



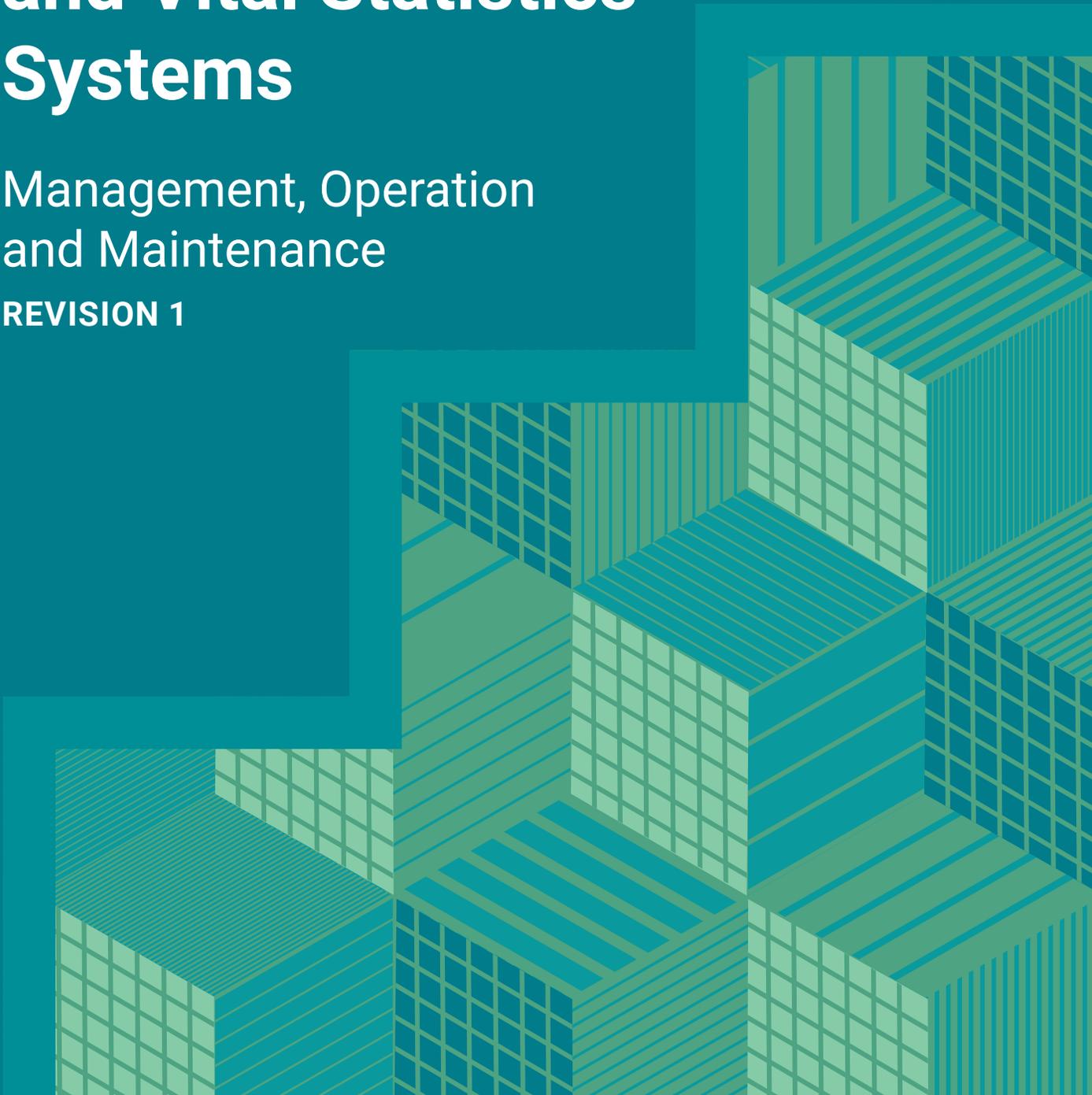
**United
Nations**

Department of Economic and Social Affairs

Handbook on Civil Registration and Vital Statistics Systems

Management, Operation
and Maintenance

REVISION 1



Department of Economic and Social Affairs
Statistics Division

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Handbook on Civil Registration and Vital Statistics Systems

Management, Operation and Maintenance

Revision 1



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Department of Economic and Social Affairs

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Preface

The present *Handbook on Civil Registration and Vital Statistics Systems: Management, Operation and Maintenance, Rev. 1*, has been developed as a companion volume to the *Principles and Recommendations for a Vital Statistics System, Rev. 3*, published in 2014.^a It aims to provide guidance and assistance to national authorities in establishing a holistic system of civil registration, vital statistics and identity management. This is the first revision of the original handbook, which was issued in 1998.

The present *Handbook* offers background information, specifications and practical examples for the establishment—or, where already in existence, improvement—of civil registration, vital statistics and identity management systems. It presents model organizational and legal arrangements, together with descriptions of exemplary processes and protocols that are considered to be the gold standard in this domain. Although a number of national examples are presented in support of successful approaches, the *Handbook* is not a technical report describing and analysing country practices; rather it elaborates the international standard and describes in detail the resulting operational holistic model. It aims to encourage countries to undertake—long-term self-sustaining programmes designed to strengthen the management and inter-operability of their civil registration, vital statistics and identity systems.

