Revision 1, 2020

Production of a Vital Statistics Report: Guide

with accompanying Template and Workbook

UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

United Nations
Economic Commission
for Africa

Statistisk sentralbyrå
Statistics Norway

Bloomberg Philanthropies
DATA FOR HEALTH INITIATIVE

Vital Strategies

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Vital Strategies, United Nations Economic Commission for Africa, United Nations Economic and Social Commission for Asia and the Pacific, and Statistics Norway (2020). Production of a Vital Statistics Report: Guide. NY, Vital Strategies.

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Abbreviations and acronyms

ASFR	Age-Specific Fertility Rate
ASMR	Age-Specific Mortality Rate
CBR	Crude Birth Rate
CDR	Crude Death Rate
CRVS	Civil Registration and Vital Statistics
CSMF	Cause-Specific Mortality Fraction
DHS	Demographic and Health Survey
ECA	(United Nations) Economic Commission for Africa
ESCAP	(United Nations) Economic and Social Commission for Asia and the Pacific
IMR	Infant Mortality Rate
MCCD	Medical Certification of Cause of death
MMR	Maternal Mortality Ratio
SDG	Sustainable Development Goal
UN	United Nations
USCDC	United States Centers for Disease Control and Prevention
VA	Verbal Autopsy
VS	Vital Statistics
WHO	World Health Organization

Acknowledgments

This guide is an output of the Bloomberg Philanthropies Data for Health Initiative (www.bloomberg.org). The views expressed are not necessarily those of the Philanthropies. The authors and contributors also wish to thank Carla AbouZahr, Don de Savigny, Cynthia Driver, Ruxana Jina, Adam Karpati, Alan Lopez, Doris MaFat, Gloria Mathenge, Raj Gautam Mitra, Srdjan Mrkic, Robert Mswia, Chalapati Rao, and Romesh Silva for their comments on and contributions to Revision 1.

Suggested citation: Vital Strategies, United Nations Economic Commission for Africa, United Nations Economic and Social Commission for Asia and the Pacific, and Statistics Norway (2020). Production of a Vital Statistics Report: Guide. NY, Vital Strategies.

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Part 1

Introduction and Methodology

Purpose

The purpose of this Guide and the files it accompanies, hereinafter referred to as the resource kit, is to enable the production of vital statistics reports, primarily using civil registration data.

The resource kit has three parts:

1. ***Guide*** (this document): Part 1 consists of a brief introduction and background, followed by Part 2, which provides detailed guidance on how to complete the vital statistics Template document.
2. ***Template***: This document can be downloaded from the resource website and contains notes to assist in the completion of tables and figures for the vital statistics report.
3. ***Workbook***: The workbook can be downloaded from the resource website and can assist in the calculation of certain indicators and production of tables, graphs and figures to be included in the vital statistics report.

Target audience

The resource kit is aimed at those in government responsible for the production of vital statistics. These authorities may vary from country to country depending on how various civil registration and statistical functions are allocated among the stakeholders who comprise the system. In most countries, responsibility for vital statistics report production rests with the national statistical office. In some countries, the civil registration office produces statistics pertaining to birth and death events, while in others the ministry of health is responsible for the production of statistics on deaths and causes of death. Any of these entities should find this document useful.

How to use this document

This guide is a revision of the "Guidelines and Template for Developing a Vital Statistics Report" produced by Statistics Norway, UN Economic Commission for Africa (ECA) and UN Economic and Social Commission for Asia and the Pacific (ESCAP).[1] It is meant to be a resource to support those completing the accompanying vital statistics report template, hereinafter referred to as the Template, based on data provided by a civil registration system. In each chapter of Part 2, the guide specifies the areas that should be covered, often with a supplementary comment or specification.

A list of the tables and figures that should be included in a vital statistics report is shown at the beginning of the Template. The final set of tables and figures to be included in a vital statistics report will depend on the availability of data and the needs identified by government institutions and authorities (see corresponding section).

Throughout Part 2, there are text boxes that provide background information on how to develop and write various sections of a vital statistics report. They are meant as additional input, some of them providing examples.

Several documents were consulted during the development of this guide, in particular, the UN *Principles and Recommendations for a Vital Statistics System* (2014), hereinafter referred to as the *Principles and Recommendations*. This is a comprehensive international guide providing detailed background information useful when preparing a vital statistics report. Handbooks on CRVS published by the UN (2018, 2019a, 2019b), and several reports from the World Health

1 See www.repository.uneca.org and www.getinthepicture.org

Organization (WHO) and the US Centers for Disease Control and Prevention (CDC) training course (2015), were also consulted. These handbooks and reports also provide detailed background information for consideration when preparing a vital statistics report. Reference is made to vital statistics reports from several countries in Africa, Asia, Latin America, and the Pacific.

Reasons for publishing a vital statistics report

If a country has never before produced a vital statistics report based primarily on civil registration data, it may be useful to consider the following important reasons to publish such reports.

Vital statistics reports provide fundamental demographic and epidemiological measures that are needed in planning across multiple sectors. These include education, labour and health. Birth and death information from civil registration is critical for a wide range of government activities. In the health sector, vital statistics form the core of a country's health information system (WHO, 2010c). Vital statistics, including those dealing with causes of death, are also central to measuring progress in achieving the Sustainable Development Goals (SDGs) (see below).

Vital statistics have other potential areas of use. These include establishing school districts; planning regional and local school capacity; and allocating health and social services.

The most important reason for developing and publishing a vital statistics report is the need of the public, the government, and civil society for transparency and accountability. Such information is important for monitoring trends of key population indicators in the country and studying regional variations. Are there, for example, subnational areas or population groups with particularly high death rates? Is the birth rate changing and, if so, among which age groups?

It is recommended that all countries produce an annual vital statistics report, even if a relatively low number of vital events are registered.

The production and availability of a vital statistics report is a key step towards stimulating and guiding civil registration improvements. Putting vital statistics into the public domain demonstrates transparency and openness to scrutiny. While this does expose weaknesses and limitations and omissions in the available data, publishing whatever data are available can help build trust in the data in the long run. By identifying errors in the data, civil registrars and other officials engaged in the collection of vital events information may be encouraged to produce more reliable and accurate data. At the national level, vital statistics that reflect the complete state of the civil registration system may stimulate the government to increase investment for improving the system. In general, a report is a good opportunity to learn from experience and can inform improvement efforts, including through the national CRVS coordination mechanism. In this regard, it is recommended that all countries produce an annual vital statistics report, even if a relatively low number of vital events are registered. At the international level, producing a report can also facilitate reporting to international data collection systems, including the United Nations Statistics Division's Demographic Yearbook System[2].

The importance accorded to civil registration by the global community can be seen from the SDGs. First, improving CRVS is an SDG target in its own right. Target 16.9 calls for providing a legal identity for all, including birth registration, by 2030; Indicator 17.19.2 includes a provision to achieve 100% birth registration and 80% death registration by 2030, and Target 17.18 calls for enhanced support for developing countries to improve the quality, timeliness, reliability and disaggregation of their statistical data, of which CRVS is an integral component.

Civil registration and cause-of-death data are a necessity for monitoring key outcome indicators, such as maternal mortality and non communicable disease-related deaths. They are also key to a strategy for effecting progress in other indicators, such as social inclusion and access to education.

2 See https://unstats.un.org/unsd/demographic-social/products/dyb/

Data availability and modifying the Template

The quality, timeliness and completeness of civil registration data vary between countries. It is therefore difficult to make a Template that suits all countries seeking to produce vital statistics from these records. The responsible authorities should review the entire Template located on the resource website before attempting to complete it. Users are encouraged to modify and/or delete tables, graphs or figures based on what data are available or unavailable locally and what is in- or out-of-scope for the report. A finding that certain recommended tables are not possible to develop for the report should be noted and mentioned for future improvements.

There are 17 SDGs, with 169 targets and over 230 global indicators, which were endorsed by the Statistical Commission in March 2016. Of these, 67 global indicators covering 12 of the 17 SDGs could be estimated in full or in part using data originating from well-functioning CRVS systems (Mills et al., 2017).

A focus on births, deaths and causes of death

The current Template focuses on births and deaths as well as causes of death (with an optional section on marriages and divorces). This is in line with the *Principles and Recommendations.*

In some low- and middle-income countries, cause-of-death data have never benefited from assessment and concerted efforts at improvement. As a result, quantity may be low and the quality uncertain. Facility-based mortality and cause of death data may not be representative of the national population. Nevertheless, countries are encouraged to begin including cause-of-death statistics in vital statistics reports. This will help shine a light on the need to improve data from both facility-based and community-based sources.

Additional resources

Other sources that provide additional support and guidance could also be consulted, including:

- *United Nations Principles and Recommendations for a Vital Statistics System: Revision 3* (2014)[3]
- *United Nations Handbook, guidelines and training manuals on civil registration and vital statistics systems* (2018)[4]
- *The WHO strengthening civil registration and vital statistics for births, deaths and causes of death resource kit* (2012)[5]
- *Improving the quality and use of birth, death and cause of death information: guidance for a standards-based review of country practices* (2010b)[6]
- *A template for a national CRVS birth and death statistics report*[7]
- US Centers for Disease Control and Prevention training course on civil registration and vital statistics systems (2015)[8]
- World Bank Group eLearning course on CRVS (2020)[9]
- An extensive library of resources related to civil registration and vital statistics[10]

3 See https://unstats.un.org/unsd/demographic/standmeth/principles/M19Rev3en.pdf
4 See https://unstats.un.org/unsd/demographic-social/Standards-and-Methods/files/Handbooks/crvs/crvs-mgt-E.pdf
5 See http://apps.who.int/iris/bitstream/10665/78917/1/9789241504591_eng.pdf
6 See https://apps.who.int/iris/handle/10665/44274
7 See https://crvsgateway.info/A-template-for-a-national-CRVS-birth-and-death-statistics-report~631
8 See https://www.cdc.gov/nchs/isp/isp_fetp.htm
9 See https://olc.worldbank.org/content/civil-registration-and-vital-statistics-systems-basic-level-self-paced-format
10 See www.getinthepicture.org/resources

Part 2

Guidelines for completing the Vital Statistics Report Template

Introduction

Part 2 of this document provides section-by-section guidance on how to complete the Vital Statistics Report Template, as well as some examples and additional explanatory material contained in text boxes.

The blank, editable version of the Template is available to download at the resource website. There is also an associated Excel Workbook with pre-populated graphs that can be updated and integrated into the Template available from the same source. The workbook contains examples on data adjustment and redistribution, a life table, and age standardisation. Users are strongly encouraged to refer to the instructions in this document while completing the Template and using the workbook.

The Template has eight main chapters (see Box 1), 59 suggested tables, and 20 suggested figures. Suggested tables and figures are compliant with those recommended in the *Principles and Recommendations*. They cover the tabulations required for a comprehensive vital statistics report that includes data on births, deaths, cause of death, and marriages and divorces.

Many of the tables and figures can be presented in time series or by main administrative division (region, district, etc.). In addition, sex disaggregation is recommended where relevant.

Box 1
Suggested structure of the Vital Statistics Report

Executive summary

Front matter (list of tables and figures; preface; acknowledgements; acronyms and abbreviations; definitions)

Chapter 1. Introduction and background

- Provides information on the objectives of the vital statistics report. It should address the needs of the public, the government, and international organisations for statistics on births, deaths and causes of death.

Chapter 2. Civil registration system of the country

- Describes the civil registration and vital statistics system. Particularly for an initial vital statistics report, topics may include: history, legal background; administrative structure; local and regional systems; data flows; relationship between the civil registration and vital statistics authorities and agencies; incentives and disincentives for civil registration; links to the national identity management system (if any), and plans for further improvement of civil registration and vital statistics.

Chapter 3. Data quality, timeliness of registration, and registration completeness

- Presents the quality and completeness of the civil registration data in the form of tables and, preferably, graphs and maps. Both the absolute numbers of registered events and the completeness should be shown. If available, data on completeness for several years are useful for showing the time trends at the national and sub-national levels to see where the need for improvement is the greatest.

Chapter 4. Births

- Includes basic tables and an analysis of registered live births and the most essential fertility indicators. Graphs and maps may also be presented.

Chapter 5. Deaths

- Includes tables and analysis of registered deaths and the most essential mortality indicators. Graphs and maps may also be presented.

Chapter 6. Causes of death

- According to the *Principles and Recommendations*, causes of death should be included as part of the mortality tabulations. If cause-of-death data are available, statistics should be presented in the vital statistics report, even if the data are incomplete.

Chapter 7. Marriages and divorces

- A chapter on marriages and divorces should be included in the vital statistics report if such data are recorded and available.

Chapter 8. Summary tables

- Includes summary tables and graphs from the civil registration and vital statistics system, based on the *Principles and Recommendations*.

A sample page from the Template is shown in Figure 1. A typical page such as this will include a blank table or figure, which can be edited using country data, along with space to describe any key trends in the data.

Figure 1
Example page from the Template

3.3 Completeness of registration

Calculating the completeness of registration can be used to monitor the performance of the CRVS system in capturing all vital events and allows for adjustment of incomplete data. Completeness is defined as the number of vital events in a population that are registered, divided by the estimated number of vital events that occurred in the same year. The value is multiplied by 100 to express completeness as a per cent:

$$Completeness\ (\%) = \frac{Number\ of\ vital\ events\ registered}{Estimated\ number\ of\ vital\ events} \times 100$$

3.3.1 Birth registration

ENTER TEXT HERE. Describe how completeness was calculated (where was the 'estimated number of births' sourced from) and whether any adjustments were subsequently made to future calculations. Discuss if there have there been significant changes/improvements over time. Also note any major differences between males and females (if data is available). If data by sex are not available, just present the data for 'total' births.

Table 3.4 Birth registration completeness by year of occurrence and sex of newborn

Year of occurrence	Registered live births			Estimated total live births			Completeness (%)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Year 1									
Year 2									
Year 3									
Year ...									
Most recent									
Grand total									

Note: estimated total births were sourced from Click or tap here to enter text.

There are eight optional sections in the Template, along with several optional tables and figures. These are indicated with red, italicised text (see Figure 2). While users are encouraged to complete as many of these optional sections, tables and figures as possible, if the required data are not available, these can be omitted.

Figure 2
Example of optional table in the Template

TABLE 3.10 IS OPTIONAL. The age groups provided are a suggestion; actual age groups used will depend on country data.

Table 3.10 Adjustment of deaths by age group and sex of decedent, year

Age at death (years)	Male		Female		Total	
	Registered deaths	Adjusted deaths	Registered deaths	Adjusted deaths	Registered deaths	Adjusted deaths
0–4						
5–24						
25–74						
75+						
Grand total						

Tabulation plan

One of the first steps when planning a vital statistics report is to make a tabulation plan to determine which of the recommended tabulations can and should be produced. To make sure that the plan is realistic, it is useful to begin the planning by checking that the most important variables are available for making tables. The *Principles and Recommendations* include an extensive list of key topics and themes that can be investigated for producing vital statistics. See Annex I for the list of these topics and themes. It may also be useful to record the years for which the variables are available, as shown in Annex I. To guide the planning process, users are encouraged to complete the four tabulation lists included in the companion Excel Workbook.

Next, the user should go through the tables recommended in the *Principles and Recommendations* and other tables proposed in this guide (see Annex II). Check and indicate the data availability for each table's data requirements.

Time series should be included where relevant and possible, such as for the number of births by sex, preferably for as many years as possible. In addition, more detailed tables can be generated, such as the number of births at the regional level for the most recent year with available data. Example graphs are included in the Excel Workbook. Box 2 provides a list of software options that may be used for production of the recommended tabulations and graphs.

Box 2
Software options to produce tables and graphs

There are many different programmes that could be useful to produce tables and graphs, depending on the format of the data and the experience of the users. For many of these programmes, there are good online training solutions. The programmes are of varying complexity and cost. Some examples are:

- Microsoft Excel: For many purposes, this programme is sufficient. Its advantage is that most institutions already have it and have experience using it. As part of this guidance, an Excel Workbook to produce the recommended tables and graphs has been produced.
- CSPro (Census and Survey Processing System): A free programme provided by the United States Census Bureau that, among other things, can be used for data entry and tabulations
- R: another freeware, used mainly for advanced data analysis, but which can also be used to produce tabulations and graphs
- There are also other statistical packages that can be very helpful but require license payments. Some of the most common programmes are SPSS, SAS, and Stata

This resource kit is organised around simple tabulations and visual displays of data. For those seeking additional guidance on presenting quantitative public health and demographic data, the following resources may be of use:

- User-friendly presentation of statistics: guide to creating a dissemination strategy and dissemination guidelines for low and middle-income countries[11]
- Communicating with Data: a Guide to Writing Public Health Reports[12]

11 See https://www.ssb.no/en/omssb/samarbeid/internasjonalt-utviklingssamarbeid/a-handbook-on-dissemination-of-statistics

12 See https://www.vitalstrategies.org/resources/communicating-data-guide-writing-public-health-data-reports/

Definitions and specifications

The Template is based on the *Principles and Recommendations* and uses the same definitions for key variables (see Annex I; these are also provided at the start of the Template for reference). There is also a list of definitions provided in the Template. Users are encouraged to update these, especially for variables that lack standard definitions, or any that are country-specific. For reference, Box 3 provides a brief overview of the definition of vital statistics and vital events.

It is important for users to know the legal definition of vital events and related background variables of all involved in the registration and processing of vital events data in their country. The definitions and specifications are also useful for international stakeholders, as it will clarify whether the data are comparable to data from other countries; and for national stakeholders, in case there are different approaches nationally. The following are two examples:

- Births: Which births are included in the civil registration legislation: all births or live births only? If live births only, is the international definition of a live birth used, or are there national amendments? Are foetal deaths registered anywhere?
- Sub-national: Are the same definitions used for regional and local units by all government bodies? Is there official agreement on the borders of all regions in the country?

These questions might be especially relevant for smaller divisions. In addition, urban and rural areas may be defined differently. If so, describe how it is defined in the report, if used.

Presenting data by place of occurrence or place of usual residence

The choice of administrative levels at which to display vital event data will depend on:

- Administrative structure
- Number and sizes of the administrative units at lower levels
- Availability of data and the usefulness of small-area data on vital events. If there is a need to publish events for a large number of regional units, the corresponding table could be put in an annex.

It is important to be precise about what the tables display. 'Region' could be based on one of three commonly collected variables:[13]

- Place of occurrence of the birth or death
- Place of usual residence of the mother of decedent
- Place of registration of the birth or death
- Place of usual residence of mother of the decedent (if a child), or next of kin (if an adult)

13 Definitions for these variables can be found in the Principles and Recommendations.

Box 3

Definition of vital statistics and vital events for statistical purposes

Vital statistics constitute the collection of statistics on vital events in the lifetime of a person and relevant characteristics of the events themselves and of the persons concerned. Vital statistics provide crucial and critical information on the population in a country.

For statistical purposes, *vital events* concern the life and death of individuals and their family members. *Vital events proper* concern life and death and include live births, deaths and foetal deaths. *Dual events* are those occurring simultaneously in the lives of two individuals, which cannot occur again in the life of either individual without a previous change to his or her status. Those events include marriage, registered partnership, separation, divorce, legal dissolution of registered partnerships, and annulment of marriage. Lastly, *vertical family events* are those involving a descendant; they comprise adoption, legitimation and recognition. The focus of this document is births and deaths. The recommended definition of the event for which data are collected for vital statistics purposes are given in Part I of the *Principles and Recommendations*.

The following sections go through each of the main chapters included in the Template and provide a brief overview of what should be covered in them, along with country examples (where applicable) and additional instructions on more complex topics, tables and figures.

Chapter 1. Introduction and methodology

1.1 Introduction

Chapter 1 should provide information on the objectives of the vital statistics report. It should address the needs of the public, the government, and international organisations for statistics on births, deaths, and causes of death. A description of the background and rationale for the report should also be included.

There should be an explanation of the scope of the report, including the vital events covered and the year(s) for which the statistics are released. It would also be useful to include a brief overview on the current level of registration coverage and completeness, recent improvements (or deteriorations), and plans for future work.

