external causes in this age group.*

Step 8: Leading causes of death

Compare the tables automatically created for the distribution of cause of death categories to the expected patterns shown in the tables for the corresponding income level. Does the order of leading causes for the observed data follow that of the expected data? Explain potential reasons for any differences observed. Also, comment on the percentage of ill-defined causes observed for this country.

Looking at the table for all deaths (all ages, males and females), Colombia has a particularly high percentage of deaths from homicide, compared to other upper middle income countries; consistent with previous observations, this may be indicative of an epidemic level of homicides in Columbia. The percentage of HIV for Colombia is notably low; consistent with previous observations regarding infectious disease, this may be indicative of biased reporting practices.

Ill-defined causes are only 2.2% of deaths in Colombia, which is not an alarming number. From this perspective, the quality of certification and coding is acceptable (goal is < 10% attributed to ill-defined causes).

Step 9: Ratio of non-communicable to communicable causes of death

In the automatically-generated figure, compare the ratio of non-communicable to communicable disease for Colombia to that of countries in the same income grouping (upper middle). Explain potential reasons for any differences observed. Is this observation consistent with previous findings?

The ratio for Colombia (~6.5) is similar to that of other upper middle income countries (just under 5.0), though Colombia may slightly overestimate the number of non-communicable deaths. This observation is consistent with previous findings that suggest HIV and other communicable diseases may be under-reported.

Step 10: Ill-defined causes of death

Review the table that has been automatically populated with the proportion of deaths assigned to ill-defined causes for each age/sex category. Note which categories have >10% ill-defined. Comment on any trends/patterns. Then look at the pie chart that describes specific causes to which ill-defined deaths have been assigned. What recommendations would you make for an improvement program?

The overall % of causes that are ill-defined for this country is less than 10%, indicating generally good cause of death certification and coding practices in this country. By age, 1-9 years and 80+ years for males and 1-14 years and 80+ years for females have >10% ill-defined. The higher % ill-defined in the older age groups is expected, though still higher than ideal. Efforts should be made to reduce the % ill-defined in these age groups, particularly in the younger age groups. The pie-chart indicates that the greatest number of ill-defined causes are due to conditions related to the heart. Additional training should focus on proper certification and coding for heart-related