The *Handbook* covers the entire range of vital events—live births, deaths (including causes of death), fetal deaths, marriages, divorces, annulments, judicial separations, adoptions, legitimations and recognitions—but emphasis is placed on live births, deaths and fetal deaths, since those have been given first priority in the *Principles and Recommendations*. It should be emphasized that the present *Handbook* does not elaborate on issues related to the correct assignment and classification of causes of death, as guidelines on that matter have been published by the World Health Organization (WHO); references to existing literature are provided throughout this publication. In addition, the importance of including cause-of-death data in a comprehensive civil registration and vital statistics system is frequently highlighted, in particular in the context of intersectoral collaboration initiatives needed to establish the role of the health sector, as both a notifier of events and to ensure that cause-of-death data form an integral part of a country's civil registration and vital statistics system.

There is a clear distinction between vital statistics—a set of data crucial for policymaking—and their source, the civil registration system—a critical element for establishing the basic human rights and legal identity of individuals. In view of the heightened importance of assigning a unique identity document to each individual, the *Handbook* addresses the recommended information flow and institutional arrangements for ensuring effective civil registration, quality vital statistics and warranted rights and services for the population, notwithstanding possible security issues.

Applications of registration and statistical data and records at all levels of government, as well as in the public, private and academic domains, are highlighted throughout the *Handbook*. Specific functions are described within both centralized and decentralized structures, and continuous monitoring and evaluation are presented as components essential for good management, efficient operation and effective

^a United Nations publication, Sales No. E.13.XVII.10. Available from https://unstats.un.org/unsd/publication/seriesM/Series_M67rev3en.pdf.

maintenance. A chapter on methods for assessing the completeness and coverage of civil registration as well as a chapter on digitizing civil registration and vital statistics have been introduced, in response to the need for Governments to modernize their approaches and operations, the wide availability of information technology and the consequent need for guidance.

The present *Handbook* consists of seven chapters. Chapter I provides an overview of civil registration and vital statistics systems, including centralized and decentralized structures, the necessary legal framework and their interaction with population registers and identity management systems. Chapter II details the activities of the civil registration system and outlines its essential functional components and relationship with the vital statistics system. Chapter III describes the operational requirements for sound civil registration and vital statistics systems. Chapter IV builds on the material presented in the *Principles and Recommendations*, and examines in detail the issue of quality in the context of civil registration and vital statistics systems. Chapter V focuses on issues emanating from the proliferation of population registers, identity management systems and their interlinkages with civil registration and vital statistics systems. Chapter VI describes a range of applications and uses of data and information in civil registration and vital statistics systems. Chapter VII focuses on the technical details of implementing the enterprise information system paradigm and adapting its features for civil registration, vital statistics, population registers and identity management. For a full understanding of the management, operation and maintenance of civil registration, vital statistics and identity management systems, perusal of the full publication is recommended, although the chapters can be consulted independently if a more targeted review is necessary.

The *Handbook* draws on the *Principles and Recommendations* as well as on the World Bank e-learning course on civil registration and vital statistics systems,^b which was developed in partnership with the Global Civil Registration and Vital Statistics Group,^c and on the Civil Registration and Vital Statistics Digitisation Guidebook,^d which was developed for the purpose of supporting the Africa Programme on Accelerated Improvement of Civil Registration and Vital Statistics Systems.^e All those resources are consistent with each another in their conceptual approach, and may be used jointly.

The drafting of this first revision of the original handbook comprised several stages. First, an initial draft was prepared by the Statistics Division and presented at the Expert Group Meeting on Management and Evaluation of Civil Registration and Vital Statistics Systems, held in New York from 20 to 24 February 2017.^f Then, based on the proceedings of that meeting, a second draft was prepared by the Statistics Division and circulated to the members of the Expert Group and the Global Civil Registration and Vital Statistics Group for further comments and suggestions. A third draft was circulated to the members of the Expert Group for their final input. The final draft was submitted to the Statistical Commission at its forty-ninth session, held in March 2018.

^b See <https://olc.worldbank.org/content/civil-registration-and-vital-statistics-systems-basic-level-self-paced-format>.

^c For more information on the Group, see <https://unstats.un.org/unsd/demographic/crvs/globalcrvs.html>.

^e See www.apai-crvs.org for details about the programme.

^f See <https://unstats.un.org/unsd/demographic-social/meetings/2017/new-york-egm-on-management-and-evaluation-of-crvs-systems/> for all papers and presentations.