1.2 Data sources and methodology

This chapter should also include a brief overview of the data sources used to create the vital statistics report. Are data just from civil registration records? Are there different systems for mortality, or for vital events occurring in different regions of the country? Also mention whether data from other sources have been or will be used (such as censuses and household surveys), either for comparison or as a replacement for missing indicators. For example, in Botswana's 2017 vital statistics report, Chapter 1 includes a section on the source of administrative data on births, deaths, and marriages (Department of Civil and National Registration) and the agency that processes the data to produce the report (Statistics Botswana).[14]

The methodology should briefly describe how the analysis was conducted, mentioning the software used or relevant methods applied. It should also discuss any major limitations of the data, including any known points of 'data loss' in the system. If data are available on the number of births and deaths notified, but not registered, this could be discussed here as an important indicator of data completeness and system functionality. For instance, the authors of Fiji's vital statistics report used Microsoft Excel to analyse the data and describe how birth and death data were tabulated. Their report also discusses data limitations and how they were addressed.[15]

14 See http://www.statsbots.org.bw/vital-statistics-report-2017
15 See https://sdd.spc.int/news/2019/04/17/republic-fiji-vital-statistics-report-2012-2017

Chapter 2. The civil registration system

Before presenting the data, a description of the CRVS system should be presented to the reader as background information. The description should highlight the most important historical, legal, organisational, administrative and practical issues. To help in this description, we have formulated a number of questions that would be useful to answer or address. This would also be the place to summarise any CRVS systems, reports, reviews and assessments that have been undertaken in the country.

The suggestions in this chapter are based on the *Principles and Recommendations*, the United Nations handbooks, guidelines and training manuals on CRVS systems (see References), the ESCAP guidelines for setting and monitoring the goals and targets of the Regional Action Framework on CRVS in Asia and the Pacific,[16] and vital statistics reports from several countries.

A list of reference materials is also provided at the end of this document. Countries may find it useful to consult these publications to help write the report. It may also be useful to refer to the tools and guidelines developed by ECA,[17] ESCAP (2015),[18] WHO (2010b),[19] the CDC (2015),[20] the Bloomberg Philanthropies Data for Health Initiative,[21] and others.

The ESCAP and WHO publications include a number of relevant questions and issues that would guide the development of a well-functioning CRVS system.

2.1 History

It is useful for the readers of the vital statistics report to learn about the history of civil registration and the production of vital statistics in the country. Questions that could be addressed in this short history are the following:

- When was civil registration introduced?
- What where the reasons for introducing civil registration?
- Was civil registration initially including everybody, or did it only include some regions or population groups?
- Have there been important changes in civil registration over time on issues such as legislation, organisation, coverage and completeness?
- Does the country routinely produce vital statistics reports? How frequently are they published, and what is the reference period covered by each report?
- Are there any important initiatives or external partnerships in CRVS improvement that should be mentioned?

2.2 Legal and administrative issues

Countries have different legal and regulatory frameworks (including laws, regulations and directives) that govern the CRVS system. In this section, a reference to acts, laws, regulations and directives related to CRVS would be desirable, particularly if there has been a recent review legal and regulatory review of the CRVS system or any sub-component of it.

16 See https://www.unescap.org/resources/regional-action-framework-civil-registration-and-vital-statistics-asia-and-pacific
17 See www.uneca.org/sites/default/files/uploaded-documents/Statistics/CRVS/assessment_tool_en.pdf
18 See www.unescap.org/resources/guidelines-setting-and-monitoring-goals-and-targets-regional-action-framework-civil-0, and http://www.unescap.org/our-work/statistics/civil-registration-and-vital-statistics/about or getinthepicture.org
19 See also www.emro.who.int/civil-registration-statistics/assesment/crvs-rapid-assessments.html
20 See https://www.cdc.gov/nchs/isp/isp_fetp.htm
21 See https://crvsgateway.info/A-template-for-a-national-CRVS-birth-and-death-statistics-report~631

There are many questions about legal and administrative aspects of the CRVS system that could be addressed in this chapter.[22] From a statistical standpoint, the key issues to cover are: deadlines for registration of each vital event; penalties; and any excluded groups (e.g. refugees, internally displaced persons, stateless persons, etc.). If a legal review has been done, some of the questions that might be addressed in this chapter include:

- Are there special laws or acts for registration of vital events? (It would be useful to identify the laws and when they were introduced, including the most important paragraphs.)
    - Does legislation specify which vital events should be registered? (The legislation may also indicate whether the registration of vital events such as births and deaths is compulsory.)
- What are the timelines for vital event registration?
    - In accordance with the legal framework of the country, when should vital events be registered (specify for each vital event as applicable)?
    - Is there a deadline for registering a vital event (specify for each vital event as applicable)?
    - Is there a difference in how soon an event should be registered, depending on where the vital event takes place and what kind of vital event it is?
    - Is there a difference between birth and death registration?
        - If yes, then both should be specified.
    - In actual practice, are vital events usually registered immediately or only some days, weeks or months afterwards?
    - Is the time limit for late registration aligned to international recommendations of up to one year?[23]
    - Is there a penalty for late and delayed registration?
    - What is considered 'late' in the law? (Some countries have a timeline of six months for early registration, whereas other countries have no timeline at all.)
- Does the legislation specify how the registration should be done?
    - Does it specify who can do the registration—for example, only the civil registration office or also health personnel and/or other key actors?
    - How are institutional births and deaths registered compared to noninstitutional births and deaths?
    - Does it specify documents or forms required to process the registration?
- Does the legislation specify who can be registered?
    - Can the vital events of all residents (including refugees, asylum seekers and stateless persons) be registered, or only those of citizens?
    - Is it, for example, possible to register vital events for citizens of other countries, including refugees, asylum-seekers, and stateless persons? (In some countries, the law specifies that every birth should be registered, but in practice, persons with a foreign or an undetermined nationality are often denied the registration of their births.)
        - If yes, under which conditions?
    - Are the vital events of non-citizens registered? If so, are they recorded by the same institution as for citizens, or another institution?

22 These guidelines and the vital statistics report cannot aim to provide guidance on or include a comprehensive review of the CRVS legal and regulatory framework. Other tools and resources are available to carry out such an assessment. See www.vitalstrategies.org/resources/crvs-legal-regulatory-review/ and https://unstats.un.org/unsd/demographic-social/Standards-and-Methods/files/Handbooks/crvs/CRVS_GOLF_Final_Draft-E.pdf

23 Refer to the *Principles and Recommendations*, p. 81

- Does the legislation specify which individuals can act as informants to register and who is designated as civil registrar?
    - For example, is it specified that registration should be done by local health facilities or by civil registration offices?
    - Can vital events be registered outside the country? Where?
- Are there any fees related to registration or issuance of documentation? If applicable, state where in the law this is specified and how it is regulated.
- What do the relevant laws say about sharing and confidentiality of data?
- Is it specified in law which data on individual events can be shared with other institutions and which cannot? Are there exceptions for producing statistics or other purposes? (see Box 4)
- To what extent are the intentions of the registration law followed in different parts of the country and for different population groups?
- Is there a law requiring medical certification of cause of death (MCCD)?
    - If so, is it required for registration?
- Is there a law regarding the medico-legal death investigation system and deaths that require referral to that system?
- Is there a system for issuing and administering unique identity numbers that is integrated into the civil registration system, or is there a separate, unlinked system for identification management?
    - Are personal identification or national identity numbers used to identify individuals in the civil registration system and other systems?
- Does the legislation assign overall responsibility for official vital statistics to one organisation? To which organisation(s) is this responsibility assigned? Does the law specify how frequently vital statistics are to be produced?

Box 4
Confidentiality of data

In some countries, data on vital events are not transferred from one government agency to another. In general, individual data should not be shared with others, but exceptions should be made for agencies producing official statistics. This is also in line with the *Principles and Recommendations* (p. 12, paras. 36–37), in which the importance of safeguarding vital statistics microdata and using the data only for authorised statistical or administrative purposes is emphasised.

It is very important for the office compiling vital statistics[24] to have microdata on all vital events. In particular, microdata are necessary for detecting errors, allowing corrected data to be fed back to the civil registration system. Complete microdata usually carry personally identifying information. This is what makes the data so sensitive.

Norway, for example, has a very strict Personal Data Act and a strong data protection authority. Nevertheless, the transfer of microdata from the national population registry and other public registers to Statistics Norway is permitted by the Statistics Act, even with the inclusion of name and personal identification number. Statistics Norway is, however, not allowed to publish information on individuals or anonymous information that can be linked to specific individuals, and all data must be published in an aggregate form such as in tables, analyses and research reports.

In April 2015, the European Union passed a specific regulation on this topic, in which it was clearly stated that national statistical offices should have free access to administrative registers and the possibility of using administrative records for statistics. In the regulation, it was also stated that, when a new administrative register is established, the national statistical office should be consulted in order to see how best to use information from the register to produce statistics.[25] In Botswana, vital statistics information is captured by three organisations, namely, the Ministry of Nationality Immigration and Gender Affairs, the Ministry of Health and Wellness, and the Administration of Justice. Data are transferred to Statistics Botswana for analysis and reporting (Statistics Botswana, 2019). In Kenya, the annual vital statistics report is produced by the Civil Registration Department, in collaboration with the Kenya National Bureau of Statistics (Civil Registration Department, 2014).

In general, it should be noted that both the civil registration authority and the national statistical office should have good routines in place to protect the data from misuse and use by unauthorised persons. This includes limiting or controlling access to buildings and to servers and computers that contain the microdata, and tracking all use of the data by date, time and person.

24 In most countries, the national statistics office produces the vital statistics, but not everywhere.
25 See http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015R0759&from=EN

2.3 Organisational structure, registration process and information flows

In this section, following the overall presentation of the organisation of the CRVS system in the previous chapter, the processes of registration and information flows should be presented in more detail.

The vital statistics report, especially if it is published for the first time, should include a description of how each type of vital event is registered in the country. A diagram may be included here or in the respective vital events chapter on the data flows for each kind of event (birth in facility; birth in the community; death in facility; death in the community, and marriage and divorce). This diagram may show a simple description of the process flow or a full depiction of the business processes for the registration of vital events.[26] Diagrams should be presented separately for each kind of event, as shown in figures B5.2 and B5.3 for Kenya (see Box 5).

The description of the registration process should include the following key issues:

- Where do the vital events usually occur? At home, at a medical facility or elsewhere?

If there is available information, it is useful to know the share of births and deaths taking place at the various locations.

- Where are the vital events usually registered?
- Are births and deaths registered at medical institutions or only at local civil registration offices, or both? Are there differences between birth and death registration on this?

The division of labour between various institutions should also be clearly explained, describing the role of the health facility and what falls under the responsibility of the local civil registration or national statistics office.

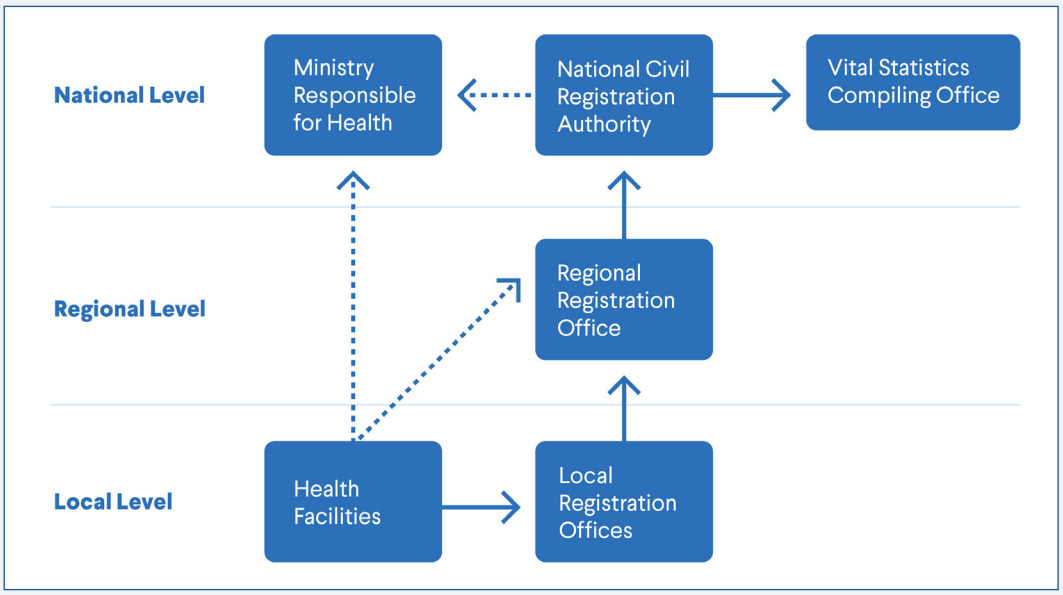
For the reader to have a quick overview, it may be useful to present a diagram of the interlinkages and data flows across agencies. Box 5 presents some examples of how this can be done (one general, B5.1, and two for Kenya, B5.2 and B5.3). Figure B5.1 presents a possible way of showing the overall structure and data flows within and between agencies. Such a structure includes:

- **Subnational levels of administration.** In some countries, there are only one or two levels, while in others there can be three or more. It is useful to mention the number of registration offices at each level.
- **Flow of information from one unit to another.** In figure B5.1, it is assumed that the local health facility is the first point of registration. The arrows show how the information flows go from there. It is assumed that information is shared with the local civil registration office, but in some countries there are no registration offices at the local level. In some countries, information may also be sent directly from the ministry of health to the civil registration office.
- **Data flow at central level.** It is common for the data to flow from the civil register to the national statistics office or other agency charged with compiling vital statistics. In some countries, the civil registration authority carries out the compilation and statistical work itself.

26 See example of Ghana's business process map for birth registration: http://www.crvs-dgb.org/en/toolbox/ghana-as-is-birth-reg-process/

Box 5
Civil registration and vital statistics organisation

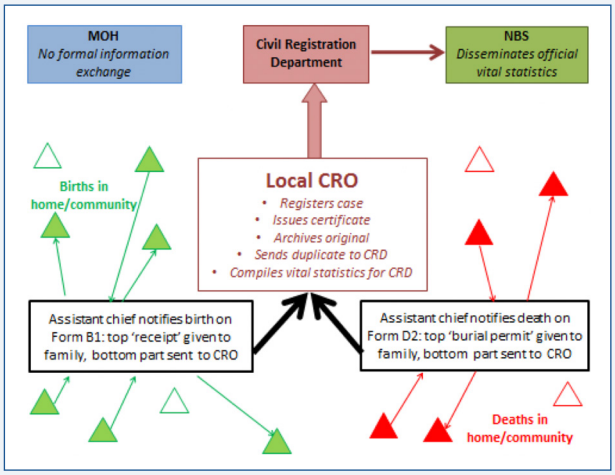
Figure B5.1
Possible organisational chart presenting multisectoral health facility–based engagements at various levels



It is possible to split the information in figure B5.1 into two or more figures, presenting various levels or reporting schemes. Figure B5.1 does not provide information on the responsibilities of the various actors involved.

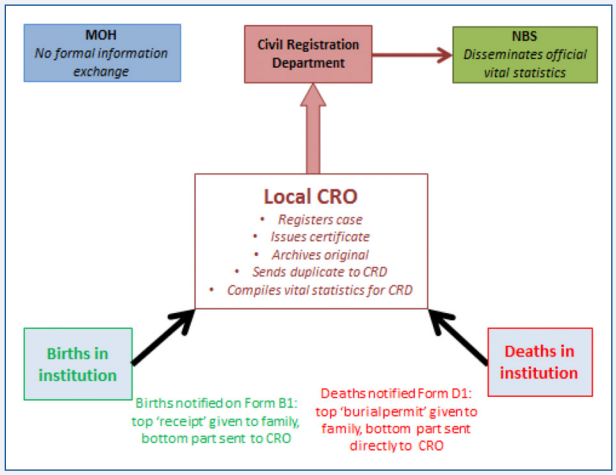
Figures B5.2 and B5.3 show two charts from a CRVS assessment for Kenya. They show the flow of information on vital events that occur at home, in the community or in a health facility. The 2013 vital statistics report for Kenya (Civil Registration Department, 2014) gives a more detailed explanation, which is quoted below as an example of how a civil registration and vital statistics system at the local level can be described.

Figure B5.2
Flow of vital events information occurring in the home or community in Kenya, 2013



Source: MEASURE Evaluation Kenya Associate Award (2013)

Figure B5.3
Flow of vital events information occurring in a medical institution in Kenya, 2013

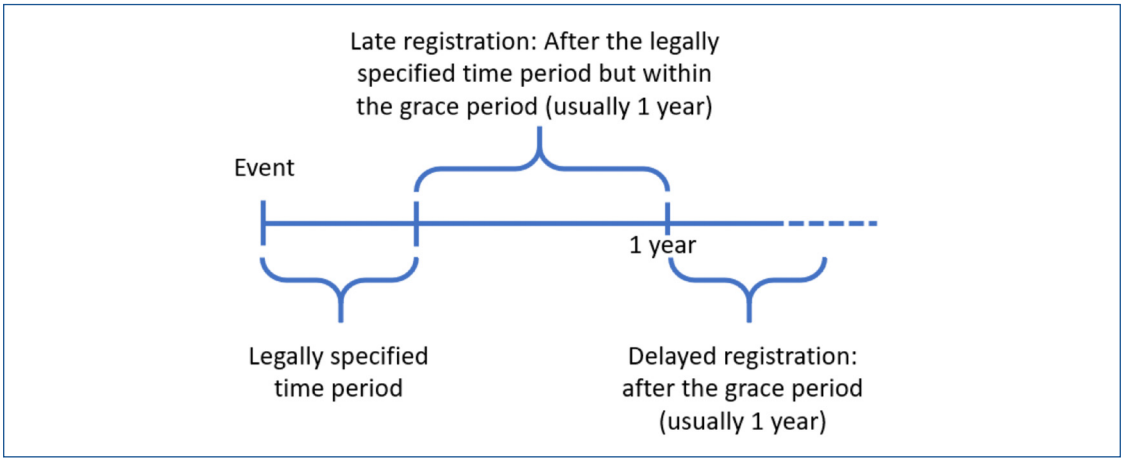


Source: MEASURE Evaluation Kenya Associate Award (2013)

Late or delayed registration

The *Principles and Recommendations* distinguish between 'late' and 'delayed' registration. A late registration is one that occurs outside the stipulated legal deadline, but within the grace period afforded by law or regulation (customarily one year). A delayed registration occurs after the grace period has expired. Some, but far from all, countries have introduced a special fee for late registrations. Such fees may encourage people to register earlier, but they may also have the effect of discouraging some people from registering their vital events at all (see Figure 2.1). To be able to distinguish based on the timeliness of registration, it is of critical importance that the date of registration, as well as the date of occurrence, are collected for every event.

Figure 2.1.
Diagram showing the difference between late and delayed registration



Source: UNESCAP Midterm Questionnaire[27]

This raises the issue of registrations that arrive too late for inclusion in the annual (or monthly or quarterly) statistics. There is no international recommendation on how to report this. The Nordic countries, for example, have a deadline of 1 February in the calendar year succeeding the year x under consideration. Vital event records that arrive after 1 February are included in the vital statistics for the current calendar year (x+1). This is more or less compensated by events that arrive too late for the current year and are included in the following year (x+2). For most countries, a cutoff date of 1 February may be too soon. Botswana, for example, has determined a cutoff point after which events that occurred in a given year and registered in the following year within a particular grace period (30 days for deaths, 60 days for births) will still be included in the tabulation (Statistics Botswana, 2019).[28]

Issuance of documentation

Include a description of the manner in which documentation is issued:

- Does the institution where the vital event occurred issue a notification document on the birth or death to the relatives?
- Does the local civil registration office issue birth and death certificates, or are these issued by another office? If yes, what is the procedure? Does the local civil registrar transmit the recorded information to the office responsible for issuing the certificates? How is this done, on paper or electronically?

27 See https://www.getinthepicture.org/resource/crvs-decade-2015-2024-midterm-questionnaire
28 See http://www.statsbots.org.bw/vital-statistics-report-2017

Transfer of records

Once the actual registration process has been described, it should be explained how the records are transferred from the local registration office (or medical institution) to a higher administrative level, regionally and/or nationally. A few key issues to consider:

- From which and to which office or institution are the records on vital events transferred? Is all information on the vital registration records transferred, or only part of it?

For example, if the health sector is responsible for notification or even for registration, are data from the vital registration records first transferred to the civil registration office at the local level, or are they transferred directly to a regional health or civil registration office? Are the transfers done electronically or on paper?