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Chapter I

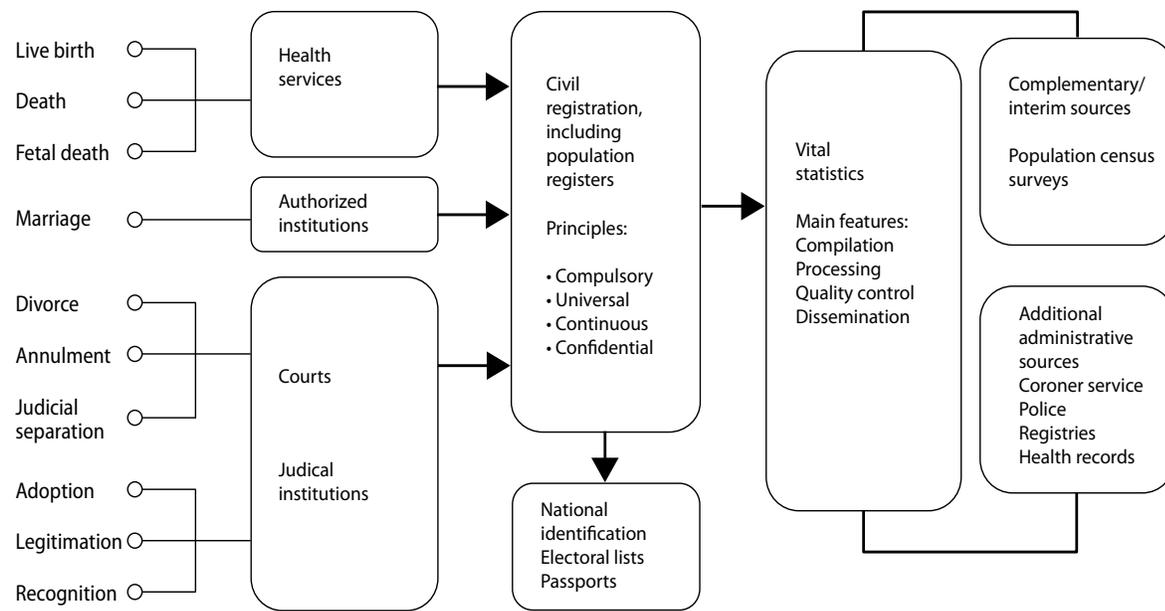
Institutional arrangements for civil registration and interface with vital statistics

A. Introduction

1. *The Principles and Recommendations for a Vital Statistics System, Rev. 3 (2014)* (hereinafter *Principles and Recommendations*) was essentially designed to present vital statistics and civil registration as separate entities, with the ultimate aim of establishing, maintaining and applying the two entities as components of a coordinated and coherent system for registering and producing vital statistics. The procedures for recording births and deaths are equally important for civil registration, as a legal exercise, and for vital statistics, as a source of statistical information. As such, the tasks performed by civil registrars and by statisticians are interdependent.¹ In addition, the emergence of interconnections between civil registration and contemporary identity management systems adds another dimension to the structure of the civil registration and vital statistics systems. The relationships and their functioning are presented in figure 1 below.

¹ *Principles and Recommendations for a Vital Statistics System, Rev. 3 (2014)*, para. 274.

Figure 1
Civil registration and vital statistics system



Source: *Principles and Recommendations*, para. 26.

2. Civil registration is defined as the continuous, permanent and compulsory universal recording of the occurrence and characteristics of vital events pertaining to the population, as provided through decree or regulation, in accordance with the legal requirements in each country, with full respect for the rules regulating the protection and privacy of individual information.² It is important to highlight the quality of universality in relation to people's rights regarding the registration of vital facts. Everyone has the right to be recognized as a person before the law, as enshrined in article 6 of the Universal Declaration of Human Rights and reaffirmed in several other global accords and international human rights instruments.³ As civil registration establishes the existence of a person under law, it has traditionally been the fundamental means of granting legal identity. In this regard, laws, policies, rules and regulations must not be a hindrance to the realization of this right. In particular, the registration of events must be performed even if the time frame given by law has expired, and regardless of migratory status, citizenship and any other request that may act as an obstacle to registering the vital facts occurred in the territory. Civil registration is carried out primarily for the purpose of establishing the documents provided for by law. The usefulness of these records as the best source for the production of vital statistics is well established.
3. "Civil registration method" refers to the procedure employed in gathering the basic information on the incidence and characteristics of vital events that occur in the population of a country (or area) within a specified time period, upon which the preparation of vital records with legal value and the production of vital statistics are based. That method should be distinguished from other methods of gathering data about the population because it is mandated by law to be continuous, permanent and confidential. Information collected within the framework of this system has legal authority.
4. Responsibility for the establishment or development of a civil registration system should lie with one or more agencies of a national Government.⁴ The term "civil registration system" refers to the entire administrative, legal and institutional framework, including the personnel, registration network, various procedures, processes of record-keeping and retrieval, issuing of certificates, preparation of outputs, transfer of data, provision of services to other agencies and all other activities pertaining to civil registration in a country (or state, or province). Therefore, the civil registration system encompasses both the registration method and all institutional, technical and legal settings associated with it.
5. The juridical function of civil registration is to register the occurrence of acts and events that constitute the source of civil status and to issue certificates. Such events are called "vital events". The vital events that most countries register, as internationally recommended, fall in the categories of live births, deaths, fetal deaths, marriages, judicial separations, divorces, annulments, adoptions, legitimations and recognitions.⁵ In addition to the legal role of maintaining public records and performing certifying activities, the production of vital statistics is a key function that must be recognized as a matter of paramount importance in the design of national development policies.
6. Civil registration also underlies the maintenance of population registers and identity lists in countries where those exist. If population registers and identity management systems are not fed from the civil registration system with information on births and deaths, they will quickly become outdated and lose their usefulness.
7. According to international standards, certain occurrences are vital events for which data must be collected for vital statistics purposes. Those are listed below with their recommended definitions:⁶
- ² Ibid., para. 279.
- ³ See 1948 Universal Declaration of Human Rights, arts. 6 and 15; 1951 Convention relating to the Status of Refugees, arts. 25 and 27; 1954 Convention relating to the Status of Stateless Persons, arts. 25 and 27; 1961 Convention on the Reduction of Statelessness, arts. 1–4; 1969 International Convention on the Elimination of All Forms of Racial Discrimination, art. 5 (d) (iii); 1966 International Covenant on Civil and Political Rights, art. 24; 1979 Convention on the Elimination of All Forms of Discrimination against Women, art. 15; 1989 Convention on the Rights of the Child, arts. 7–8; 1990 International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families, art. 29; 2006 Convention on the Rights of Persons with Disabilities, art. 18.
- ⁴ *Principles and Recommendations*, para. 301.
- ⁵ Ibid., para. 2.
- ⁶ Ibid.

- (a) *Live birth*: the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born (all live-born infants should be registered and counted as such, irrespective of gestational age or whether alive or dead at the time of registration; if a live-born infant dies at any time following birth, it should be registered and counted as a death);
- (b) *Death*: the permanent disappearance of all evidence of life at any time after a live birth has taken place (i.e., postnatal cessation of vital functions without capability of resuscitation). This definition does not apply to fetal death;
- (c) *Fetal death*:⁷ 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 fetus 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. This definition broadly includes all terminations of pregnancy other than live births, as defined above;⁸
- (d) *Marriage*: 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 recognized by national laws. Countries may wish to expand this definition to cover civil unions, if they are registered; a registered partnership usually refers to a legal construct, registered with the public authorities according to national laws, and which leads to legal conjugal obligations between two persons;
- (e) *Divorce*: the legal final dissolution of a marriage, i.e., separation of spouses which confers on the parties the right to remarry under civil, religious or other provisions, according to national laws. Where a country recognizes registered partnerships, the legal dissolution of a registered partnership refers to the legal final dissolution of such a partnership according to national laws, which confers on the parties the right to enter into another partnership or marriage;
- (f) *Annulment*: the invalidation or voiding of a marriage by a competent authority according to national laws, which confers on the parties the status of never having been married to each other;
- (g) *Judicial or legal separation*: the court-ordered living apart of married persons according to national laws, without conferring on the parties the right to remarry;
- (h) *Adoption*: the legal and voluntary taking and treating of the child of other parents as one's own, insofar as provided by national laws;
- (i) *Legitimation*: the formal investing of a person with the status and rights of a person born in wedlock, according to national laws;
- (j) *Recognition*: the legal acknowledgement, either voluntary or compulsory, of the paternity of a child born out of wedlock.

⁷ Also referred to as “dead-born fetus” and “stillbirth”.

⁸ The legal requirements for the registration of fetal deaths vary from country to country. It is recommended that dead fetuses weighing 500 grams or more at birth (or 22 completed weeks of gestation or crown-heel body length of 25 centimetres or more, if weight is not known) be registered. In addition, for statistical purposes, it is recommended that terminology such as “abortion”, “early fetal death” and “late fetal death” be replaced with weight-specific measurements, e.g., the fetal death rate for fetuses of 1,000 or more grams or the fetal death rate for fetuses weighing between 500 and 1,000 grams, etc. See WHO, *International Statistical Classification of Diseases and Related Health Problems*, 10th revision (Geneva, 2010). Details available at www.who.int/classifications/icd/en/.

8. It should be emphasized that the relationship between vital statistics and health statistics is of considerable importance in modern systems. A number of variables used for vital statistics are of direct interest in the collection of health statistics, such as age of mother, number of previous live births, cause of death and so forth. Health

statistics, in turn, are indispensable for developing policies and measures for improving the overall health of the population. The source of health statistics is usually the health institution (public or private) which also acts as an informant of the occurrence of vital events such as births and deaths. Efforts must be made to harmonize definitions, classifications and data formats relating to civil registration and vital and health statistics at a very early stage in the process when designing a holistic system of civil registration, vital statistics and population registers.

9. Continuous, permanent recording of vital events can best be ensured by the adoption of proper legislation and the establishment of mechanisms for its nationwide enforcement. Civil registration legislation should promote the close integration of people into the community and give them clear guidelines on how the civil registration system is organized in the country or area. It should also spell out the types of vital events that must be registered, their definitions, designation of informants for each type of event, time allowances for registering each type of vital event, procedures for late registration, the registrar's duties, rights and obligations related to registration, penalties for non-compliance and so forth.

10. In the context of defining a system as a set of interacting or independent components forming an integrated whole, and in accordance with the Principles and Recommendations, the components of a vital statistics system are legal registration; statistical reporting of vital events;⁹ and collection, compilation and dissemination of statistics pertaining to those events, as illustrated in figure 1.

⁹ *Principles and Recommendations*, para. 26.

11. Given that the institutional organization of civil registration and vital statistics significantly affects the system's interlinkages as well as its set-up and functioning, it is necessary to look more closely at the different arrangements implemented in various countries and circumstances. Both civil registration and official (vital) statistics are, in most countries, a function of the Government, yet the organizational settings for one or the other differ. In general, the organizational structure(s) for the efficient management, operation and maintenance of the system might be centralized or decentralized. In terms of overall structure, a centralized system relies on being managed at the national level, with subnational offices at appropriate local levels. A decentralized system is one where the primary responsibility for civil registration and local vital statistics rests with subnational authorities, such as governments of states or provinces.