If the registration was not done with an online system, are there different systems for recording the information at various organisational levels—that is, on paper locally, or regionally and electronically at the centre? Are all local offices reporting the vital events on paper, or are some reporting electronically? Is the system electronic from the lowest administrative level at which registration takes place to the national level? Are electronic registrations recommended if resources are available?

It is important to clarify that data transfer of such sensitive information is authorised under a relevant statute, regulation or interministerial memorandum of understanding. Some questions that may be covered in this part of the report:

- If the data are transferred electronically, how is this done?
- Which is the main approach for data transfer: online, by mobile phone or tablet, or offline using memory sticks or similar?
- How often are the data transferred: daily, monthly, annually or irregularly?
- Are there differences in the frequency of data transfer by reporting level, and to whom are the data transferred? Are there regional differences in efficiency and delivery upon agreed time?
- Are data transferred at an individual or aggregate level? How is confidentiality protected and maintained?

It is very important to describe how data are secured and how confidentiality is protected. Key information is whether the organisations that compile the vital statistics have access to data or not and, if yes, to which data they have access. This is because microdata make it easier to check for errors and prepare the relevant tables. With aggregate data, there are very limited possibilities of checking the quality of the data received, and it is usually not possible to design tables that deviate significantly from those received.

2.4 Organisation of vital statistics production and dissemination

Clarify which organisations at the national level process and disseminate vital statistics. These might include the civil registration authority, national statistical office, and in some countries, the ministry of health.

- Once the data have been collected, who is responsible for processing and publishing them?

2.5 Incentives and disincentives for registration

It would also be useful to include a few paragraphs on factors that have influenced the registration of vital events positively or negatively (often called incentives and disincentives) in the time period for which the report is valid. In Box 6, examples of both incentives and disincentives have been included that might provide input on what could be relevant for the contents of this chapter in the vital statistics report.

Box 6
Incentives and disincentives for civil registration

People are more likely to register vital events if they are aware of the benefits that civil registration brings. In most settings, civil registration documents are the key to the following:

- Obtaining proof of place of birth and place of registration
- Obtaining identity numbers and papers needed for government services
- Establishing citizenship by showing the place of birth and origin of parents
- Obtaining proof of age in relation to rights and obligations that are conditional upon reaching a certain age, such as schooling, military duties and pension entitlements
- Providing evidence of identity and age for marriage
- Obtaining a driver's licence, passport or other travel documents
- Obtaining evidence of death for use by the heirs of the deceased
- Opening a bank account, obtaining a loan or microcredit

Other factors having a positive effect on the frequency and magnitude of birth registration and issuance of birth certificates (incentives) include the following:

- Easy access to free registration
- Short distance to registration offices
- Registration at health facilities so that the family can register a birth directly at the hospital before taking the baby home. Many hospitals report births to the civil registration office and provide the papers necessary for the family to get a birth certificate at this office
- Facilitation of civil registration while receiving the first vaccination of a child
- Mobile health and civil registration teams offering initial registration services using technologies (SMS notification, etc.)
- No payment for the registration and issuance of documents, including for late or delayed registration

Similar factors affect registration of deaths. Death registration completeness could be increased where there is a regulation or law that requires a burial/cremation permit or that inheritance requires proof of lineage and/or that a death has occurred. Obtaining evidence of cause of death may also be important for insurance or legal purposes.

Chapter 3. Data quality, timeliness of registration, and registration completeness

3.1 Data quality

This chapter should first provide information on the approaches that are used when considering data quality and processing data. The information on data quality may be brief, but it is important. The chapter should include information related to any specifications in the legislation or overall statistical guidelines regarding data quality and how corrections to the civil register can be made. There might be concrete language in the civil registration law concerning this matter.

On a more general note, there might be guidelines within the national statistical system on how data should be cleaned. This will often be linked to quality assessment or quality assurance frameworks. If a specific method or system is used, this should be specified, as well as its main aspects.

- What are the main procedures for checking for data errors?
- Are there routines for quality control at the local registration offices? Is data quality control carried out on a regional or a national level?
- What key methods are used for improving quality?

Provide a short description of the measures that have been taken to improve data quality.

- If the data quality control is done at a central level, are there specific mechanisms for verification against the local level (e.g., checks against original paper forms or with the persons who provided the information)? How and how often? If not, have errors been corrected using other methods? Which ones?[29]

Here we provide additional guidance on how to check and improve data quality. The *Principles and Recommendations* also provide useful information on quality assurance.

There is a need to evaluate the quality of the civil registration data and check for errors. Errors are common in all systems, even the best, and may occur at any stage of the civil registration and vital statistics process, owing to reporting errors, clerical errors, misprints, misunderstanding, errors in the computer code, tabulation errors, problems with the electricity supply, and perhaps corruption. A routinely run quality assessment procedure is critical. Some national statistical systems have procedures for this. It would be useful for the reader to know how the civil registration data are checked and verified for errors.

Checking for errors

The first task is to identify errors and present the methods of error detection. The office registering the information should ideally have a system for checking the data while they are being entered. However, external control mechanisms, such as random checks at the central civil registration level, are also important. Common approaches are:

Checking against other time periods and sources of vital statistics: A common way of detecting errors is to compare data with that of other time periods or sources of vital statistics. Consistency checks should always be carried out both on the raw data and on key indicators (e.g., birth and death rates) before they are used or made more widely available. Comparison of raw data can be done by checking against corresponding figures from previous years. If there are major changes from one month or year to another, this should be investigated further.

29 For example, Statistics Botswana uses Microsoft Excel to identify data gaps and inconsistencies, such as age of mother less than 12 years old or unrealistic birth weights. Statistics Botswana engages with the Department of Civil and National Registration to make these corrections (Statistics Botswana, 2019).

Most countries have censuses and surveys that include questions about vital events occurring in the population, which may provide fertility and mortality estimates by age and sex. Age- and sex-specific mortality and fertility estimates from civil registration should be compared by the national statistics office with the estimates from other data sources. Data can also be checked for various regions or other subdivisions. Typically, vital event indicators from censuses and surveys are higher than comparable rates from civil registration, suggesting an underreporting of deaths and births in the civil registration system. The civil registration completeness rate would provide further clues on this.

Checking proportion of missing values: For each vital event, are all the specified variables recorded, or are there missing values, such as for the age of the mother of a child? What is the general picture? Is it, for example, the case that many variables lack information, although they are specified as obligatory on the birth or death registration forms? Does the law say anything about correcting errors?

Checking for duplicates: Has information on some vital events been recorded or reported two or more times? Are there any records that are identical or almost identical?

Checking data that seem very implausible: Are there any odd patterns of births or deaths by age of the mother/age of deceased or by month, or out-of-range values for date of birth and age of the mother/the deceased, or unrealistic values of crude birth and death rates and other indicators for some regions?

Checking for digit preference, or 'age heaping': Are there any values that occur more often than others without any specific reason? For example, when people are asked about their age, there is often an overreporting on ages ending in 0 or 5, and sometimes also on other ages, such as 7 (this is referred to as age heaping). This is mostly a problem in censuses and surveys, but it may also occur in a civil registration system when recording background information on parents who have not previously been registered, when clearing backlogs, and for recording deaths of persons without a birth registration. If data are presented in the vital statistics report in groups of five or more ages, this is of less importance. However, if variables are published for single ages, this should be looked at more closely, using appropriate statistical techniques.[30]

Dialogue with registration officers

If data control is carried out elsewhere than at the place of registration, for example, at the central agency responsible for vital statistics, it is important to mention in the vital statistics report how detected errors are reported back to the responsible registration officers.

- Do they receive information on key errors, and are they expected to go through and improve data quality, if possible? Are they allowed to change the records?

In general, focusing on errors that have the most impact on the results can be a useful approach. This is also true for differences between regions and between local offices. If one office has many errors and missing values, then it might be useful to focus feedback and work to improve data in this specific office. The reason is that improved quality from poor performers often may lead to a significant change in the general quality of data. Different approaches on how quality checks and feedback are carried out can be useful information for the vital statistics report.

Correcting errors

There are various methods for correcting errors. The best approach is that the local registration officer goes through the records and fills in missing or erroneous information, if possible, and reports back to the central or regional level on these changes. Other methods exist and can be

30 For example, see this guidance on Whipple's Index: https://unstats.un.org/unsd/demographic/products/dyb/DYBcensus/V1_Notes1c.pdf

considered. Some examples are briefly described below. Correction methods used should be described in the vital statistics report.

Removing duplicates, errors and outliers: If this is done, the original data set should first be saved and there should be methods for marking changes, such as flagging records in the database. In addition, before removing duplicates, there should be a check to see whether the event is a multiple birth.

Imputation of missing or inconsistent values: In this process, missing or deficient values may be generated by a process called imputation. A typical imputation technique is to use similar observations or an average value to replace missing cases. However, imputation should be considered only as a last resort, and should be used with caution and thoroughly documented. Imputation may be misleading since it reduces the number of missing values, mistakenly giving the impression that the quality of the data has been improved.

Small numbers

The number of births and deaths in areas with small populations may fluctuate from year to year owing to random variations. This variability is not due to sample errors, given that the vital events are usually registered for the total population. Consequently, one should be careful when analysing rates based on small numbers of vital events. This is the case for all countries, regardless of their size and the quality and completeness of their civil registration. For the United States of America, for example, the National Center for Health Statistics (NCHS) annual vital statistics report includes a table that provides correction factors when the number of deaths is less than 100 (CDC, 2016, table XIV).

3.2 Timeliness of registration

A graph or table showing the proportion of vital events that are registered within the timelines set by the law would be useful. It would also be useful to know whether in actual practice the vital events are registered immediately or only some days, weeks, months or years afterwards. Box 7 provides examples of how timelines are presented in South Africa and Georgia. In Botswana's 2012 vital statistics report, there is a table and a chart showing whether the births were registered currently or late (i.e., occurred in previous calendar years). Another table shows how soon the births were registered (within one month, one to three months, etc.).

It may also be useful to make a table showing when (e.g., how late) the events that took place in a specific year were registered. Box 7 also provides an example of this.

Notes on completing Section 3.2 in the Template: This section is *optional*. If data on the timeliness of registration (or extent of delayed registration) are available, they can be presented here. The table provided is for annual data. However, if a 'late' registration is defined as seven or 30 or X days after the event, the table can be updated to match the system.

For data shown in the report, it should be indicated if only current registration data (from events occurring in that year) are used, or whether it includes both current and late registrations. Some countries publish vital statistics by the year of registration only (and not the year of occurrence), which is not recommended.

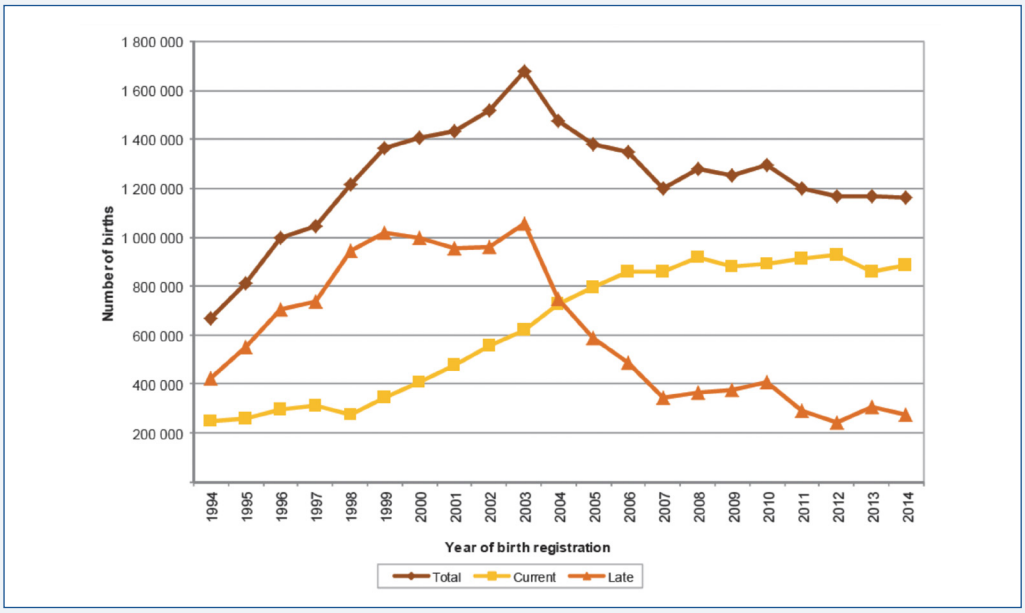
See Tables 3.1–3.3 in the Template for examples.

Box 7
Timeliness of registration

This box provides a few examples relating to the timeliness of registration. Figure B7.1 is from South Africa's vital statistics report for 2014 and presents recent trends in current and late registrations. In South Africa, the law requires that registration be done within 30 days of a birth (defined as current registration). It can be seen that there is a downward trend in late registration. There should be an explanation for this decline: Is it because more people are aware of the need to register their child, or are there other reasons? Why is the total number of registered births declining? Are there fewer births in total, or are fewer people registering the births of their children? To address the last question, one should look at completeness rates.

The South Africa Vital Statistics Report explains the reasons for the large number of late registrations. This was due to registration of all those who came to register a birth and who themselves had not be previously registered. The total number of births is declining mainly due to the fall off in late registration, not timely registrations. Absolute numbers of births will tend to diminish with declining fertility.

Figure B7.1
Birth registrations by status of registration in South Africa, 1994–2014

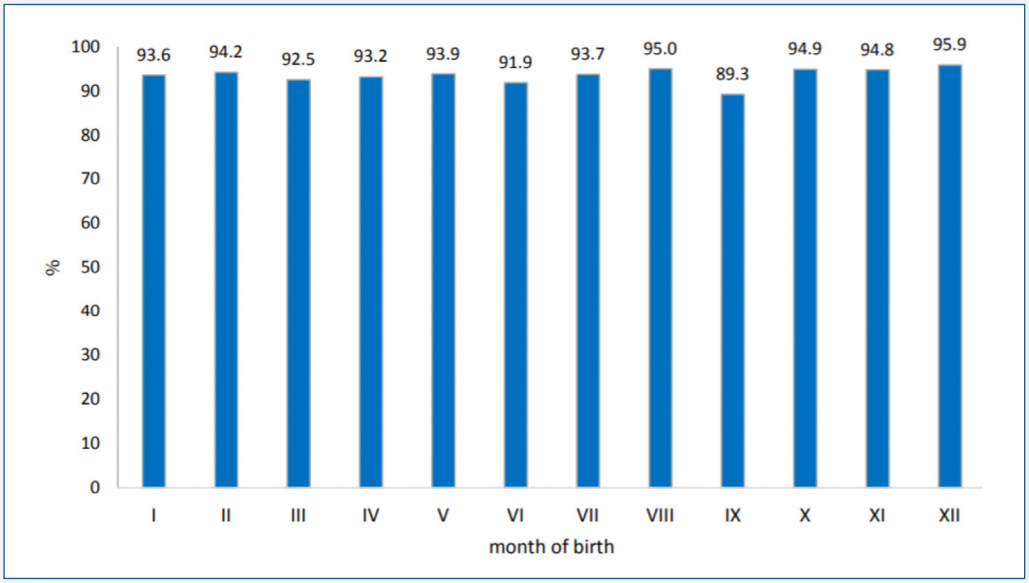


Source: Statistics South Africa (2015a)

Box 7 (continued)
Timeliness of registration

Figure B7.2 shows the percentage of birth registrations each month that occurred in the same month as the birth in Georgia in 2018. It is worth noting the high percentages each month, highlighting the timeliness and efficiency of Georgia's civil registration system.

Figure B7.2
Live births distribution by months of birth in 2018, for which the months of birth and registration are the same, Georgia 2018



Source: National Statistics Office of Georgia (2019)

3.3 Completeness of registration

In this section, the completeness rates of birth and death registration at the national and subnational levels should be presented. This is important as:

- The rates alert the audience to discrepancies in completeness and provide a caution in the interpretation of statistics that are presented throughout the report
- They provide an objective baseline that can be used to measure and evaluate future progress in completeness
- They can be used to adjust published indicators, such as crude birth and death rates.

Because the actual number of vital events is usually not known, civil registration completeness should be calculated on the basis of projections or estimates of the *expected* number of vital events. Box 8 provides more information on calculating completeness and how it differs from the concept of 'coverage.' Box 9 describes how to calculate the expected number of events to estimate completeness. It is particularly important to include estimates of the proportion of the total number of births (and deaths) that are registered in the country and in each region and local administration. These proportions are essential indicators of civil registration completeness. If the proportions are low, the vital statistics based on registrations are less useful for planning.

Notes on completing Tables 3.4–3.7 in the Template: Completeness rates are presented separately before statistics on vital events are presented in subsequent chapters. It is also a viable option to present completeness rates for each vital event together with the general vital statistics results in Chapters 4 and 5.

Box 8
Coverage and completeness

The two terms 'coverage' and 'completeness' are often used incorrectly. Coverage is sometimes used when completeness would have been a more appropriate term. Later in the document, the focus will be primarily on completeness rates, but coverage is, in many countries, also used as an indicator of the share of the population that is covered by the civil registration system. Moreover, some countries continue to use it to mean completeness, which is now considered to be the most appropriate term for the proportion of the actual number of births (or deaths) that are registered.

Definition of coverage

As defined in the *Principles and Recommendations*, a vital statistics system should have universal coverage: it should include all of the vital events occurring in every geographical area and in every population group of the country. Coverage, then, has two important components: geographic and population-based coverage. Geographic coverage measures the proportion of the population of a country that has access to civil registration. Population-based coverage refers to the fact that all vital events occurring to the resident population should be included in the total count of the geographical area of interest. Many countries, for example, have separate registration systems (or none) for 'foreign residents', excluding the registration of their events from the overall CRVS system.

Definition of completeness

Civil registration completeness is the number of registered events divided by an estimate of the total actual vital events (births or deaths) in the population during a specific period of time. Complete registration has been reached when every vital event that has occurred to the members of the population of a specific country (or area), in a specified time period, has been registered in the system (i.e. 100 per cent completeness). Vital statistics from registration data are complete when, in addition to registration of each event, there is a vital statistics report, which is forwarded to the agency responsible for the compilation and production of vital statistics (*Principles and Recommendations*, para. 576).

Estimation of completeness rates

The completeness rate is defined as the percentage of the total (actual) number of events that are registered. There are two approaches to estimating the completeness of civil registration: direct methods and indirect methods. The direct method entails matching registration records with records containing some or all of the same information from an independent source, such as civil registration records for other events, administrative and social records, and censuses and surveys. Indirect methods are demographic methods that use registration data, population, and a set of demographic assumptions to estimate completeness. Death registration completeness can also be estimated using an empirical method or comparison to an estimate of total deaths. This empirical method estimates completeness using a statistical model with inputs of registered deaths, population, under-5 mortality rate, and the percentage of the population aged 65 years and above (Adair and Lopez, 2018).

An often-used method to estimate completeness of civil registration is to compare the number of registered events to the estimated number of actual events. The number of registered events is the number recorded by the civil registration system, whereas the number of actual events must be estimated on the basis of other data sources. Usually, the best source is the most recent population census. However, if it has been some time since this census took place and the population or the demographic rates have changed significantly, the census numbers will be incorrect.

Box 8 (continued)
Coverage and completeness

In this case, the number of actual events should be estimated using population projections or by using information from demographic household surveys. Estimates of total deaths are usually made by the national statistical office, the Global Burden of Disease, or the United Nations Population Division (Box 9). It is often useful to estimate the completeness rates at subnational levels if the number or estimated number of events at subnational levels is available.

The completeness of registration of live birth rates can be calculated using the following formula:

$$\textit{(1) Completeness rate for births} = \frac{\text{Number of registered births within the year of occurence}}{\text{Estimated number of live births within the year}} \times 100$$

The number of registered births is those from the civil registration system and reported before the cutoff date, as explained in Chapter 2. If a population census has been carried out recently, ideally in the same year as the data that are analysed, the total number of births can be used directly. However, since births are commonly underreported in censuses, it would be better to use fertility rates from a Demographic and Health Survey (DHS), or use the United Nations estimates of total births. Alternatively, if estimates of births exist for the relevant year, these can be used. National figures are recommended, typically from the national statistical office, if available. The modelled population estimates and projections from the United Nations Population Division are an alternative if there are no reliable national figures. For birth registration, it is important to use a cutoff date for late registration, which can be common (e.g. families not registering a birth until there is a need for a birth certificate to access a health service or enroll in school).