B. Centralized administration for civil registration

12. A centralized administration responsible for civil registration usually has an agency for directing, coordinating and monitoring nationwide civil registration. An office with such duties can promote national standards and uniform registration of all vital events occurring within the country and among various groups of the population.

13. Under this type of central arrangement, the national registration agency not only plays an administrative and legal role but also exercises a technical function in relation to the network of subnational and local civil registration offices. It establishes all local registration offices, provides written materials and standard operating procedures to local registrars to guide their daily work, coordinates the registration procedures throughout the system, and supervises and evaluates the registration work of the local offices.

14. The central office is responsible for coordination with other government agencies that support the civil registration system, including the health services that report the occurrence of vital events and certify causes of death, the courts that deal with marriages and divorces, and the national statistical service that compiles the registra-

tion data and publishes vital statistics. Coordination is often resolved by means of a national inter-agency committee.

15. In most cases, the national body in charge of the the system conducts such vital statistics functions as cleaning, coding, data processing, preparing tables and charts, statistical and trend analyses, publishing reports and conducting related research. The national body then distributes that information to local government units. That approach ensures the consistency of the data and information for the country as a whole. Local agencies can then use such data for local programmes, planning and population-related activities. A number of countries, however, also conduct cleaning, coding and data processing at regional or subnational levels which, depending on the size and specific characteristics of the country, may be much more efficient in terms of timeliness and proximity to the original source of information. That approach necessitates uniform data cleaning and processing procedures and protocols in order to ensure standard format and content of the resulting vital statistics.

16. In a centralized system, the fact that all direction comes from above may result in a lack of incentives at the local level with the effect that there is no feedback or input from the bottom up in terms of proposals for useful innovations based on local knowledge. That may prevent a comprehensive understanding of local circumstances from reaching the central agency and can result in a failure by local officials to put forth innovative approaches that could enhance the system. To prevent that from occurring, it is essential to ensure that strong lines of communication are in place in both directions—from the central office to the local units and vice versa—, so as to ensure that knowledge from both levels is used to manage and operate the system effectively.

17. The advantages of having a central registration office to administer the system are as follows:

- (a) It makes possible the preparation and approval of a standard legal framework for the civil registration system, which promotes uniformity of procedures throughout the country and, in turn, facilitates further changes in legislation, whenever needed;
- (b) It facilitates the interpretation and enforcement of norms and regulations;
- (c) It permits the adoption of uniform procedures for recording and reporting vital events nationwide, including ways and means of certifying registered vital events, and for releasing certificates to the public;
- (d) In terms of establishing direct links with identity management authorities, it allows for more secure and uniform protocols for channelling the necessary inputs;
- (e) It promotes the maintenance of direct and effective control over the entire system and facilitates the carrying out of research based on vital records kept under uniform archival techniques;
- (f) It facilitates the development and channelling of advisory services and other forms of technical assistance to local civil registrars, such as periodic training courses to keep them abreast of any changes in the system and the provision of focal technical advice for solving a particular problem.

18. In a centralized administration paradigm, there are two principal options for the administration of the vital statistics system:

- (a) In one option, the responsibility for both civil registration and vital statistics rests with a single government institution.¹⁰ That might be the national statistical office, the ministry of health or of internal affairs or of justice or an independent agency;

¹⁰ The example of the Philippines is noteworthy. The Philippine Statistics Authority is responsible for both civil registration and issuing certificates, as well as generating vital statistics. In India, the Office of the Registrar General and Census Commissioner cover both civil registration and the compiling of vital statistics, although civil registration coverage, in terms of the occurrence of vital events, varies significantly between states in India.

- (b) In the other option, the civil registration and vital statistics functions are separate. Civil registration might be under the responsibility of the national civil registrar, the ministry of internal affairs or of justice, and the vital statistics system may be under the responsibility of another agency, most often the national statistical office.¹¹ In turn, the vital statistics system itself can be administered in a centralized or decentralized manner. In both cases, critical importance is attached to the coordination of the two components, so as to avoid the dissemination of differing vital statistics, one set based on civil registration data and the other on official statistics.

¹¹ A number of examples fall into this category, such as Costa Rica, Ethiopia, Guatemala, Mongolia, Norway and Uzbekistan, among others.

1. Separate administrative agencies for civil registration and vital statistics

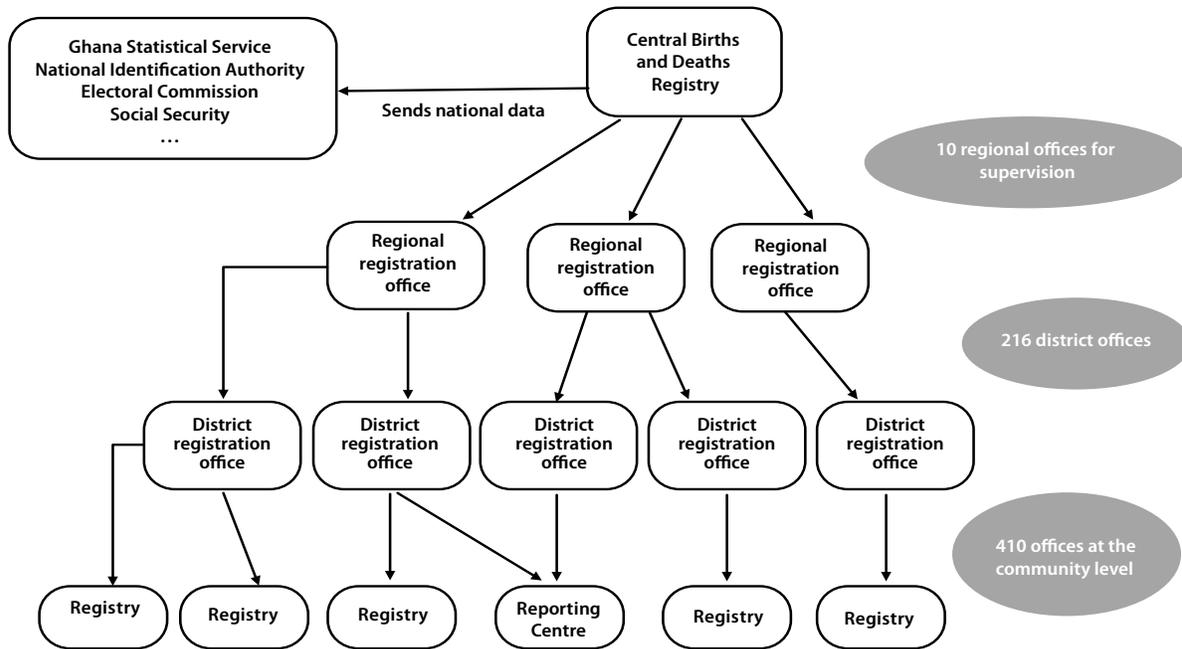
19. As presented above, in a number of cases, civil registration and vital statistics functions are assigned to separate administrative agencies. In that arrangement, those agencies have complementary functions. The civil registration agency is in charge of collecting the information that the statistics agency later analyses and uses to produce tabulations, rates and ratios. Maintaining interaction and cooperation between these agencies becomes a key factor in ensuring that the resulting civil registration and vital statistics systems are effective. Offices of civil registrars, ministries of internal affairs, justice or health or other independent agencies have responsibility for the civil registration system, while another agency, most often the national statistics office, has the responsibility for the vital statistics system. This kind of structure requires a more complex organizational and operational arrangement than when a single agency is responsible for both systems. The vital statistics system may be centralized or decentralized.

20. In this arrangement, the first concern is how to create an interactive and collaborative relationship between the two agencies. The vital statistics function is fed with data from the daily operation of the civil registration system. The statistical agency should take the lead in establishing a working relationship with the registration programme. The best option is to have an inter-agency committee established by the laws and regulations on civil registration, or by the vital statistics law. Another option is to prepare a memorandum of agreement that designates a committee with representatives from both programmes, together with other stakeholders, such as the ministry of health. The committee's membership should be representative of the various factors affecting the civil registration and vital statistics systems. Those should include the operational parts of both systems, such as the legal registration formalities and documentation and other requirements for the preparation of vital statistics. Another issue with which the committee is concerned is the set of rules and regulations needed to provide complete and accurate data for both programmes. The committee also needs to consider processing methods to ensure effective registration services and timely and relevant vital and health statistics. The committee should meet every two months or every quarter to review the completeness, accuracy, timeliness and reliability of the data for each function. It should also consider coding and data-entry activities, along with problems arising in the processing routines of each programme.

21. The data (micro level) flow from the local registration units through district and regional offices to the national level, and then to the statistical component, taking into account data confidentiality restrictions. In this context, the committee should also play a coordination role with regard to interaction with those local offices. Figures 2 and 3 present examples of the centralized model with separate agencies for civil registration and vital statistics, from Ghana and Georgia, respectively.

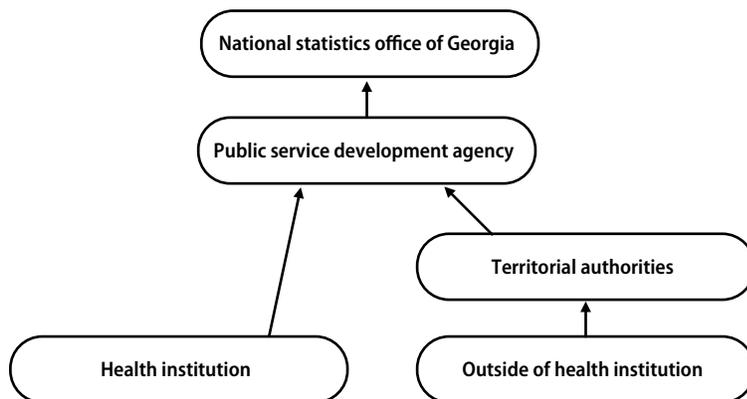
22. Furthermore, the importance of the routine collection of data from civil registration for use in the production of birth and death statistics (fertility and mortality), including cause of death, should be reflected in the national statistics strategy or equivalent national strategy document.

Figure 2
Organizational structure of civil registration in Ghana



Source: Workshop on the Principles and Recommendations for African English-speaking countries, held in Addis Ababa, 2–5 December 2014 (see https://unstats.un.org/unsd/demographic/meetings/wshops/Ethiopia/2014/list_of_docs.htm).

Figure 3
Civil registration and vital statistics systems in Georgia



Source: Subregional Asian workshop on applying principles and recommendations for implementing the Regional Action Framework for strengthening CRVS, held in Istanbul, Turkey, 15–18 September 2015 (see https://unstats.un.org/unsd/demographic/meetings/wshops/Turkey/2015/list_of_docs.htm).