Similarly, completeness rates for deaths may be obtained by this calculation:

$$\textit{(2) Completeness rate for deaths} = \frac{\text{Number of registered deaths within the year of occurence}}{\text{Estimated number of deaths within the year}} \times 100$$

The number of registered deaths is those from the civil registration system. The total number of deaths, as was specified for births, can be obtained from the most recent population census or by using information from a demographic household survey.

Alternatively, if estimates of deaths exist for the relevant year, these can be used. National figures are recommended, typically from the national statistics office, if available. The modelled population estimates and projections from the United Nations Population Division are an alternative if there are no reliable national figures.

Box 9 provides a description of how these calculations can be made if the total number of deaths is unavailable or of poor quality. If age data are nonexistent or poor, the total number of deaths may be estimated by multiplying the estimated crude death rate by the total population size (and dividing by 1,000).

It should be noted that for countries with close to universal civil registration, the above method for calculating completeness rates is not precise enough due to problems of declining accuracy of population estimates as one gets further away from the census year (see Box 9). As a result, countries could obtain rates above 100 per cent when they register 98 per cent of their vital events, or alternatively they could obtain rates of 98 per cent when they register all vital events.

Box 9
Calculating the expected number of births or deaths

The expected number of births or deaths may be calculated using either crude birth and death rates or age-specific birth and death rates. This number can then be used to calculate the completeness (see Box 8). Age-specific rates yield more accurate estimates of expected events because they control for age. All the completeness rates should therefore preferably be generated using age-specific information if available.

Sex- and age-specific birth and death rates may be estimated from the most recent census or from a sample survey, such as demographic and health surveys. If there are clear time trends, the rates should be projected. If no age-specific rates are available and there are no relevant data with which to estimate them, they may be taken from the database of the United Nations Population Division.[31]

Estimates of the population size may be taken from a population register, which relatively few countries have, or more commonly from population projections, which are normally based on the most recent census. It should be noted that there are problems of declining accuracy of population estimates as one gets further away from the year of the most recent census. The reasons for this are primarily changing trends of fertility, mortality and migration rates, both at the national and regional levels. This is particularly true for small areas and is usually the reason why completeness rates for small areas may be greater than 100 per cent.

If reliable national population projections are not available, they may be taken from the database of the United Nations Population Division.

Multiply the crude birth rate or crude death rate by the population size to calculate the number of expected events.

$$\textit{(3) Estimated number of expected events} = \text{CBR or CDR} \times \text{Total population size}$$

The calculation of completeness should be done for the country as a whole and preferably for all the vital events presented in the report. Other groupings should also be considered if available, namely, sex, age, region, urban/rural residence, place of occurrence, and place of registration. At a minimum, the report should report completeness by sex, broad age groups, and urban/rural location.

However, as discussed in Box 9, it can be a challenge to get reliable and accurate denominator data at the regional level, especially if the census is not very recent. Moreover, subnational population projections tend to be rare and quite unreliable over time. Internal migration, for example, in particular rural-to-urban migration, is common in most countries but is not reported in most national registration systems (and where it is, quality tends to be poor) (see Box 10). Estimated completeness rates may therefore be influenced by unrecorded population changes caused by internal migration. This should be taken into account when the estimates are made.

31 See http://esa.un.org/unpd/wpp/DataQuery/

Box 10
Migration

Internal and external migrations are not considered vital events by the United Nations. These events are nevertheless very important, both in peoples' lives and for the population development of a country or a region.

Migrations are generally more complicated to record (and define) than births and deaths. Most migrations must be registered by the migrants themselves, and incentives for registering migrations—and in particular emigrations—are often much weaker, and sometimes negative, than for births and deaths. Many countries do not register migration or change of address.

A migration is more ambiguous than a birth or death because it involves a move across some geographically defined boundary to change the place of usual (or permanent or legal) residence. Migrations can be subdivided into *international* (or external) migrations, which are defined by a crossing of an international border with intent to change residence, and *internal* migrations, which occur within the borders of a country. United Nations (2017b) has published a handbook on how to produce statistics on international migration through population censuses. In addition, a United Nations Expert Group on Migration Statistics was initiated in 2017 with the objective of improving statistics on international migration for effective policymaking.[32]

The use of modern technology, passports and unique identification numbers makes it possible to estimate the number of cross-border moves that are international migrations. Several countries have introduced this methodology, including Georgia.[33] In the United Kingdom a sample of international passengers is asked how long each migrant intends to remain in or out of the UK (Office for National Statistics, 2019). Another possible data source of immigration is records of residence permits. Migration may also be recorded in censuses and sample surveys. The Nordic countries register internal and international migrations on a continuous basis to update population registers and publish migration statistics. Other countries that register migrations at local registration centres include Mongolia (only internal) and Kyrgyzstan (both internal and external).

If data are available, the vital statistics report could include a table or graph showing the number of immigrations, emigrations and net migrations for recent years. It would also be useful to include a table showing the most important countries of immigration and emigration.

Information on why there are differences between the various groups should be included, if available. For example, if there has been a campaign to improve birth registration in one region, this could be linked to the regional completeness rate.

- Does it look like the completeness rate in one region is significantly higher than in other comparable regions?
- Do areas with lower education have lower levels of completeness?

If available, completeness rates based on other characteristics, including for vulnerable groups, could also be estimated and presented. Surveys may be a possible source for this information.

32 For more information on the work of the Expert Group and its resources see https://unstats.un.org/unsd/demographic-social/migration-expert-group/
33 See https://www.geostat.ge/en/modules/categories/322/migration

Typical examples include:

- Remote and hard-to-reach areas of the country
- Specific population groups (e.g., specific ethnic groups or refugees)
- Age of mother
- Previous number of births of the mother
- Level of education of mother and father

In order to estimate the levels of completeness by different characteristics, data on the size of these groups are also needed, which is not always available.

As emphasised earlier, it would improve the vital statistics report if the results were discussed and analysed and not merely presented. This is important because it will provide the civil registration administration and policymakers with information on which areas or groups need special attention in order to attain increased completeness.

Another aspect of completeness over time is linked to late registrations. In many countries, many births are not registered in the year of delivery but are instead registered one or more years later. It is, therefore, common that the completeness rates for children born in a specific year increases over time. If available and relevant, a table or graph could be included that shows the increase in completeness over time for births occurring in a specific time period. This can give decision-makers an understanding of when children are registered and possibly take action to improve timely registration. There are many ways of displaying this (see Box 7).

3.4 Data adjustment and redistribution

Data adjustment and redistribution should be undertaken by a skilled demographer who is familiar with these statistical techniques.

Adjustment for incomplete registration

If the number of registered events in a population is significantly underreported, indicators for fertility and mortality will be incorrect and may have misleading effects on policies. The infant mortality rate (IMR) could be particularly affected by both since neither birth nor death may be recorded. The fertility level will be considered too low and the life expectancy too high (because too few deaths are registered). But if there are reasonably reliable estimates of the completeness of registration, indicators and absolute numbers may be adjusted for incompleteness. Note that there is no agreement among experts on the matter of when to adjust or not to adjust data. Some argue that data should not be adjusted if completeness is below 50 – 90 per cent. Others are of the opinion that adjustment should always be performed. Suffice it to say that if in doubt, the report writers can publish both adjusted and unadjusted numbers or seek the input of a demographer who can explain the implications of adjusting data in the local context.

If, for example, it has been found that 55 per cent of deaths are registered, the adjusted number of deaths is found by dividing the registered number of deaths (here 50,000) by 0.55:

$$\textit{Adjusted number of deaths} = \frac{\text{Registered deaths}}{\text{Completeness}} = \frac{50{,}000}{0.55} = 90{,}909$$

Other indicators, such as crude birth rate and crude death rate, may be adjusted in the same way.

Note that the life expectancy cannot be adjusted in this simple way, since it is derived from a complex formula. To do this, each age- and sex-specific death rate would have to be adjusted before producing a new life table with adjusted life expectancies. This would require an assumption that the completeness of death registration is the same for all ages and both sexes, which is usually not the case. See for example, Dorrington and colleagues (2019) for age differences in

registration of deaths in South Africa. A similar assumption applies regarding completeness by age when calculating the total fertility rate (TFR).

Note also that if *regional* vital statistics numbers and indicators are adjusted, *regional* completeness rates should be used, if available. There are often large regional differences in completeness, with remote areas registering fewer vital events than the capital city.

If data are available on death registration completeness by age group (for example, from a recent census or household survey), then sex- and/or age-specific completeness rates should be applied to the data. In the example below, deaths from the census were used to calculate registration completeness by sex and broad age groups. This was then applied to the original data to provide the adjusted number of deaths by sex and age group. Note that the total number of adjusted deaths is the sum of each of the age-specific adjusted deaths (and it may differ slightly from dividing the total number of registered deaths by overall completeness).

Table 3.1
Adjusting deaths for incomplete registration by age and sex

Age at death (years)	Registered deaths		Completeness of registration (%)		Adjusted deaths	
	Males	Females	Males	Females	Males	Females
0–4	34	28	68	58	50	48
5–24	45	14	81	83	56	17
25–74	1025	600	93	92	1102	652
75+	588	665	82	78	717	853
Total	1692	1307	89	84	1925	1570

Adjusted results are more unreliable the lower the completeness rate is, due to the possible selectivity biases mentioned above.[34]

Notes on completing Tables 3.8–3.10 in the Template: There is no expert consensus about thresholds of completeness above or below which one should or should not adjust. While this section is *optional*, our recommendation is to carry out the adjustment and report *both* adjusted and unadjusted figures. Once data have been adjusted, remember to use the adjusted and unadjusted numbers in the subsequent sections for all calculations.

Redistribution for missing values

Another type of adjustment that may be done is redistributing values that have not been recorded, for example, age. To do this, the age distribution of deaths for which age at death was recorded (or the age of the mother, for births) are applied to the missing values to estimate how many of the deaths or births with unknown age should go into each age group. As age patterns are different for males and females, the redistribution of these deaths should be done separately by sex. Whether the redistribution is done by year, or over an aggregated period, will depend on the number of births or deaths, and the proportion that have missing values.

In the example below, the proportion of deaths (with age at death recorded) occurring in each age group is calculated, and this proportion is then applied to the 33 male and 24 female deaths with an 'unknown' age at death. This gives the number of 'additional' deaths that should be added to the original number of deaths within each age group. Note that the total number of deaths remains the same (399 for males and 329 for females). However, in the adjusted columns, there are now zero deaths with an unknown age. When calculating the proportions, the denominator is the total number of deaths with a *known* age, so in this example, 366 deaths for males and 305 deaths for females.

34 Note that that adjusted figures may be unreliable when completeness is low. Therefore, it is also acceptable to not adjust and instead report unadjusted values.

Table 3.2
Adjusting deaths for missing registration of age

Age at death	Number of deaths		Proportion of deaths (%)		Adjusted number of deaths	
	Males	Females	Males	Females	Males	Females
<1 year	14	12	3.8	3.9	15	13
1–4 years	6	4	1.6	1.3	7	4
5–9 years	2	1	0.5	0.3	2	1
10–14 years	1	4	0.3	1.3	1	4
15–19 years	5	6	1.4	2.0	5	6
20–24 years	9	13	2.5	4.3	10	14
25–29 years	16	12	4.4	3.9	17	13
30–34 years	23	12	6.3	3.9	25	13
35–39 years	25	14	6.8	4.6	27	15
40–44 years	22	15	6.0	4.9	24	16
45–49 years	26	22	7.1	7.2	28	24
50–54 years	35	26	9.6	8.5	38	28
55–59 years	38	28	10.4	9.2	41	30
60–64 years	48	32	13.1	10.5	52	35
65–69 years	58	44	15.8	14.4	63	47
70–74 years	36	36	9.8	11.8	39	39
75+ years	2	24	0.5	7.9	2	26
Unknown	33	24	0.0	0.0	0	0
Total	399	329	100.0	100.0	399	329

Below is also an example of birth statistics that were adjusted for missing values on age of mother at birth, following the same steps.

Table 3.3
Adjusting births for missing registration at delivery

Mothers' age group (years)	Original data		Adjusted data
	Number of births	Proportion (%)	Number of births
<15	2	0.0	2
15–19	239	4.8	250
20–24	1,088	21.8	1,140
25–29	1,596	31.9	1,673
30–34	1,298	26.0	1,360
35–39	640	12.8	671
40–44	124	2.5	130
45–49	12	0.2	13
50+	1	0.0	1
Unknown	240	0.0	0
Total	5,240	100.0	5,240

In the vital statistics report for a country, both the original and the adjusted numbers should be reported, and the adjustment method should be explained.

Notes on completing Tables 3.11–3.12 in the Template: If data are available on births by age of mother and deaths by age and sex of decedent, use the two example tables provided to redistribute for missing values.

Chapter 4. Births

In this chapter, statistics on registered live births are presented. The tables and graphs to be presented will naturally depend on the variables that are collected when registering a birth. When considering which tables on births to include in the vital statistics report, it is useful to look at the 'Minimum list of tabulations' section on live births in the *Principles and Recommendations*, as shown in Annex II. Some characteristics of the mother recommended in the *Principles and Recommendations*, such as completed education, are rarely collected by civil registration authorities. If such data are available, the educational level and the occupational status of mothers can be very useful information for policymakers.

If possible, all tables listed in Annex II should be included in the report. However, some of the variables may not be available in some countries, and especially for births that occur outside of health facilities. Consequently, a set of 'first priority' and 'second priority' tables is proposed. The first priority set of tables is based on information usually available on birth notifications, registration sheets or birth registers.

It is also important to emphasise that the chapter concerns live births only.

The main indicator, the total number of registered live births, should be published for as many years as possible. If possible, there could be an attempt to distinguish changes in this number that may be due to changes in registration completeness, the number of women between 15 and 49 years of age, or the changing fertility level (total fertility rate).

As the list of tables in Annex II indicates, live births should be presented for various demographic groups. If the number of births in a group is not known for all births, the number of unknowns (missing data) should be entered in a special column, marked Unknown, Other or Missing.

In the following section, instructions on how to complete the seven first priority tables are provided. The presentation of additional tabulations should be considered, depending on data availability and stakeholder interests. For more information on the key birth registration variables, see the 'Birth registration variables' tab in the Excel Workbook. Box 11 shows examples of birth registration tables and figures from some countries' vital statistics reports.

4.1 Births by place of occurrence

Counts of the numbers of live births by place of occurrence are useful for the planning and evaluation of medical facilities and manpower, as well as other health and social programmes, and may also be used to monitor the workload and performance of the civil registration system in each civil division. Unusual changes in counts of births or in the ratio of male to female births may indicate registration problems or changes in the availability of medical care or health and hospital facilities.

Sex ratio at birth

The sex ratio at birth is the number of male live births for a specific area during a specified period divided by the number of female live births for the same area and period multiplied by 100:

$$\textit{Sex ratio at birth} = \frac{\text{Number of male live births}}{\text{Number of female live births}} \times 100$$

The sex ratio at birth is an important demographic indicator of the distribution of boys and girls at birth. The indicator is calculated as the number of boys per 100 girls. This number is usually in the order of between 103 and 107 boys per 100 girls. Numbers that are very different from this range may indicate faulty registration procedures (or random fluctuations due to small numbers of births). In some societies, higher sex ratios at birth have also been taken as evidence of gender-selective abortions. There may also be under-registration of girls (or boys) in some areas. Data for India in 2010 show that 16 per cent more male than female births and 40 per cent more male

than female deaths were registered.[35]

Notes on completing Table 4.2 in the Template: If data on births by place of occurrence are not available, the table could be changed to show total births for the country by year, as shown below.

4.2 Births by place of occurrence and usual residence of mother

Mother's place of usual residence is the most common definition when classifying births by region or other administrative units. Data on the number of births by place of usual residence are useful for studying the geographical distribution of births. The number of births by place of residence is also useful for program planning, evaluation and research in many fields of application, such as health, education, population estimates and projection, and social and economic policy.

If it is customary for expectant mothers to travel from their homes or elsewhere than their place of usual residence to give birth, it may be useful to classify data on births by both place of occurrence of the birth, and place of usual residence of the mother. This information may be used to see whether mothers are giving birth in the same civil division as that of their residence or in other geographical locations.

It should be noted that, in Annex II, most tables on births relate to place of usual residence of the mother. However, it is acknowledged that many countries may not collect information on place of usual residence of the mother and even if they do, the data are not collected in a manner amenable to geographic coding and, hence, easy tabulation.

Notes on completing Table 4.3 in the Template: to complete this table, data on the number of live births by place of occurrence and by place of usual residence of the mother are needed.

4.3 Births by age of mother

The tabulation of live births by age of mother is essential to the study of fertility and fertility differentials. This tabulation should be done both alone, and in conjunction with other items such as place of usual residence and marital status of the mother. It is also useful in formulating welfare and social policy, including family planning.

Notes on completing Tables 4.4–4.6 in the Template: If data are available by urban and rural location (for place of usual residence of the mother) complete the two tables in the Template. If data are only available for the total country, delete the second table and just provide data for the country. If this is done, remember to update the section and table headings (remove reference to 'place of usual residence of the mother').

35 Source: Office of the Registrar-General of India (2013)

4.4 Births by site of delivery

Statistics on live births by site of delivery and attendant at birth are of great use in evaluating the need for medical services and for providing insight into patterns of infant mortality.

Notes on completing Table 4.7 in the Template: If data by place of occurrence of birth are not available, present data on all births. If data on the type of attendant at birth are not available, data on births by site of delivery by year could be presented, as shown below.

Box 11
Country examples of birth registration tables and figures

The table and figures below provide examples of how birth statistics may be presented. Table B11.1 provides a summary of the most important birth statistics for Botswana in recent years, including births according to marital status, birth registration completeness, and mean maternal age at birth.

Table B11.1
Summary statistics on births in Botswana, 2012–2017

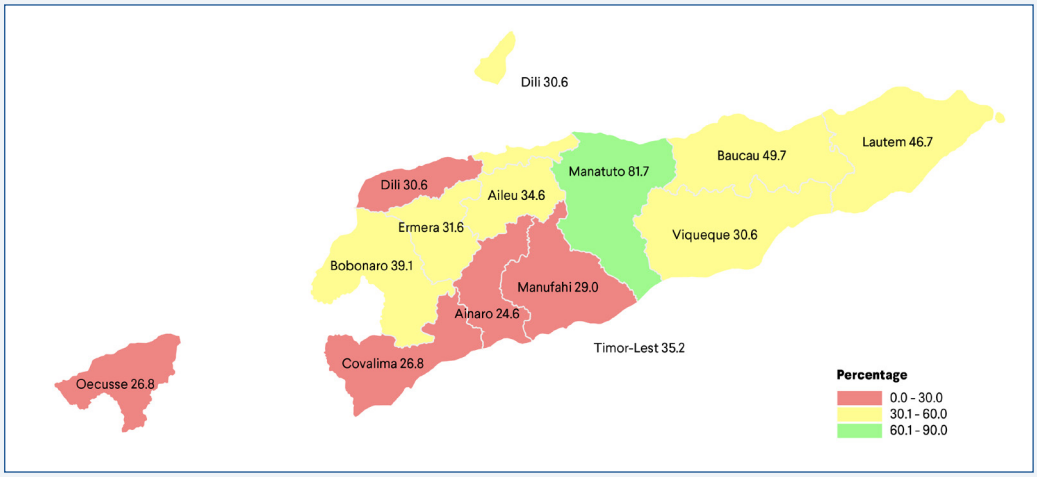
		2012	2013	2014	2015	2016	2017
Live Births Male	number	20 738	22 732	21 142	23 413	25 258	21 940
Female	number	20 118	22 062	20 599	23 352	24 726	21 350
Total (occurred)	number	40 856	44 794	41 741	46 765	49 984	43 290
Total Population (projections)	Number	2 068 529	2 110 050	2 149 255	2 185 903	2 219 732	2 254 021
Births (projected) 1	Number	55 859*	53 495*	50 924*	48 159	54 2672	45 690
CBR (using registered births)	Rate	19.7	21.2	19.4	21.4	22.5	19.2
CBR (using projected births)	Rate	27.0	25.4	23.7	22.0	24.4	20.3
Sex ratio	ratio	103.1	103.3	102.6	100.3	102.2	102.8
Nuptial births	Percent	23.0	22.5	23.6	21.8	28.3	26.4
Ex-nuptial births	Percent	77.0	77.5	76.4	78.2	71.7	73.6
Mean age of mother at birth	years	27.3	27.3	27.6	28.3	28.5	28.0
Birth registration	Percent	73.1	83.7	82.0	97.1	92.1	94.7
Health facility deliveries	Percent	99.7	99.2	99.5	99.5	99.8	99.7

NB: The figures in the table above refer to registered births that occurred in the given year.
1 low variant scenario projections 2011-2026 were used for years 2012-2017
2 Live births obtained from Health Statistics
Ex-nuptial birth includes births to never married, widows and the divorced mothers.
*Births readjusted according to the population projections 2011-2026

Source: Statistics Botswana (2016)

Box 11 (continued)
Country examples of birth registration tables and figures

Figure B11.1
Completeness rates of reported births by municipality, Timor-Leste, July 2014 to June 2015



Source: Timor-Leste Births and Deaths Statistics Report 2014–2015[36]

4.5 Crude birth rate

The crude birth rate (CBR) is a basic measure of fertility. It is the number of live births for a specific area during a specified period divided by the total resident population for that area (usually midyear), multiplied by 1,000:

$$\textit{Crude birth rate} = \frac{\text{Total live births}}{\text{Total resident population}} \times 1{,}000$$

There are other fertility measures that are more specific to the population at risk and more comparable across time and geography, such as general fertility rate and total fertility rate. Note that the CBR cannot be calculated for births by place of occurrence (e.g. hospital, other health facility, etc.), since the population of women is not known in these instances.