23. The vital statistics system derives its data from the civil registration system and the combined or separate statistical and civil registration forms (on paper or in electronic format) that are completed at the time of registration. The civil registration

system brings in all the necessary information, for both registration and statistical purposes. Hence, contact and interaction with local units (village, district and region) should originate from the registration office. The registration system unit responsible for field activities should consult with the committee then initiate these contacts. In the centralized separate-agency structure, the national-level body maintains the legal and statistical functions. Registration offices at the local level conduct registration activities, including the issuing of certificates, corrections, amendments and so on.

24. One advantage of having separate agencies for civil registration and vital statistics is that each agency can focus exclusively on the discharge of its specific function. In addition, collaborative and constructive competition between the two agencies can result in more attention being given to managing each system in an effective and efficient manner. The joint or inter-agency committee maintains coordination of those separate system activities.

25. The separate-agency structure has another positive feature in that it is more conducive to support for changes, modifications and improvements. Requests for resources are more often given greater consideration by government budget offices when support is requested by separate agencies for the same activity than when a single agency seeks support on its own. One negative aspect, however, is the necessity for the two agencies to agree on the specific needs to be addressed and the resulting distribution of available resources. This is particularly the case when the civil registration agency views the statistical function as just another by-product and not a critical component.

26. Agreement between the two agencies may be difficult to reach on any number of issues. For example, when civil registration and vital statistics systems are both automated, there could be duplication of data entry and other processing activities, not to mention incompatibility of the technologies applied and the need for harmonization. There could also be problems reaching agreement on the data-collection process, the forms used and the data items to be included, the definitions employed and the procedures for assessing the completeness, validity and accuracy of information. Those issues are best resolved at the time that the memorandum of agreement is drawn up and through the established committee responsible for addressing such issues and concerns.

27. Within a centralized system, the major difference between a system in which a single agency is responsible for both civil registration and vital statistics and a system with two agencies is the need for a legal mandate for cooperation and coordination or official agreement and a coordinating committee. The combination of committee and agreement ensures that each system has an operational structure that can produce high-quality results.

2. One single agency for civil registration and vital statistics

28. Another type of arrangement for the civil registration and vital statistics systems is for both responsibilities to be placed in a single government organization, based on the reasoning that the two systems are closely linked. Vital statistics come from data on combined civil registration and vital statistics forms or from the pairing of civil registration forms with statistical forms filled out at the time of registration. Their completeness and accuracy depend on the data collection and data processing methods used in registration. It is more efficient to maintain control of the forms and processes within a single organization. For example, in countries in which a single agency is responsible for both systems, it is easier to operate with a single data-collection form that combines data for both legal and statistical purposes.

29. The advantage is that the agency responsible for both systems controls all the modifications that affect either system, thus eliminating the need to resolve differences

about the systems between the agencies. That approach is also conducive to closer intra-agency collaboration and enables effective changes to be made more swiftly.

30. A committee made up of representatives from both the civil registration and the vital statistics units within the agency can be very effective in providing guidance for monitoring and operating each functional area. While, in their daily activities, the civil registration and vital statistics units pursue their own specific goals, attainment of these goals and objectives is in a single agency setting.

31. The single agency approach also has the advantage of overall management of the total system of registration and vital statistics. A single agency in a centralized structure can initiate, develop and achieve each functional and operational task. Single administrative control allows for the appropriate distribution of staff and other resources. In those cases where the local staff are not employees of the central agency, the agency must provide regulations and standards for the operational aspects of the system, ensuring that local offices operate in a manner consistent with central office protocols. The assignment of local offices and local registrars to carry out registration activities in the various geographical areas is essential for an effective system.

32. Direct control over each component of the system enhances the ability to operate the system in an efficient and cost-effective manner. A single administrative agency with oversight over both civil registration and vital statistics is in a good position to accomplish such efficiencies. The design of forms, the selection of data items, the development of coding structures, the establishment of processing methods and the choice of statistical measures and indicators are more efficiently executed within a single agency. A more focused, coordinated and uniform approach is also followed to the development and use of contemporary information technology. A single administrative body can more effectively provide services to the public, the research community and other government programmes.

33. In a centralized system, the primary resources for operating and maintaining the system at the national level are concentrated in a central office. It is important to note that, under a single, centralized system, the designated central agency has responsibility for each operational and functional activity conducted by offices at the national, regional and local levels, making the registration activities at the regional or local levels more consistent. The centralized national structure minimizes any local bias or difference in process.

34. The central agency needs to establish an organizational structure with specific operational roles clearly defined at each level. It also needs to establish, at each level, standing monitoring and evaluation protocols to assure the quality and completeness of data collection and the timely reporting of vital events. A centralized programme presents a systematic structure with all parts of the programme within a single administrative unit. That will result in a unified programme, with all operational units functioning in accordance with a single, coordinated mode of operation. It provides both the necessary registration services to the public and produces the vital statistics for national, regional and local use.

35. As the centralized registration authority, the agency manages civil registration throughout the country. It also sources vital statistical data from the civil registration forms, on such matters as births, deaths, fetal deaths, marriages and divorces. The data derived from those records and used for both registration services and vital statistics are reviewed, validated, coded and processed at the central site. That ensures that standards and criteria are used for both registration and vital statistics needs in a consistent fashion and represents a very important attribute of the system.