The crude birth rate is affected by the age structure of the population, which may make comparisons over time and space misleading, but it is not affected as strongly as the crude death rate is.

Notes on completing Table 4.8 in the Template: Place of usual residence of mother could relate to urban/rural location or lower administrative division. If data on births by place of usual residence are not available, data for the whole country can be provided.

36 See https://www.getinthepicture.org/sites/default/files/resources/Timor-Leste%20Births%20and%20Deaths%20Statistics%20Report%202014-2015.pdf

4.6 Age-specific fertility rates

Age is usually defined as the age of the mother in completed years at the time of the delivery. Alternatively, age at the end of the year may be used. This is calculated as the year of event (delivery) minus the mother's year of birth.

It is most common to present data in five-year age groups from age 15 to age 49. One-year age groups may also be used. Births over age 49 are very rare and may be deleted or combined with age groups 45–49. SDG indicator 3.7.2 on the adolescent birth rate corresponds to the 10–14 or 15–19 age-specific fertility rates (ASFR). Countries are especially encouraged to report on the 10–14 ASFR, as it is often disregarded.

There are also commonly used indicators linked to the age of the mother. These are the ASFR and total fertility rate (TFR). These indicators are important for several purposes, such as making population projections and for assessing the number of births by women in the oldest and youngest age groups, who could be at higher risk for health problems.

Notes on completing Tables 4.9-4.10 in the Template: If data by urban/rural location are available, include this in the table. If not, delete the second table and present data for the whole country. Remember to include both the number of births, and the ASFR for each age group. The ASFR for births that does not specify the age group of the mother cannot be calculated, as there is no denominator for the calculation (but births with missing age of the mother may be redistributed, as explained in Section 3.4.2).

4.7 Total fertility rate

The total fertility rate (TFR) is the sum of the age-specific fertility rates (ASFRs) of female residents of a specific area aged between 15 and 49 years during a specified period, usually one calendar year. If it is calculated as the sum of rates for 5-year age groups, it must be multiplied by five:

$$\textit{Total fertility rate} = (\Sigma\text{Age-specific fertility rate}) \times 5$$

The TFR is an estimate of the average number of children a cohort of women in the specified population would bear if they went through their childbearing years experiencing the same age-specific birth rates, as measured for the specified time period. The TFR is a commonly used standardised fertility measure because it is well suited for comparative purposes and is a comprehensive summary measure that is readily interpreted and understood. A disadvantage of the total fertility rate is that it is a period measure. It measures the fertility level of a population during a given period, usually a calendar year. The final number of children that a cohort of women bears is retrospective and can only be estimated once childbearing has ended. Another disadvantage of total fertility rate is that it assumes that no women die before the end of the reproductive period (49 years).

Notes on completing Table 4.11 in the Template: Place of usual residence of mother could relate to urban/rural location or lower administrative division. If data on births by place of usual residence are not available, data for the whole country can be provided.

4.8 Other fertility indicators (optional)

Note that these indicators are not included in the Template. However, if they are usually reported on, and the required data are available, they can be included from section 4.8 onwards.

Low (or very low) birth weight

The number of live births for a specific area during a specified period with a birth weight of less than 2,500 grams (1,500 for very low birth weight) divided by the number of live births for that area and period multiplied by 100 to obtain a percentage:

$$\textit{Low birth weight} = \frac{\text{Number of resident live births} < 2{,}500 \text{ grams}}{\text{Number of resident live births}} \times 100$$

Births of low and very low weight are often associated with negative birth outcomes and poor health and may be an indicator of problems in access to quality health services and the need for prenatal care services.

Preterm live births

The number of live births for a specific area during a specified period with a gestational age of less than 37 completed weeks[37] divided by the number of live births for that area and period multiplied by 100 to obtain a percentage:

$$\textit{Preterm live births} = \frac{\text{Number of preterm (} < 37 \text{ weeks) live births}}{\text{Total resident live births}} \times 100$$

This figure requires rather detailed information on how far along the mother is in the pregnancy when giving birth. The information is available in most high-income countries but not considered a necessity for all countries to present.

37 For the definition of 'preterm birth' see https://www.who.int/news-room/fact-sheets/detail/preterm-birth.

Chapter 5. Deaths

In this chapter, the available civil registration data on deaths should be presented. A combination of tables, graphs and explanatory text will be useful for the report's audience.

Since cause of death is considered an important aspect of death registration, especially as a source for planning and policymaking, this guide suggests a division between the presentation of statistics on deaths (Chapter 5) and cause of death (Chapter 6). All countries should aim for the complete civil registration of deaths and recording of minimum information, including the sex and age of the decedent, place and date of occurrence, and place of usual residence.

The topics on death to be investigated in the vital statistics report are based on the information that is collected on each death in the civil registration system. The data to be presented will naturally depend on the variables actually collected and their quality. This may include the topics listed in Annex I. However, even some of the high-priority topics may be challenging to include in an early vital statistics report (such as educational attainment, occupation and socio-economic status of the decedent).

Deaths are more commonly under-registered than births, and particularly so for women, young children, and infants.[38] This is, among other reasons, due to a lack of incentives for registering deaths and large numbers of deaths occurring outside of medical institutions.

Knowledge of the number of deaths is, nevertheless, very important for monitoring health trends and health sector planning and for population projections. Unless the completeness is very high, completeness rates should be presented, together with the death registration figures, to enlighten the audience about the quality of the data presented.

Data on deaths from a comprehensive and well-functioning civil registration system is the preferred source of mortality estimates because it is cost-effective to collect the statistics, and the analysis is direct, timely and can be tailored to any time period and to any administrative unit (Kenya Civil Registration Department, 2014). Particularly in countries where the civil registration of death is not complete, other sources of cause of death information (e.g. surveys, control programs for specific diseases) could also be consulted and considered for inclusion in the report or used to assess the plausibility of the cause of death information collected in the CRVS system.

The COVID-19 pandemic, which started in late 2019, has had enormous consequences on the number of deaths worldwide. In many countries it has been difficult to estimate the exact number of deaths due to COVID-19 because all suspected cases are not tested. For this reason, the number of registered excess deaths in the CRVS system, regardless of cause of death, can be of enormous benefit during public health emergencies – be they epidemics, natural disasters, or other catastrophes causing a short- or long-term mortality shock. The continuousness of the CRVS system also means that the calculation of excess mortality for a given time period is fairly straightforward. The monitoring can be done in near real-time if the CRVS is organized in an efficient way.

Several countries published weekly numbers of deaths during the pandemic and compared the numbers with those of previous years, including Brazil,[39] South Africa,[40] Switzerland,[41] and Norway.[42] Some of these show large numbers of excess deaths while other show stable or lower numbers of deaths due to fewer deaths from other infectious diseases than COVID-19. Advice and examples of rapid mortality surveillance can be found in "Revealing the Toll of COVID-19: A Technical Package for Rapid Mortality Surveillance and Epidemic Response".[43]

38 See https://crvssystems.ca/news-and-events/knowledge-brief-series-gender-and-crvs-0
39 See https://www.conass.org.br/indicadores-de-obitos-por-causas-naturais/
40 See https://preventepidemics.org/wp-content/uploads/2020/05/RMS_Report.pdf, p. 20
41 See https://www.bfs.admin.ch/bfs/en/home/statistics/health/state-health/mortality-causes-death.html
42 See https://www.ssb.no/korona/statistikk-om-koronakrisen
43 See https://preventepidemics.org/wp-content/uploads/2020/05/RMS_Report.pdf

5.1 Deaths by place of usual residence and sex of decedent

This tabulation provides data needed for studying the geographical distribution of deaths, along with differences between males and females. These data are used to calculate crude death rates at national and subnational levels (see Section 5.5).

Notes on completing Table 5.2 in the Template: If data on place of usual residence of the decedent are not available at a detailed level (for example, by major administrative division), the data could be presented by urban/rural location. If no data on place of usual residence are available, the table could show total deaths for the country by year, as shown in Figure 5.1.

5.2 Deaths by place of occurrence, place of usual residence, and sex of decedent

The comparison of deaths by place of occurrence and place of usual residence for each sex is useful for administrative purposes and for interpreting patterns of mortality and the distribution of medical facilities.

Notes on completing Tables 5.3–5.4 in the Template: If data on place of usual residence of the decedent at a detailed level (for example, by major administrative division) are not available, statistics could be presented by urban/rural location. If no data on place of usual residence are available, the table could be changed to show total deaths by place of occurrence instead, as displayed in Figure 5.2.

5.3 Deaths by place and site of occurrence

This tabulation is useful for the analysis of the numbers of deaths occurring in hospitals, in other institutions, in public places, and at home for each geographical subdivision of the country. Such data are helpful in planning for medical facilities and health staffing.

Notes on completing Table 5.5 in the Template: If data by urban/rural location are not available, the statistics can be presented by place of occurrence according to major administrative divisions.

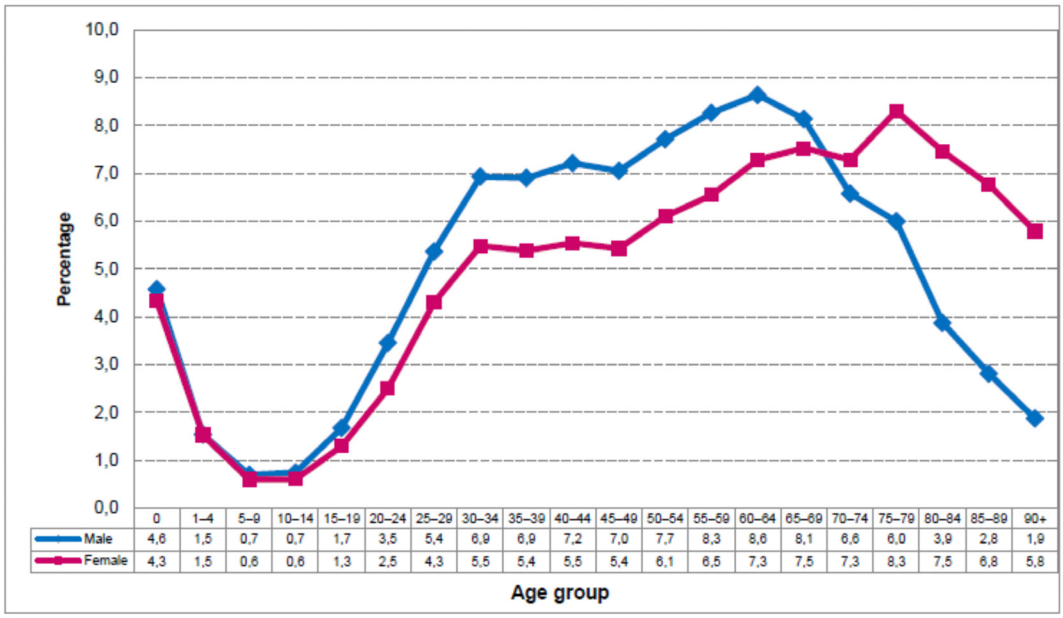
5.4 Deaths by place of usual residence, age and sex of decedent

The comparison of deaths by place of occurrence and place of residence for each sex is useful for administrative purposes and for interpreting patterns of mortality and the distribution of medical facilities. It is also necessary for the construction of life tables and, in conjunction with the other components of population change, is useful for demographic projections.

Understanding the age and sex distribution of registered deaths is also an important quality check. The age-sex distribution should look quite different depending on the overall level of mortality in a population, with more males generally dying at each age group (until the very oldest ages, when more females tend to die) and an increase in the number of deaths as age increases (after about ages 5–10). Departures from expected patterns can be an indicator of underreporting of deaths at certain ages for males or females.

Notes on completing Tables 5.6–5.7 in the Template: If data by urban/rural location are available, statistics for all deaths could be presented and the second table in the Template deleted. There is also a figure included in the Excel Workbook that shows deaths by age and sex of the decedent, similar to the example provided by South Africa in Figure 5.3.

Figure 5.3
Percentage distribution of deaths by age and sex, South Africa, 2016*



	0	1–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90+
Male	4,6	1,5	0,7	0,7	1,7	3,5	5,4	6,9	6,9	7,2	7,0	7,7	8,3	8,6	8,1	6,6	6,0	3,9	2,8	1,9
Female	4,3	1,5	0,6	0,6	1,3	2,5	4,3	5,5	5,4	5,5	5,4	6,1	6,5	7,3	7,5	7,3	8,3	7,5	6,8	5,8

*Excluding deaths with unspecified age and sex.

Source: Statistics South Africa, 2016

5.5 Crude death rate

The crude death rate (CDR) is defined as the number of resident deaths for a specific area during a specified period divided by the total population (midyear estimate) for the same area and period multiplied by 1,000:

$$\textit{Crude death rate} = \frac{\text{Number of resident deaths}}{\text{Total resident population}} \times 1{,}000$$

The CDR is a very general indicator or index of the health status of a geographic area or population. This crude rate is, in general, not appropriate for a comparison of different populations or areas because of the significant effect of age on mortality and the highly different age distributions in different populations. Age-adjusted mortality (standardised death rates), or the life expectancy, should be used for comparative analysis.

Table 5.1 shows the CDR, life expectancy and median age of the population for 16 selected countries. It demonstrates that countries with similar CDRs can have very different life expectancies at birth. This can mostly be explained by the population age structure, measured here by median population age. For example, both Japan and Somalia have a similar CDR of between 10.5 to 10.9 deaths per 1,000 population but life expectancy at births differs greatly at 84.8 and 57.7 years respectively. In other words, while a similar proportion of the population dies each year, the mortality rates for each age group overall are much lower in Japan. The reason is because the number of deaths is strongly affected by the age structure of the population. Usually, aside from children under 5, mortality rates increase with age. Therefore, countries with younger age structures, demonstrated in this case by the median population age, will have a lower CDR than a country with an older age structure, even if people are exposed to the same risk of dying. In Japan, the median age of the population is 48.4 years compared to Somalia where the median age is 16.7 years. Therefore, while life expectancy in Japan is high, the CDR is the same as Somalia where the population is exposed to much higher rates of mortality in each age group, simply because the population is much older. One way to solve this problem is to standardise the death rate, as shown later in Box 12.

Table 5.1
Crude death rate, life expectancy at birth and median population age (2020 estimates)

	CDR (deaths per 1,000)	Life expectancy at birth	Median age
Israel	5.3	83.1	30.5
Kenya	5.3	67.0	20.1
Congo	6.5	64.8	19.2
Australia	6.6	83.6	37.9
Eritrea	6.9	66.7	19.2
New Zealand	7.1	82.4	38.0
Benin	8.6	62.1	18.8
United States	8.9	78.9	38.3
Equatorial Guinea	8.9	59.1	22.3
Sweden	9.1	82.9	41.1
Somalia	10.5	57.7	16.7
Japan	10.9	84.8	48.4
Germany	11.5	81.5	45.7
Sierra Leone	11.3	55.1	19.5
Estonia	11.9	78.9	42.4
Chad	11.7	54.5	16.6

Source: United Nations Department of Economic and Social Affairs Population Division, 2019

Notes on completing Table 5.8 in the Template: Place of usual residence of the decedent could relate to urban/rural location or lower administrative division. If data on deaths by place of usual residence are not available, data for the whole country can be provided.

5.6 Age-specific mortality rates

The age-specific mortality rate (ASMR) is the number of deaths for a specific age or age group in a specific area during a specified period divided by the population of the same age or age group in the same area and period multiplied by 100,000 (or 1,000):

$$\textit{Age-specific mortality rate} = \frac{\text{Number of resident deaths in specified age or group}}{\text{Total population in same specified age or group}} \times 100{,}000$$

ASMRs can be used to assess the quality of mortality data by comparing the rates calculated from the input data with expected age patterns of mortality risk. Generally, mortality rates are high during infancy and early childhood, and fall to their lowest levels between ages 5 and 14 years. After this, mortality rates rise with increasing age. Male mortality is usually higher than female at all ages, with a peak of excess mortality between ages 15 to 24 years. From the mid-30s, the rates for both males and females generally increase linearly.

Notes on completing Figure 5.4 in the Template: There is no table for this section; however, a proposed graph is included in the Excel Workbook (see tab F5.4).

5.7 Infant and child mortality

Neonatal mortality rate

The neonatal mortality rate (NMR) is the number of deaths among live-born infants during the first 28 days of life per 1,000 live births over a specified time period.[44] Mortality during the neonatal period accounts for a large proportion of deaths and is a useful indicator of maternal and neonatal health and care.

$$\textit{Neonatal mortality rate} = \frac{\text{Number of resident neonatal infant deaths}}{\text{Number of resident live births}} \times 1{,}000$$

Under-5 mortality rate

The under-5 mortality rate (U5MR) is the probability of dying between birth and age 5. It is expressed per 1,000 live births.

$$\textit{Under-5 mortality rate} = \frac{\text{Number of deaths in resident children under 5 years}}{\text{Number of resident live births}} \times 1{,}000$$

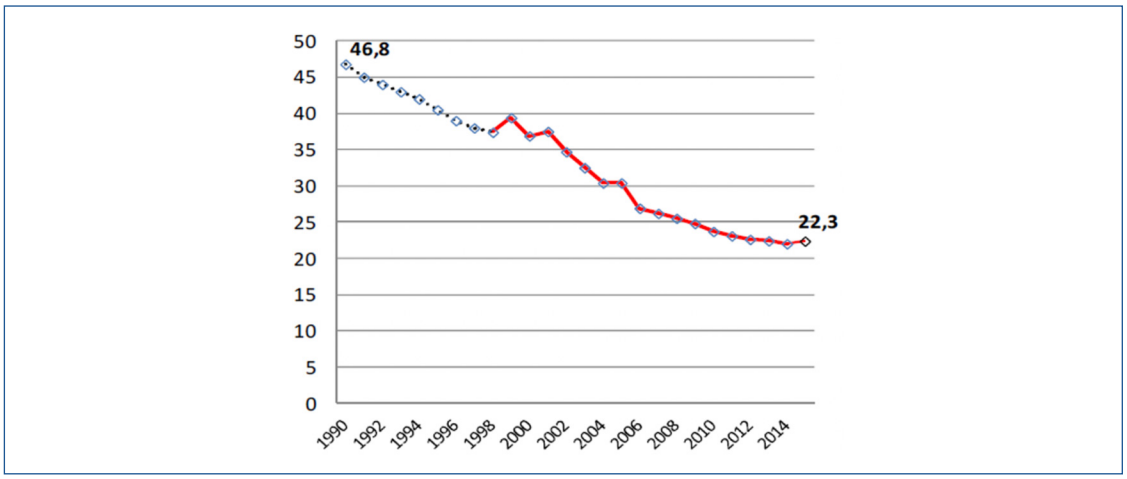
Infant mortality rate

The infant mortality rate (IMR) is defined as the number of newborns dying before they reach 1 year of age for a specific area during a specified period divided by the number of resident live births for the same area/period multiplied by 1,000. Infant mortality is the same as the probability of dying before age 1:

$$\textit{Infant mortality rate} = \frac{\text{Number of resident infant deaths}}{\text{Number of resident live births}} \times 1{,}000$$

Notes on completing Table 5.9 in the Template: If data by year are available, the mortality rate could be presented as a line graph, rather than in a table, as in the example from Algeria in Figure 5.5.

Figure 5.5
Infant mortality rate in Algeria, 1990–2015



Source: Office National des Statistiques, Algeria (2016)

44 For computing purposes, the first 28 days of life should be seen as 0–27 completed days.

The data could also be presented by place of occurrence or place of usual residence of the mother, such as the example from India (Figure 5.2). Note that infant and child mortality indicators would potentially be the most affected by low death registration completeness as deaths of children, and especially infants, are less likely to be registered.

Figure 5.2
Percentage distribution of registered infant deaths by place of occurrence, India, 2017

Place of Occurrence	No. of Registered Deaths	No. of registered Infant Deaths	Percent Share of Registered Infant Deaths by Place of Occurrence	Registered Infant Deaths as a Percent of Total Registered Deaths
Rural	3,621,270	40,583	24.5	1.1
Urban	2,842,509	124,911	74.5	4.4
Total	6,463,779	165,494	100.0	2.6

Source: Vital Statistics of India, 2018

5.8 Maternal mortality

The maternal mortality ratio (MMR) is the number of maternal deaths (the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes) in a specific area during a specified period divided by the total number of live births for the same area and period multiplied by 100,000:

$$\textit{Maternal mortality ratio} = \frac{\text{Number of resident maternal deaths}}{\text{Number of resident live births}} \times 100{,}000$$

The maternal mortality ratio is an indicator of SDG 3 and is considered a primary and important indicator of an area's overall health status or quality of life. The maternal mortality ratio can also be used as an indicator of access to prenatal and obstetrics care.

Because maternal deaths are rare in some countries, large samples would be needed to collect information on maternal mortality in surveys. Having access to this information through the civil registration system with correct International Classification of Diseases (ICD) coding is therefore of great value.

Notes on completing Table 5.10 in the Template: If data on maternal mortality by place of usual residence of the mother are available, it can be included in Table 5.10 in the Template. Usual residence could be either detailed administrative division, or by urban/rural location. If data by place of usual residence are not available, data by year could be presented.

5.9 Life expectancy (optional)

Life expectancy at birth is the most often calculated indicator. It is derived using life table calculations. Note that the life table approach would only be useful in areas with high completeness, otherwise estimated life expectancy would be too high (because the number of deaths would be underreported). However, the age-specific number of deaths may be adjusted as explained in section 3.4.1. The life expectancy at birth is a standardised summary measure sometimes used as an overall gauge of health based on a population's mortality experience. Accordingly, it is a measure of the level of mortality within a population and represents a hypothetical number of years a newborn would live, on average, if he or she experienced the prevailing level of mortality in each age group as he or she ages. Life expectancy can also be measured at older ages e.g. remaining life expectancy at 60 years (e_{60}). The International Union for Scientific Study of Population (IUSSP) provides a more thorough explanation on life tables and how to calculate life

expectancy through its online course, Population Analysis for Policy and Programs.[45]

Notes on completing Figure 5.5 in the Template: Please note that the calculation of life expectancy using a life table is an advanced demographic concept that requires the assistance of a trained demographer. Countries without access to this type of assistance are not required to complete this section of the Template.

5.10 Foetal deaths (optional)

According to the WHO, a foetal death, also referred to as a 'stillbirth,' is "death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation the foetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles."[46] As the legal requirements for the registration of foetal deaths vary from country to country, it is recommended that they are reported on separately from all other deaths.

Notes on completing Tables 5.11–5.12 in the Template: Two tables are provided in the Template based on examples from the Principles and Recommendations. Given the difficulties in obtaining good-quality data on foetal deaths, countries that wish to complete this section can present their data according to the available information.

5.11 Other mortality indicators (optional)

Note that these indicators are not included in the Template. However, if they are usually reported on and the required data are available, they can be included from section 5.11 onwards.

Standardised death rate

The standardised death rate is the crude death rate of a population **adjusted to a standard age distribution** (see Box 12). It is calculated as a weighted average of the age-specific death rates of a given population. The weights are the age distribution of that population.

45 See http://papp.iussp.org/index.html#
46 See https://www.who.int/classifications/icd/ICD-10_2nd_ed_volume2.pdf

Box 12
Age standardisation

The incidence of most demographic events varies strongly by age. The same is the case for prevalence of disease, for example. This may make comparison of rates for different populations misleading, if we do not take the age structure into account. One of the most obvious examples of this is deaths, which are most common among young children and older people. Comparing crude death rates for populations with widely different age structures may lead to surprising results, as in Figure 5.1. Highly developed countries such as France, Switzerland and the US have crude death rates of the same magnitude as developing countries such as Eritrea and Ghana. The reason for this is that the first group of countries has a high proportion of elderly people, whereas the second group has a young population with a high mortality level.

There are two methods of standardisation, direct and indirect.[47] This guidance focusses on direct standardisation:

In *direct* standardisation, we take the observed age-specific mortality rates from a study population and apply them to a standard population (for example, as provided by WHO[48]) in order to calculate an age-adjusted summary rate for each study population. In order to carry out a *direct* standardisation we need:

- age-specific rates for the populations under study
- an appropriate standard population with a known age distribution

To adjust for age, a standard population must be selected. In principle, any age distribution may be used, but 'choosing a standard population with higher proportions in the younger age groups tends to weight events at these ages disproportionately. Similarly, choosing an older standard does the opposite' (Ahmad et al., 2001). To minimize such problems WHO has 'adopted a standard based on the average age-structure of those populations to be compared (the world) over the likely period of time that a new standard will be used (some 25–30 years), using the latest UN assessment for 1998' (Ahmad et al., 2001). If only a few countries are compared, the average age structure of these countries may be used. If the regions of a country are compared, the national age structure may be used. The same is the case if a rate is compared for the same population over time, in which case the average age structure over the time period may be used.

As an example of *direct* standardisation, Moultrie et al. (2012) estimate age-standardised rates for Ecuador and Sweden using an arbitrary standard population, finding 7.8 and 5.7, respectively. This implies that the mortality level in Ecuador is 37% higher than in Sweden (CMR = 7.8/5.7 = 1.37). If, on the other hand, the population of Ecuador is used as the standard population, they find that the mortality level is 51% higher than in Sweden (CMR = 5.6/3.7 = 1.51).[49]

47 This text is adapted from Moultrie et al (2012).
48 See https://www.who.int/healthinfo/paper31.pdf
49 See http://papp.iussp.org/sessions/papp101_s06/PAPP101_s06_060_010.html

Chapter 6. Causes of death

Civil registration records can be used when a) the cause of death is included in the death certificate; b) the cause of death written derives from a medical certification process, ideally from the health sector and consistent with with the standards of the WHO International Classification of Diseases (ICD). In some countries, this information is shown on the certificate that is given to the relatives of the deceased. In other countries, the cause is only included on the part of the certificate that is sent to the central health, civil registrar and/or statistical agencies. The cause of death is considered to be sensitive medical information in some but not all countries. Moreover, some countries have separate civil and medical death certificates. In some countries the cause of death listed on death certificates is as reported by the family or other lay reporter such as the registrar. These causes should be treated with extreme caution.

The chapter on cause of death should be based on information collected on deaths in the civil registration system. This usually includes the variables included in the Excel Workbook, under the tab 'Death.Tab.List'.

Statistics on deaths should be presented in tables, graphs and maps in this chapter. In addition, the form used for medical certification of causes of death in the country may be included at the end of the report.

Tabulating leading causes of death

When analysing cause-of-death data there are many different ways of aggregating and tabulating individual ICD codes to create tables of leading causes of death. For countries that have poor-quality cause-of-death data, or limited data analysis software tools, one option is to use the WHO's Startup Mortality List (SMoL)[50] or aggregate and tabulate codes according to ICD Chapter-Level Headings, as shown in Figure 6.1 from Fiji (which has a relatively small population, and thus a small number of deaths each year).

Figure 6.1
Ten leading causes of death for females of all ages, Fiji (2015–2017)

List Code	Diseases	Female	Percentage distribution of deaths by cause	Standardized Death Rates
I00-I99	Diseases of the circulatory system	2,896	29.8	263
E00-E88	Endocrine, nutritional and metabolic diseases	2,252	23.2	194
C00-D48	Neoplasms	1,487	15.3	121
A00-B99	Certain infectious and parasitic diseases	501	5.2	45
J00-J98	Diseases of respiratory system	399	4.1	35
N00-N99	Diseases of the Genitourinary System	245	2.5	21
K00-K92	Diseases of the Digestive System	214	2.2	19
L00-L98	Diseases of the Skin and Subcutaneous Tissue	202	2.1	12
P00-P96	Certain Conditions Originating in the Perinatal Period	161	1.7	12
G00-G98	Disease of Nervous System	151	1.6	8

Note: The totals do not end up to a 100 percent as the table only covers the top ten causes. The ill-defined causes of death and external causes are excluded.

Source: Fiji Bureau of Statistics (2019)

Many countries have also developed their own local tabulation lists, which allow for grouping of causes of death based on local health needs. While these lists are useful for monitoring country-specific trends in mortality and monitoring the progress of local health programmes, they are less useful at an international level.

To allow for meaningful international comparison, and in line with formal recommendations regarding lists for tabulation, tables on leading causes of death in the Template should be generated following the standards provided in Chapter 5 (Statistical presentation) of the

50 See https://www.who.int/healthinfo/civil_registration/smol/en/

ICD-10.[51] The two condensed tabulation lists (List 1 and List 3) condense the full range of ICD three-character categories into a manageable number of items for publication purposes. The condensed lists recommended for use are:

- Mortality Tabulation List 1, General mortality (which contains 103 distinct groups of codes)[52]
- Mortality Tabulation List 3, Infant and child mortality (which contains 67 distinct groups of codes)[53]

Cause-of-death data from health facilities

Information on causes of death from health facilities will be of good quality only if the cause of death has been certified and coded according to the standards of the ICD.[54] Furthermore, quality assurance checks on cause-of-death data should be applied and the results of the quality assessments published.

Ideally, cause of death is determined by a physician – from the health sector or by a medical examiner – who has been trained in the use of the international form for medical certification of cause of death (WHO, 2016).

For public health purposes it is the underlying, as opposed to the immediate or an intermediate, cause of death that is of most value. The underlying cause is defined as '(a) the disease or injury which initiated the train of morbid events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury.'[55] It is this underlying cause of death that is amenable to preventative public health interventions.

Following the completion of the form by a certifier of cause of death, a trained coder or nosologist (an expert in the classification of diseases) should code cause of death on the medical certificate of cause of death in line with ICD rules.[56]

Although cause-of-death data may be incomplete, publishing what is available would be an important beginning (see Box 13 for a description of available tools to assist in analysing cause-of-death data). Publishing this information might increase the focus on data quality and highlight needs for improvements to the handling of cause-of-death data in the CRVS system.

Cause-of-death data quality and ill-defined causes

According to WHO (2010b), a frequently used indicator of the quality of cause-of-death data is the percentage of all deaths for which the cause is classified as ill-defined (Chapter XVIII of the ICD-10). Ill-defined causes are of no public health value. Also, where they are common, they will make the cause of death distribution unreliable, because the true causes of death are hidden and hence underestimated. Generally, it is often mentioned that the percentage of deaths for which the cause is ill-defined should ideally be less than 10 per cent at ages 65 and over, and less than 5 per cent below age 65.

If the percentage of ill-defined causes declines significantly with improved cause of death attribution, caution must be exercised when interpreting trends in specific causes (such as cancers or heart disease), because changes in death rates from these causes may be largely or entirely due to the redistribution effect from ill-defined to more-specific causes. Under these circumstances, increases in proportions and rates due to specific causes could be an artifact of these improvements.

51 See https://www.who.int/classifications/icd/ICD10Volume2_en_2010.pdf?ua=1
52 See https://www.cdc.gov/nchs/data/dvs/im9_2002.pdf.pdf
53 See https://www.cdc.gov/nchs/data/dvs/im9_2002.pdf.pdf
54 See World Health Organization, https://apps.who.int/iris/handle/10665/246208. ICD-10 was endorsed in 1990. ICD-11 was released in 2018 and will come into effect on 1 January 2022, see https://www.who.int/news-room/detail/18-06-2018-who-releases-new-international-classification-of-diseases-(icd-11).
55 See World Health Organization, "Mortality database". http://www.who.int/healthinfo/cod/en
56 See https://icd.who.int/en

Box 13
Tools to analyse cause-of-death data from health facilities

Analysing mortality levels and causes of death (ANACoD):[57] This electronic tool, developed by WHO, allows users to conduct analysis of data on mortality and causes of death. First the tool will review the data for errors, and then it will tabulate and present the results in the form of tables and charts. The tool can be downloaded from WHO's website and is available in Russian, French, Spanish and English. The most recent version of ANACoD in English offers a wider range of analyses. The tool consists of three parts: I) Input data (Steps 0–1), II) Mortality levels analysis (Steps 2—5), and III) Causes of death analysis (Steps 6—10).

Analysis of Causes of (National) Death for Action (ANACONDA):[58] Jointly developed by the Melbourne School of Population and Global Health at the University of Melbourne and the Swiss Tropical and Public Health Institute at the University of Basel, ANACONDA is another electronic tool that can be used to check the quality of mortality and cause-of-death data. ANACONDA is based on the 10 data quality assessment principles published by the Health Information Systems Knowledge hub, which were also used to produce ANACoD. The tool automatically generates figures and tables that can be used for data quality assessment.

Cause-of-death data from communities

Many deaths, however, occur outside the health system and far away from trained health personnel, which makes it difficult to apply the aforementioned approach. While in some countries, such as Mongolia and Norway, deaths outside health facilities are examined by a person with medical training who can determine the most likely cause of death, this is often not feasible. Some countries leave the reporting of cause of death to either the family or local registrars, who are not medically trained. Sometimes this entails picking from a short list of causes included in the reporting or registration form. As noted above, such lay reporting of cause of death is not reliable, and the data generated are unlikely to be of sufficient quality to merit inclusion in a vital statistics report. Overall cause-of-death data reported by laypersons (i.e. nonmedical professionals) without the use of a structured tool such as a 'verbal autopsy' (VA) questionnaire should be analysed and interpreted with great caution. In many low- and middle-income countries, most deaths occur at home where there is no doctor to medically certify the cause. In such circumstances, the use of verbal autopsy to understand community patterns of cause-specific mortality is advisable.

Verbal autopsy[59,60] is a proven method to ascertain community patterns in causes of death for deaths that occur outside health facilities and for which medical certification of cause of death is not possible (i.e. no physician can attend the death and medically certify the cause of death). VA can be used to provide information on causes of death for the population, but not at an individual level. In addition, since it cannot provide reliable information at the individual level, there is no need to conduct VA for all deaths occurring outside health facilities that have not been medically certified. In the course of the verbal autopsy, family members or relatives of the deceased are asked about the circumstances and events leading to the death of a person, including signs and symptoms and their durations. VA interviews are conducted by trained interviewers using a structured VA questionnaire.

The probable cause of death from the completed VA interview is assigned by either a trained physician who reviews the VA questionnaire, or uses a computer algorithm. This cause is not

57 See https://www.who.int/healthinfo/anacod/en/
58 See https://crvsgateway.info/anaconda
59 See https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5328373/
60 See https://crvsgateway.info/file/11243/3231

recorded on the death certificate, however, and not communicated to the relatives of the deceased. It is only used for public health and statistical purposes.

Causes of death are then tabulated using a predetermined list of causes. The primary output from a VA system are the cause-specific mortality fractions (CSMFs) by age and sex and, where possible, geography. Outputs from VA data analysis can be presented in the country's annual vital statistics report to complement the mortality data from health facility–based MCCD.

Notes on completing Chapter 6 in the Template: In countries where both MCCD and VA data are available, data should be reported separately for the two methods of cause of death assignment. While methods for combining MCCD and VA data are being developed, there is currently no best practice guidance for doing so. Future versions of these Guidelines will include such content.

Additional resources

WHO has published several publications on cause of death statistics that should be consulted by those producing vital statistics, including the International Statistical Classification of Diseases and Related Health Problems (ICD-10) (WHO, 2010a); Analysing Mortality Levels and Causes of death (WHO 2011); and the Application of ICD-10 for Low-resource Settings Initial Cause of death Collection (WHO 2014a). Volume 1 of ICD-10 has international standard tabulation lists for causes of death that should be consulted when producing cause of death statistics. Moreover, the training course on civil registration and vital statistics systems, developed by the International Statistics Programme of the U.S. Centers for Disease Control and Prevention (2015), has several modules addressing cause of death statistics. In addition, resources for the implementation of ICD-11 have been published and are available for use and implementation.[61] The World Bank has developed an online e-learning course on approaches to strengthening CRVS systems.[62]

6.1 Deaths by broad cause of death group

A first step in checking the quality of cause-of-death data is to look at the distribution of deaths by three broad groups to assess whether the observed pattern is consistent with what is known about the extent of the epidemiological transition in the country. The three groups are:

- Group 1: Communicable, maternal, neonatal and nutritional diseases[63]
- Group 2: Noncommunicable diseases, including mental health conditions[64]
- Group 3: External causes and injuries (e.g. accidents, homicide, suicide, war deaths and natural disasters).[65]

Notes on completing Figure 6.1 in the Template: If cause-of-death data are not usually analysed by these three groups, download the free ANACoD tool from the WHO website.[66] In the supporting documentation for the tool, there are tables that show the corresponding ICD codes for each group. To generate the suggested graph, see tab 'Step 6 – dataGBD', refer to column C, rows 175-178 in ANACoD; and tab 'F6.1' in the linked Excel Workbook.

All leading causes of death in a population follow a predictable age pattern that has been identified from decades of epidemiological research. As such, it is important to check whether the age pattern of deaths from broad causes is consistent with what one would expect from

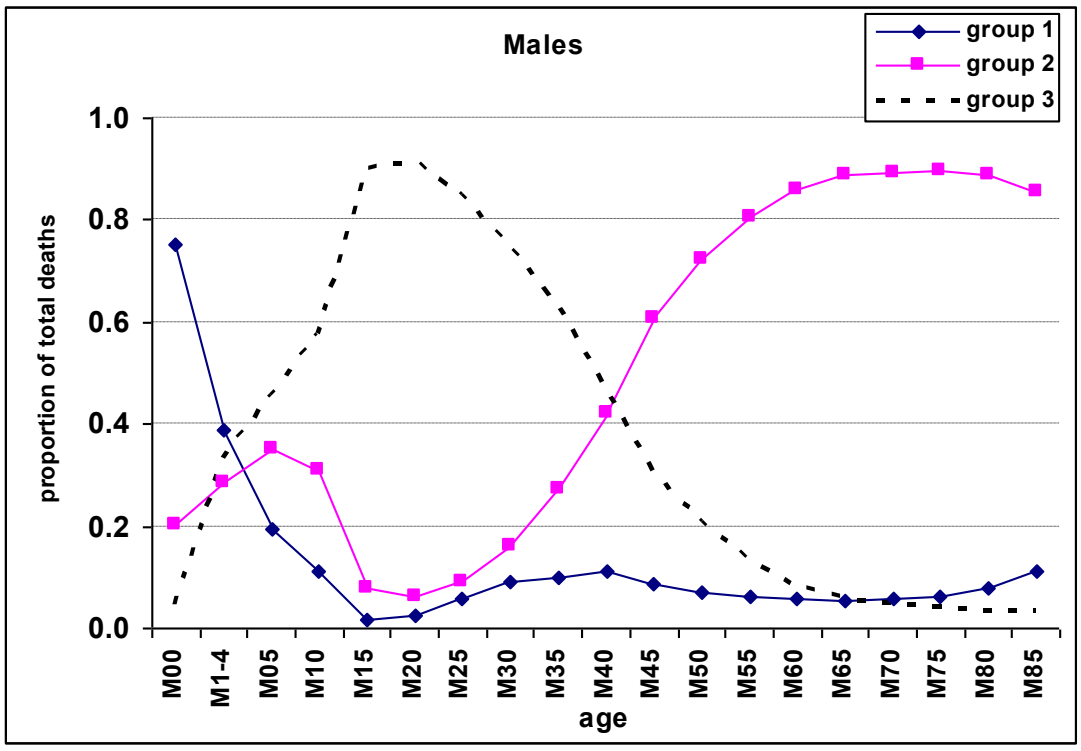
61 https://icd.who.int/en
62 See https://olc.worldbank.org/content/civil-registration-and-vital-statistics-systems-basic-level-self-paced-format
63 ICD-10 codes:A00-B99, G00-G04, N70-N73, J00-J06, J10-J18, J20-J22, H65-H66, O00-O99, P00-P96, E00-E02, E40-E46, E50, D50-D53, D64.9, E51-64
64 ICD-10 codes:C00-C97, D00-D48, D55-D64 (minus D 64.9) D65-D89, E03-E07, E10-E16, E20-E34, E65-E88, F01-F99, G06-G98, H00-H61, H68-H93, I00—I99, J30—J98, K00-K92, N00-N64, N75-N98, L00-L98, M00-M99, Q00-Q99
65 ICD-10 codes: V01-Y89
66 See https://www.who.int/healthinfo/anacod/en/

epidemiological research and modelling. These age patterns do not change very much with increasing life expectancy. Figure 6.2 shows a typical distribution of deaths across Groups 1, 2 and 3 at different ages for a country (Venezuela) with a life expectancy of around 70 years.[67] At each age, the graph shows the expected proportion (fraction) of deaths at that age that are likely to occur on average; the three fractions, at any age, add up to 1 (or 100 per cent when converted to a per cent).

The proportion of deaths due to Group 1 causes (communicable diseases, maternal, perinatal and nutritional conditions) is high among children but declines thereafter to very low levels, although it may rise again at older ages (above 80 years or thereabouts) due to pneumonia. The proportion of deaths due to Group 2 causes is relatively high in children (due to congenital anomalies for example), declines in adulthood, but rises significantly at older ages due to the increasing incidence of cancers and cardiovascular diseases and stroke. The proportion of deaths due to Group 3 causes, i.e. external causes of death including accidents and violence, is generally highest in young adulthood. This pattern is especially marked among males.

Figure 6.2 shows a typical cause of death pattern by age and would not be replicated exactly in every country. However, significant departures from this pattern should be closely investigated as they are suggestive of problems such as poor medical certification of the cause of death, poor coding practices, and age-misreporting of deaths. In general, the graphs for males and females should be broadly similar, although there is often higher mortality due to external causes among young males.

Figure 6.2
Distribution of broad cause of death groups (1, 2 and 3) by age for males



Source: ANACoD Guidance notes[68]

Notes on completing Figures 6.2–6.3 in the Template: To generate the suggested graphs, see tab 'Step 7 – Group 1, 2, 3', in ANACoD; and tab 'F6.2' in the linked Excel Workbook.

67 WHO mortality database, http://www.who.int/healthinfo/morttables/en/index.html
68 See https://www.who.int/healthinfo/anacod/en/

6.2 Top 10 causes of death

From a policy perspective, knowing the leading causes of death by age group and sex allows for the formulation of more targeted and responsive policies and programmes. However, achieving this level of detail is often difficult for many CRVS systems, where cause-of-death data may only be available at an aggregate level. Many countries have also routinely reported the top 10 (or 15 or 20) causes of death, as this provides an overall summary of population health that is easily understandable.

Notes on completing Table 6.2 in the Template: To generate the table on leading causes of death (all ages) for males and females, we recommend tabulating to the WHO ICD General Mortality List 1.[69] The table could be expanded to include 15 leading causes of death if there are an important number of diseases to highlight. The table could also list both a major cause (e.g. cancer) and one or more subcategories (e.g. the most important cancer sites) to highlight their importance—with the subcategory(ies) not counting as one of the 10 or 15 leading causes of death. Note that even if deaths due to R codes (ill-defined) are ranked in the top 10, we suggest showing them separately, as they are not a cause of death, but rather an indicator of poor data quality (this applies to all tables in this section).

6.3 Leading causes of death by age and sex

It is important to first present the leading causes of death for the whole country by sex, noting that causes by age group will be discussed in the following tables.

Notes on completing Tables 6.3–6.4 in the Template: To generate the tables on leading causes of death (all ages) for males and females, we recommend tabulating to the WHO ICDGeneral Mortality List 1.[70]

Infants and young children (0–4 years old)

Repeat the national and/or regional leading cause of death analysis for infants and children of both sexes.

Notes on completing Table 6.5 in the Template: To generate the table on leading causes of death for both sexes, we recommend tabulating according to the WHO ICD General Mortality List 3.[71]

Children (5–14 years old)

Repeat the national and/or regional leading cause of death analysis for children aged 5 to 14.

Notes on completing Table 6.6 in the Template: To generate the table on leading causes of death for both sexes, we recommend tabulating according to the WHO ICD General Mortality List 1.

Adolescents and adults (15–69 years old)

Repeat the national and/or regional leading cause of death analysis for adolescents and adults for each sex separately.

Notes on completing Tables 6.7-6.8 in the Template: To generate the tables on leading causes of death for males and females, we recommend tabulating according to the WHO ICD General Mortality List 1.

69 See https://www.cdc.gov/nchs/data/dvs/im9_2002.pdf.pdf
70 See https://www.cdc.gov/nchs/data/dvs/im9_2002.pdf.pdf
71 See https://www.cdc.gov/nchs/data/dvs/im9_2002.pdf.pdf

Older adults (70+ years old) (optional)

At older ages, cause-of-death data are notoriously unreliable as the elderly may suffer from more than one condition that might cause death. Therefore, some countries omit this open-ended age group. The determination of whether data are sufficient in quality and quantity to tabulate should be made as part of the tabulation plan.

Notes on completing Tables 6.9–6.10 in the Template: To generate the tables on leading causes of death for males and females, we recommend tabulating according to the WHO ICD General Mortality List 1.

Other cause-specific mortality indicators (optional)

Note that these indicators are not included in the Template. However, if the required data are reported and available, they can be included from section 6.4 onwards.

Proportional mortality

The proportional mortality is the proportion of total deaths due to a specific cause. It is often calculated as the proportion of deaths for which a cause is known. It should be noted that in many cases, the cause of death is known only for a fraction of all deaths; the proportional mortality, therefore, only applies to those deaths that have a cause assigned. Results should be disaggregated by age and sex.

$$\textit{Proportional mortality} = \frac{\text{Number of deaths from a specific cause}}{\text{Total number of deaths in a given period of time}} \times 100$$

Cause-specific mortality rates and fractions

The cause-specific mortality rate is the number of deaths in a specific age group for a defined period attributed to a specific underlying cause of death (as defined by ICD-10) divided by the total (mid-period) population in that age group. It is usually reported per 100,000 population.

$$\textit{Cause-specific mortality rate} = \frac{\text{Number of deaths from a specific cause}}{\text{Midyear population}} \times 100{,}000$$

It is useful to disaggregate by age and sex (Box 14 shows the geographical distribution of tuberculosis mortality in Peru using an age-standardised cause-specific mortality rate). It is important to be clear about data sources. For example, cause-specific mortality rates based on data that are only from hospitals may miss deaths reported through the medico-legal death investigation system. Rates produced on the sole basis of hospital data, under such conditions, would produce implausible estimates for deaths due to external causes including injuries. Such data limitations should be mentioned.

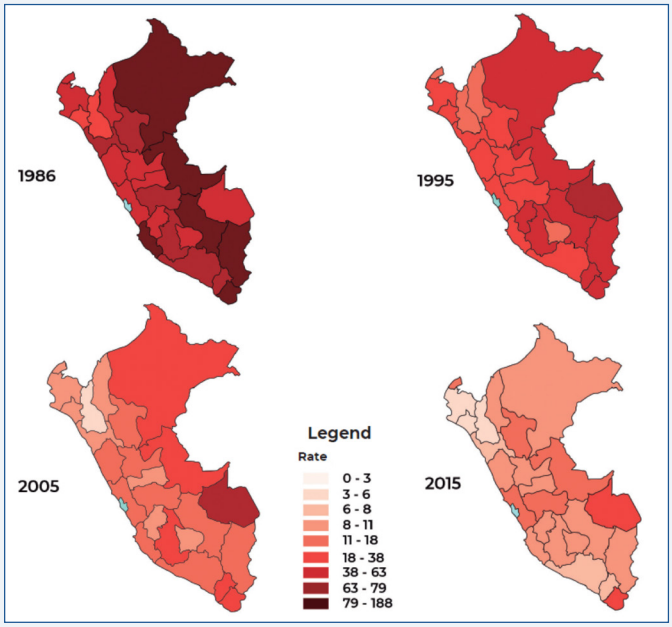
The cause-specific mortality fraction is the number of deaths for a defined period attributed to a specific underlying cause of death (as defined by ICD-10) divided by all deaths during the same time period:

$$\textit{Cause-specific mortality fraction} = \frac{\text{Number of deaths from a specific cause}}{\text{Total number of deaths}} \times 100$$

Box 14
Visualising cause of death

In Peru, the decline in mortality from infectious diseases has not been homogeneous throughout the country. Thus its most recent mortality report included a section highlighting the inequalities in mortality due to certain infectious diseases, such as tuberculosis (Figure B14.1). As the map shows, over the course of 30 years in Peru, mortality due to tuberculosis has decreased, but in 2015 mortality was considerably higher in certain regions than in others.

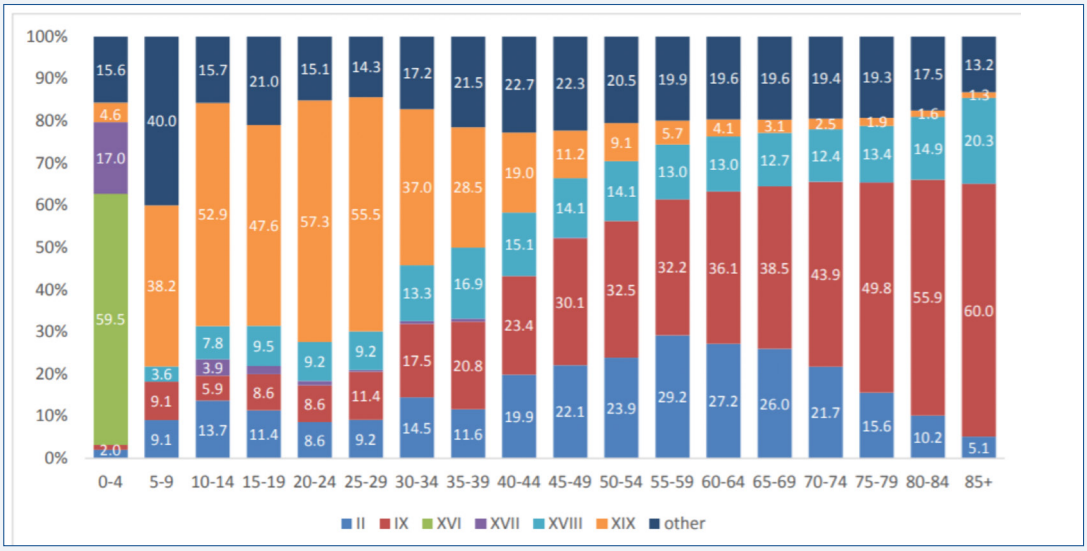
Figure B14.1. Age-standardised tuberculosis mortality rate, Peru: 1986, 1995, 2005 and 2015



Source: Peru Ministry of Health (2018)

Figure B14.2 uses a stacked column chart to show the breakdown of the main causes of death across age groups, using ICD-10 chapters as a reference. Among the older populations, diseases of the circulatory system (Chapter IX) were the main causes of death. [72]

Figure B14.2.
Distribution of deaths (%) by age and the main causes of death*, Georgia, 2018



*Other – includes all major chapters except II, IX, XVI, XVII, XVII and XIX
Source: National Statistics Office of Georgia, 2018

72 Based on the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10)

Chapter 7. Marriages and divorces

Marriage and divorces are registered in many countries. The registration of them is necessary to obtain certificates, which may be of great legal and human rights significance. Examples include property rights, inheritance, child marriage, custody of children, and the right to remarry. Women and children in families in which the spouses are not married, in particular, may be in a much weaker economic and legal position if one of the parents dies or if the nonmarital union is split. Many countries do not publish marriage and divorce statistics. The reasons for this can be a lack of availability of data, a lack of social significance of marriage, or a wide range of marriage forms, some of which may be difficult to register.

In this chapter, statistics on marriage, divorce and other marital changes may be presented if data on such events are registered. A combination of tables, graphs and explanatory text will be useful. Linkages to earlier chapters, especially the one on completeness, should also be considered.

It may be useful to begin this section by mentioning how a marriage is defined. In the *Principles and Recommendations*, a marriage is defined as 'the act, ceremony or process by which the legal relationship of spouses is constituted. The legality of the union may be established by civil, religious or other means as recognised by the laws of each country.' It is also stated in the document that 'countries may wish to expand this definition to cover civil unions if they are registered' and that 'it is necessary to take into account customary unions (which are legal and binding under customary law) and extralegal unions, known as de facto or consensual unions'.

Furthermore, a divorce is defined as 'the final legal dissolution of a marriage, that is, that separation of spouses which confers on the parties the right to remarriage under civil, religious and/or other provisions, according to the laws of each country'.

A legal contract of marriage may be dissolved by the death of one of the spouses, a divorce decree or cancellation (annulment).

The tables and graphs to be presented on marriage and divorce will depend on the variables collected when registering a marriage or divorce. There are two tabs ('Mar.Tab.List' and 'Div.Tab. List') in the Excel Workbook that provide an overview of the variables that are considered most important. If available, these variables should be considered when presenting information. Annex I includes marriage and divorce variables and Annex II, a list of tables recommended by the *Principles and Recommendations*. Box 15 provides examples of tables and figures on marriages.

7.1 Marriages

Marriages by year

Notes on completing Figure 7.1 in the Template: There is no table for this section, however a proposed graph is included in the Excel Workbook (see tab 'F7.1').

Marriages by place of usual residence and age of bride and groom

Information on age at marriage for brides and grooms may have implications for future completed family size, which may be useful for planning in fields such as economics, health and education, as well as in the study of geographical differentials in patterns of family formation. Box 15 provides an example from Azerbaijan's Statistical Committee.

Notes on completing Tables 7.2–7.3 and Figure 7.2 in the Template: If data by urban/rural location are not available, present the data for all marriages in the country and delete the second table in the Template. Refer to tab 'F7.2' of the Excel Workbook for an example graph showing the average age at marriage by sex.

Marriages by age and previous marital status

Previous marital status of bride and of groom is an essential item of information for the analysis of patterns of marriages and marriage dissolution. It is useful in demographic and social studies of family patterns, and as an indicator of family stability. The introduction of age into the 'previous marital status' tabulation increases the significance of this item considerably for the analysis of both marriage patterns and fertility.

Notes on completing Tables 7.4–7.5 in the Template: Update the headings for 'previous marital status' to reflect the correct country terminology.

Box 15
Examples of tables and figures on marriages

Azerbaijan's Statistical Committee provides a number of tables on marriages and divorces, including Table B15.1, which shows marriages disaggregated by age group and sex (groom) across 40 years. The same data could be visualised in a line graph to observe trends in marriages among age groups over time among both males and females.

Table B15.1
Marriages by age groups of groom

		By age groups of groom, years			
Year	Number of marriages	Under 18	18–24	25–34	35 over
1970	35,222	-	11,839	16,481	6,902
1980	60,134	6	30,359	24,213	5,556
1990	73,119	21	29,145	36,712	7,241
1991	74,378	24	30,508	38,411	5,435
1992	68,740	29	28,759	34,752	5,200
1993	60,028	56	23,849	31,273	4,850
1994	47,147	45	18,021	24,794	4,287
1995	43,130	44	15,688	23,290	4,108
1996	38,572	47	12,316	22,059	4,150
1997	46,999	50	14,161	27,855	4,933
1998	40,851	38	12,846	23,430	4,537
1999	37,382	22	10,974	22,001	4,385
2000	39,611	11	10,932	24,082	4,586
2001	41,861	15	11,593	25,392	4,861
2002	41,661	12	10,912	25,506	5,231
2003	56,091	21	14,824	34,189	7,057
2004	62,177	25	17,502	36,741	7,909
2005	71,643	48	21,452	40,687	9,456
2006	79,443	50	24,260	45,154	9,979
2007	81,758	36	25,891	45,220	10,611
2008	79,964	35	27,283	42,584	10,062
2009	78,072	20	26,940	41,312	9,800
2010	79,172	7	27,284	42,297	9,584
2011	88,145	11	28,085	48,241	11,808
2012	79,065	51	25,031	43,081	10,948
2013	86,852	21	26,918	47,746	12,186
2014	84,912	21	25,438	47,534	11,938
2015	68,773	31	19,878	39,804	9,088
2016	66,771	31	18,074	40,156	8,538
2017	62,923	11	15,537	39,402	7,983
2018	62,484	-	14,584	39,714	8,186

Source: State Statistical Committee of the Republic of Azerbaijan (2020)

7.2 Divorces

Divorces by year

Notes on completing Figure 7.3 in the Template: There is no table for this section, but a proposed graph is included in the Excel Workbook (see tab 'F7.3').

Divorces by age

This tabulation is used to establish age patterns of divorced couples and is also used in the study of age differences between husbands and wives as factors in the stability or instability of marriages.

Notes on completing Table 7.6 and Figures 7.4–7.5 in the Template: Refer to tab 'F7.4' of the Excel workbook for an example graph showing the average age at divorce by sex. If population data are available, the age-specific divorce rate can be calculated and presented on a graph (see tab 'F7.5' of the Excel Workbook).

Divorces by duration of marriage

This tabulation is used to enable a more complete study of marital instability by including duration of marriage as an explanatory variable. Also, in the study of divorce involving women of childbearing age, it is an important element for understanding the effect of marital instability on the potential fertility of the population.

Notes on completing Tables 7.7–7.8 and Figure 7.6 in the Template: Refer to tab 'F7.6' of the Excel Workbook for an example graph showing the duration of years of marriage until divorce.

Divorces by number of dependent children

Duration of marriage for divorcing couples is a measure of marriage stability, while information on the numbers of dependent children offers insight into the social, psychological and economic impact of divorce on families and society.

Chapter 8. Summary Tables

At the end of the vital statistics report, there may be a few summary tables that show the development of the major vital statistics indicators over time, for as many years as possible. In the *Principles and Recommendations* (p. 159), a list of summary tables is proposed, which is also found in Annex II.

The recommended tables are important, and efforts should be made to include as many as possible. Data on some of these variables may, however, not be available at all or there may be serious under-registration, in particular for foetal deaths, infant deaths, marriages and divorces. If data are not available by place of usual residence, the numbers may be tabulated by place of occurrence or registration.

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Annex I: Civil registration variables

Birth registration variables					
Number	**Topic**	**Available from civil registration of birth**	**Available from other sources**	**Not available**	**Year(s) available**
(i)	**Characteristic of the event**				
a	Date of occurrence				
b	Date of registration				
c	Place of occurrence				
d	Locality of occurrence				
e	Urban/rural occurrence				
f	Place of registration				
g	Type of birth (i.e., single, twin, triplet, quadruplet or higher multiple delivery)				
h	Attendant at birth				
i	Type of place of occurrence (hospital, home, etc.)				
(ii)	**Characteristics of the newborn**				
a	Sex				
b	Weight at birth				
(iii)	**Characteristics of the mother**				
a	Date of birth				
b	Age				
c	Marital status				
d	Child born in wedlock (legitimacy status of the child)				
e	Educational attainment				
f	Literacy status				
g	Ethnic and/or national group				
h	Citizenship				
i	Economic activity status				
j	Usual occupation				
k	Socioeconomic status				
l	Place of usual residence				
m	Locality of residence				
n	Urban/rural residence				
o	Duration of residence in usual place				
p	Place of previous residence				
q	Place/country of birth				
r	Migrant status				
s	Date of last menstrual cycle of the mother				
t	Gestational age				
u	Number of prenatal visits				
v	Month of pregnancy prenatal care began				
w	Children born alive to mother during her entire lifetime				
x	Birth order or parity				
y	Foetal deaths to mother during her entire lifetime				
z	Date of last previous live birth				
aa	Foetal deaths to mother during her entire lifetime				

Birth registration variables					
Number	**Topic**	**Available from civil registration of birth**	**Available from other sources**	**Not available**	**Year(s) available**
ab	Date of last previous live birth				
ac	Interval since last previous live birth				
ad	Date of marriage				
ae	Duration of marriage				
(iv)	**Characteristics of the father (if known)**				
a	Date of birth				
b	Age				
c	Marital status				
d	Educational attainment				
e	Literacy status				
f	Ethnic and/or national group				
g	Citizenship				
h	Economic activity status				
i	Usual occupation				
j	Socioeconomic status				
k	Place of usual residence				
l	Locality of residence				
m	Urban/rural residence				
n	Duration of residence in usual (present) place				
o	Place of previous residence				
p	Place/country of birth				
q	Migrant status				
(v)	**Characteristics of population at risk**	See United Nations (2014, p. 48)			

Death registration variables					
Number	**Topic**	**Available from civil registration of births**	**Available from other sources**	**Not available**	**Year(s) available**
(i)	**Characteristics of the event**				
a	Date of occurrence				
b	Date of registration				
c	Place of occurrence				
d	Locality of occurrence				
e	Urban/rural occurrence				
f	Place of registration				
g	Cause of death				
h	Manner of death				
i	Whether autopsy findings were used to establish cause of death				
j	Death occurring during pregnancy, childbirth and puerperium (for females between 15 and 49 years of age)				
k	Certifier				
l	Type of certification				

Death registration variables					
Number	**Topic**	**Available from civil registration of births**	**Available from other sources**	**Not available**	**Year(s) available**
m	Attendance at birth (for deaths under 1 year of age)				
n	Type of place of occurrence (hospital, home, etc.)				
(ii)	**Characteristics of the decedent**				
a	Date of birth				
b	Age				
c	Sex				
d	Marital status				
e	Educational attainment				
f	Literacy status				
g	Ethnic and/or national group				
h	Citizenship				
i	Economic activity status				
j	Usual occupation				
k	Socioeconomic status				
l	Whether birth was registered (for deaths under 1 year of age)				
m	Born in wedlock (for deaths under 1 year of age)				
n	Legitimacy status (for deaths under 1 year of age)				
o	Place of usual residence				
p	Place of usual residence of the mother (for deaths under 1 year of age)				
q	Locality of residence				
r	Urban/rural residence				
s	Duration of residence in usual (present) place				
t	Place of previous residence				
u	Place of birth				
v	Migrant status				
(iii)	**Characteristics of population at risk**	(see United Nations (2014, p. 48)			

Foetal death registration variables					
Number	**Topic**	**Available from civil registration of births**	**Available from other sources**	**Not available**	**Year(s) available**
(i)	**Characteristics of the event**				
a	Date of occurrence (of foetal delivery)				
b	Date of registration				
c	Place of occurrence				
d	Locality of occurrence				
e	Urban/rural occurrence				
f	Place of registration				
g	Type of birth (i.e., single, twin, triplet, quadruplet, or higher multiple delivery)				
h	Attendant at birth				

Foetal death registration variables					
Number	**Topic**	**Available from civil registration of births**	**Available from other sources**	**Not available**	**Year(s) available**
i	Certifier				
j	Type of certification				
k	Cause of foetal death				
l	Type of place of occurrence (hospital, home, etc.)				
(ii)	**Characteristics of the newborn**				
a	Sex				
b	Delivered in wedlock				
c	Legitimacy status				
d	Weight at delivery				
e	Date of last menstrual period of the mother				
f	Gestational age				
(iii)	**Characteristics of the mother**				
a	Date of birth				
b	Age				
c	Number of prenatal visits				
d	Children born alive to mother during her entire lifetime				
e	Birth order or parity				
f	Children born to mother during her entire lifetime and still living				
g	Foetal deaths to mother during her entire lifetime				
h	Date of last previous live birth				
i	Interval since last previous live birth				
j	Date of marriage				
k	Duration of marriage				
l	Educational attainment				
m	Literacy status				
n	Economic activity status				
o	Usual occupation				
p	Socioeconomic status				
q	Ethnic and/or national group				
r	Citizenship				
s	Place of usual residence				
t	Locality of residence				
u	Urban/rural residence				
v	Duration of residence in usual (present) place				
x	Place of previous residence				
y	Place of birth				
z	Migrant status				
(iv)	**Characteristics of the father**				
a	Date of birth				
b	Age				
c	Education attainment				
d	Literacy status				
e	Economic activity status				

Foetal death registration variables					
Number	**Topic**	**Available from civil registration of births**	**Available from other sources**	**Not available**	**Year(s) available**
f	Usual occupation				
g	Socioeconomic status				
h	Place of usual residence				
i	Locality of residence				
j	Urban/rural residence				
k	Duration of residence in usual (present) place				
l	Place of previous residence				
m	Place of birth				
n	Migrant status				
o	Ethnic and/or national group				
p	Citizenship				
(v)	**Characteristics of population at risk**	See United Nations (2014, p. 48)			

Marriage registration variables					
Number	**Topic**	**Available from civil registration of marriages**	**Available from other sources**	**Not available**	**Year(s) available**
(i)	**Characteristics of the event**				
a	Date of occurrence				
b	Date of registration				
c	Place of occurrence				
d	Locality of occurrence				
e	Urban/rural occurrence				
f	Place of registration				
g	Type of marriage				
(ii)	**Characteristics of bride and groom (separately)**				
a	Date of birth				
b	Age				
c	Marital status (previous)				
d	Number of previous marriages				
e	Marriage order				
f	Educational attainment				
g	Literacy status				
h	Economic activity status				
i	Usual occupation				
j	Socioeconomic status				
k	Ethnic and/or national group				
l	Citizenship				
m	Place of usual residence				
n	Locality of residence				
o	Urban/rural residence				
p	Duration of residence in usual (present) place				
q	Place of previous residence				
r	Place of birth				

Marriage registration variables					
Number	**Topic**	**Available from civil registration of marriages**	**Available from other sources**	**Not available**	**Year(s) available**
s	Migrant status				
(iii)	**Characteristics of population at risk**	See United Nations (2014, p. 48)			

Divorce registration variables					
Number	**Topic**	**Available from civil registration of divorces**	**Available from other sources**	**Not available**	**Year(s) available**
(i)	**Characteristics of the event**				
a	Date of occurrence				
b	Date of registration				
c	Place of occurrence				
d	Locality of occurrence				
e	Urban/rural occurrence				
f	Place of registration				
(ii)	**Characteristics of divorcees (husband and wife separately)**				
a	Date of birth				
b	Age				
c	Type of marriage being dissolved				
d	Number of dependent children of divorced persons				
e	Number of children born alive to the marriage being dissolved				
f	Date of marriage				
g	Duration of marriage				
h	Mode of dissolution of previous marriage				
i	Number of previous marriages				
j	Marriage order				
k	Educational attainment				
l	Literacy status				
m	Economic activity status				
n	Usual occupation				
o	Socioeconomic status				
p	Ethnic and/or national group				
q	Place of usual residence				
r	Locality of residence				
s	Urban/rural residence				
t	Duration of residence in usual (present) place				
u	Place of previous residence				
v	Place of birth				
w	Migrant status				
x	Place of occurrence of marriage being dissolved				
(iii)	**Characteristics of population at risk**	(see United Nations 2014, p. 48)			

Source: United Nations (2014, table III.1, pp. 18–19)

Note: definitions and specifications are presented in the Principles and Recommendations (2014, chap. III.D, pp. 24–48).

Annex II: Tabulation plan

This annex includes the tables recommended by the *Principles and Recommendations* and other tables proposed in these guidelines. It may be useful to go through these lists when making the tabulation plan and to include the years(s) for which the tables can (or should) be made. The choice and numbering of the tables is up to the country.

Place of usual residence is commonly considered to be the most important location variable. The number of administrative units to be included depends on the administrative structure of the civil registration system and the number of units. If the number of units is large, a more detailed table may be included as an annex to the vital statistics report and/or a web table.

Table A2.1
Births

Table no. in UN P&R	Ref no.	Table heading	Registration variables required	
First priority tabulations				
LB-1	T 4.2	Live births by place of occurrence and sex of newborn	(i)-a (i)-c (ii)-a	Date of occurrence Place of occurrence Sex
LB-2	T 4.3	Live births by place of occurrence and place of usual residence of mother	(i)-a (i)-c (iii)-l	Date of occurrence Place of occurrence Place of usual residence
NA	T 4.4	Live births by age of mother and type of birth	(i)-a (i)-c (i)-j (iii)-b	Date of occurrence Place of occurrence Type of birth Age
LB-5	T 4.5 T 4.6	Live births by age and marital status of mother, urban areas Live births by age and marital status of mother, rural areas	(i)-a (iii)-b (iii)-c (iii)-n	Date of occurrence Age Marital status Urban/rural residence
LB-13	T 4.7	Live births by place of occurrence, site of delivery and attendant at birth	(i)-a (i)-c (i)-h (i)-i	Date of occurrence Place of occurrence Attendant at birth Type of place of occurrence (site)
ST-2	T 4.8	Crude birth rate by usual residence of mother	(i)-a (iii)-l	Date of occurrence Place of usual residence
NA	T 4.9 T 4.10	Age-specific fertility rates by usual residence of mother, urban areas Age-specific fertility rates by usual residence of mother, rural areas	(i)-a (iii)-b (iii)-l	Date of occurrence Age Place of usual residence
NA	T 4.11	Total fertility rate by usual residence of mother	(i)-a (iii)-b (iii)-l	Date of occurrence Age Place of usual residence
First priority figures				
NA	F 4.1	Live births by year	(i)-a	Date of occurrence

NA	F 4.2	Live births by age of mother	(i)-a (iii)-b (iii)-l	Date of occurrence Age Place of usual residence
NA	F 4.3	Crude birth rate by year of occurrence	(i)-a (iii)-n	Date of occurrence Urban/rural residence
NA	F 4.4	Age-specific fertility rates (ASFRs) by year of occurrence of birth	(i)-a (iii)-b	Date of occurrence Age
NA	F 4.5	Total fertility rate by year of occurrence of birth	(i)-a (iii)-b	Date of occurrence Age
Second priority tabulations				
LB-3	NA	Live births by place of registration, month of occurrence and month of registration		
LB-4	NA	Live births by month, place of occurrence and place of usual residence of mother		
LB-6	NA	Live births by age of father		
LB-7	NA	Live births by place of usual residence, age and educational attainment of mother		
LB-8	NA	Live births by educational attainment and age of mother, and live-birth order		
LB-9	NA	Live births by place of usual residence and age of mother, sex of child and live-birth order		
LB-10	NA	Live births by live-birth order and interval between last and previous live births to mother		
LB-11	NA	Live births by place of birth, place of usual residence and age of mother		
LB-12	NA	Live births by place of usual residence and age of mother and legitimacy status		
LB-14	NA	Live births by site of delivery, attendant at birth and birth weight		
LB-15	NA	Live births by birth weight and place of usual residence and educational attainment of mother		
LB-16	NA	Live births by gestational age, place of usual residence of mother, and birth weight		
LB-17	NA	Live births by birth weight, place of usual residence of mother, and month in which prenatal care began		
LB-18	NA	Live births by age and place of usual residence of mother and month in which prenatal care began		
LB-19	NA	Live births by live-birth order, place of usual residence of mother, and month in which prenatal care began		
LB-20	NA	Live births by place of usual residence of mother and duration of residence at the current usual residence		

Ref no. = table or figure number in the Vital Statistics Report Template; NA = not applicable

Table A2.2
Deaths

Table no. in UN P&R	Table no.	Table heading	Registration variables required	
First priority tabulations				
DE-1	T 5.2	Deaths by place of usual residence and sex of decedent	(i)-a (ii)-c (ii)-o	Date of occurrence Sex Place of usual residence
DE-2	T 5.3 T 5.4	Deaths by place of occurrence and place of usual residence of decedent, males Deaths by place of occurrence and place of usual residence of decedent, females	(i)-a (i)-c (ii)-c (ii)-o	Date of occurrence Place of occurrence Sex Place of usual residence

DE-4	T 5.5	Deaths by place of occurrence and site of occurrence	(i)-a (i)-c (i)-n	Date of occurrence Place of occurrence Type of place of occurrence (site)
DE-5	T 5.6 T 5.7	Deaths by age and sex of decedent, urban areas Deaths by age and sex of decedent, rural areas	(i)-a (ii)-b (ii)-c (ii)-r	Date of occurrence Age Sex Urban/rural residence
NA	T 5.8	Crude death rate by place of usual residence of decedent	(i)-a (ii)-o	Date of occurrence Place of usual residence
NA	T 5.9	Infant and child mortality (deaths per 1,000 live births) by year of occurrence	(i)-a (ii)-b	Date of occurrence Age
NA	T 5.10	Maternal mortality by year of occurrence	(i)-a (i)-j	Date of occurrence Death occurring during pregnancy, childbirth and puerperium
First priority figures				
NA	F 5.1	Deaths by year of occurrence	(i)-a	Date of occurrence
NA	F 5.2	Deaths by sex and age of decedent	(i)-a (ii)-b (ii)-c	Date of occurrence Age Sex
NA	F 5.3	Crude death rate by sex and year of occurrence of death	(i)-a (ii)-c	Date of occurrence Sex
NA	F 5.4	Age-specific mortality rate by sex	(i)-a (ii)-b (ii)-c	Date of occurrence Age Sex
Second priority tabulations				
DE-3	NA	Deaths by month and place of occurrence and place of usual residence of decedent		
DE-6	NA	Deaths by place of usual residence, age and sex of decedent		
DE-7	NA	Deaths by age, sex, place of usual residence and marital status of decedent		
DE-8	NA	Deaths by place of usual residence, age, sex and educational attainment of decedent		
DE-11	NA	Deaths by place of occurrence, sex of decedent and type of certification		
DE-13	NA	Deaths by age and type of usual activity of decedent		

Ref no. = table or figure number in the Vital Statistics Report Template; NA = not applicable

Table A2.3
Cause of death

Table no. in UN P&R	Table no.	Table heading	Registration variables required	
First priority tabulations				
NA	T 6.2	Top 10 causes of death (all ages, both sexes)	(i)-a (i)-g	Date of occurrence Cause of death

NA	T 6.3 T 6.4	10 leading causes of death, males 10 leading causes of death, females	(i)-a (i)-g (ii)-c	Date of occurrence Cause of death Sex
NA	T 6.5	10 leading causes of death, infants and children (0–4 years, both sexes combined)	(i)-a (i)-g (ii)-b (ii)-c	Date of occurrence Cause of death Age Sex
NA	T 6.6	10 leading causes of death, children (5–14 years, both sexes combined)	(i)-a (i)-g (ii)-b (ii)-c	Date of occurrence Cause of death Age Sex
NA	T 6.7 T 6.8	10 leading causes of death, adolescents and adults (15–69 years, males) 10 leading causes of death, adolescents and adults (15–69 years, females)	(i)-a (i)-g (ii)-b (ii)-c	Date of occurrence Cause of death Age Sex
NA	T 6.9 T 6.10	10 leading causes of death, older adults (15–69 years, males) 10 leading causes of death, older adults (15–69 years, females)	(i)-a (i)-g (ii)-b (ii)-c	Date of occurrence Cause of death Age Sex
First priority figures				
NA	F 6.1	Deaths by broad group, including ill-defined codes	(i)-a (i)-g	Date of occurrence Cause of death
NA	F 6.2 F 6.3	Deaths by broad disease group and age, males Deaths by broad disease group and age, females	(i)-a (i)-g (ii)-b (ii)-c	Date of occurrence Cause of death Age Sex
Second priority tabulations				
DE-9	NA	Deaths by sex, cause of death, place of usual residence, and age of decedent		
DE-10	NA	Deaths by month of occurrence and cause of death		
DE-12	NA	Maternal deaths by cause of death and age of woman		

Ref no. = table or figure number in the Vital Statistics Report Template; NA = not applicable

Table A2.4.
Marriages and divorces

Table no. in UN P&R	Ref no.	Table heading	Registration variables required	
First priority tabulations				
MA-2	T 7.2	Marriages by place of usual residence of groom and age of bride and of groom, urban areas	(i)-a	Date of occurrence
			(ii)-b	Age (bride)
			(iii)-b	Age (groom)
	T 7.3	Marriages by place of usual residence of groom and age of bride and of groom, rural areas	(iii)- m	Place of usual residence
MA-3	T 7.4	Marriages by age of groom and previous marital status	(i)-a	Date of occurrence
			(ii)-b	Age (bride)
			(ii)-c	Marital status (bride)
	T 7.5	Marriages by age of bride and previous marital status	(iii)-b	Age (groom)
			(iii)-c	Marital status (groom)
DI-2	T 7.6	Divorces by age of husband and wife	(i)-a	Date of occurrence
			(ii)-b	Age (wife)
			(iii)-b	Age (husband)
DI-3	T 7.7	Divorces by duration of marriage and age of husband	(i)-a	Date of occurrence
			(ii)-b	Age (wife)
	T 7.8	Divorces by duration of marriage and age of wife	(ii)-g	Duration of marriage (wife)
			(iii)-b	Age (husband)
			(iii)-g	Duration of marriage (husband)
DI-4	T 7.9	Divorces by duration of marriage and number of dependent children	(i)-a	Date of occurrence
			(ii)-d	Number of dependent children (wife)
				Duration of marriage (wife)
			(ii)-g	Number of dependent children (husband)
			(iii)-d	Duration of marriage (husband)
			(iii)-g	
First priority figures				
NA	F 7.1	Marriages by year of occurrence	(i)-a	Date of occurrence
NA	F 7.2	Average age at first marriage by sex and year of occurrence	(i)-a	Date of occurrence
			(ii)-b	Age (bride)
			(iii)-b	Age (groom)
NA	F 7.3	Divorces by year of occurrence	(i)-a	Date of occurrence
NA	F 7.4	Average age at divorce by sex and year of occurrence	(i)-a	Date of occurrence
			(ii)-b	Age (wife)
			(iii)-b	Age (husband)
NA	F 7.5	Age-specific divorce rate by sex and year of occurrence	(i)-a	Date of occurrence
			(ii)-b	Age (wife)
			(iii)-b	Age (husband)
NA	F 7.6	Divorces by duration of marriage and year of occurrence	(i)-a	Date of occurrence
			(ii)-g	Duration of marriage (wife)
			(iii)-g	Duration of marriage (husband)

Second priority tabulations		
MA-1	NA	Marriages by place of usual residence of groom and month of occurrence
MA-4	NA	Marriages by educational attainment of bride and groom
MA-5	NA	Marriages by occupation of bride and groom
DI-1	NA	Divorces by place of usual residence of husband
DI-5	NA	Divorces by educational attainment of husband and of wife
DI-6	NA	Divorces by occupation of husband and of wife
DI-7	NA	Divorces by number of previous marriages of husband and of wife

Ref no. = table or figure number in the Vital Statistics Report Template; NA = not applicable

Table A2.5. Summary tables

Table no. in UN P&R	Ref no.	Table heading
First priority tabulations		
ST-9	T 8.1	Live births, deaths, and infant and child deaths by year of occurrence
ST-1	T 8.2	Live births, deaths, and infant and child deaths by place of usual residence of mother (births) or decedent (deaths)
ST-9	T 8.3	Fertility and mortality indicators by year of occurrence
ST-2	T 8.4	Fertility and mortality indicators by place of usual residence
ST-9	T 8.5	Marriage and divorce indicators by year of occurrence
Second priority tabulations		
ST-3	NA	Time series of live births by place of usual residence of mother (past 10 years)
ST-4	NA	Time series of deaths by place of usual residence of decedent (past 10 years)
ST-5	NA	Time series of infant deaths by place of usual residence of mother (past 10 years)
ST-6	NA	Time series of foetal deaths by place of usual residence of mother (past 10 years)
ST-7	NA	Time series of marriages by place of usual residence of groom (past 10 years)
ST-8	NA	Time series of divorces by place of usual residence of husband (past 10 years)

Ref no. = table or figure number in the Vital Statistics Report Template; NA = not applicable