36. The national system may use district and regional offices to direct the flow of records from the local registration offices. The offices at each level may retain copies of the records completed for each vital event to provide services to the population. The national office, however, prepares the vital statistics derived from those forms and then provides the information to users at different levels.

37. Thus, within the single-agency configuration, the registration functions of record retention and copy preparation for public access may occur at each level of government—local, district and regional. The vital statistics component is primarily a national office activity. As district and regional offices develop the ability to prepare vital statistics data locally, some efficiency may be gained if the units abstract data from the registration records as they pass through their offices on their way to the national office; this would become an even more efficient and routine operation if the system is digitized (see chap. VII). This flow of registration records provides an incentive for local units to develop the capacity to use the data in a proactive manner, while also playing an active role in civil registration.

38. Since the centralized system has both civil registration and vital statistics functions, it serves as the single source for information from either system. Thus other agencies, both public and private, and related programmes may seek direct access to the centralized data source. As the harvesting of anonymized microdata is becoming one of the major sources for the detailed analysis of population dynamics and for related economic and social research, the consolidation of all the records under one roof enables the more stringent development of protocols on the use of microdata and protection of their confidentiality and privacy. In addition, that makes all the processes more effective and eliminates the difficulties in resolving differences between various aspects of the system which could arise if the components were divided among a number of agencies.

39. The centralized single-agency configuration may give rise to concerns as to whether there is adequate representation and access for other programmes or government agencies seeking both registration and statistical information. The health sector, in particular, other statistical and research organizations and government agencies in the social and health service areas all rely to some degree on information from the registration and vital statistics systems. Input from those disciplines is essential, so the single administrative agency will need to formulate a comprehensive programme to meet their needs.

40. In more general terms, that concern can be addressed through the establishment of an inter-agency committee, with representation from appropriate programmes and organizations. The committee may include such programmes as maternal and child health, family planning, social services, population registers, identity management agencies, electoral rolls, immigration and naturalization, demography and population dynamics, and police. In this way, the needs and issues of other programmes can be included as part of the administration and operation of the registration system.

41. Another possible disadvantage of the single-agency approach is related to the agency's need to reconcile two different methodological concepts in discharging its official responsibilities; the civil registration method is oriented to a case-by-case approach, which refers to applying rules and regulations according to the facts and characteristics of each particular situation. The statistical approach is all about the quantification of individual cases into aggregates, in which process each entry is given equal treatment. Translated into the operational arrangement, the difference is reflected in the necessity for much closer and much more frequent interaction of registrars with the public—such interaction is not really necessary in the production of statistics. Hence, if a single-agency approach is chosen, additional efforts will have to be made and structures established to accommodate the efficient delivery of both functions.

C. Decentralized administration of civil registration

42. Decentralized civil registration has more than one model. In fact, the distinction is made based not only on the manner and institution(s) administering the registration of vital events, but primarily on the uniformity of procedures, protocols, content of records and harmonization of processes. For example, in a number of European countries, the actual registration of vital events and the issuance of relevant certificates is the sole authority of local governments, such as municipalities, and in most cases, even the funding for those services comes from the local government budget. At the national level, however, the civil registration law and accompanying regulations ensure that the registration process, in terms of procedures, content and all other aspects, is identical. Accordingly, while the actual administering of civil registration is decentralized, that is, not managed by one national agency and accompanying hierarchical structure, the registration process is uniform in terms of protocols, deadlines, forms, certificates and so forth.

43. In another decentralized administration model, civil registration is administered at the level of the major civil divisions, such as the state, province or department. In the capital city of each major division, a civil registration authority is established to direct and monitor the civil registration work of the division. Many countries with a federated political system or a large territory or a large population may adopt this model of decentralized administration for civil registration. See box 1 for an example of this model, from Canada.

44. Although it is recommended, not all countries with decentralized administration for civil registration have adopted uniform legal provisions and procedures for civil registration. A number of countries have made provisions to develop a model law and implementing regulations to enable each major civil division to promulgate its own laws and regulations on the basis of that model. It is recommended that countries develop such a model law on civil registration and that each subnational jurisdiction be encouraged to follow it. The model law should cover data access, in order to facilitate national compilation of vital statistics. More detailed guidance on the legal framework can be found in section D of the present chapter.

Box 1

Canada: Decentralized system of civil registration and vital statistics

Canada's national vital statistics system is based on cooperation and collaboration between the 13 provincial and territorial registrars and the federal Government represented by Canada's central statistical agency, Statistics Canada. Together, they form the Vital Statistics Council for Canada, the advisory group responsible for civil registration and vital statistics in Canada.

Civil registration of births, deaths, stillbirths and marriages is the responsibility of the provinces and territories. Each operates under its own provincial or territorial vital statistics act. The collection and dissemination of national vital statistics are the responsibility of Statistics Canada, whose operation is governed by the federal Statistics Act.

The provincial and territorial vital statistics registrars collect data on births, deaths and stillbirths and send an agreed upon subset of those data to Statistics Canada, using the National Routing System. The National Routing System was developed as a joint partnership between three federal departments—Statistics Canada, Canada Revenue Agency and Service Canada—to enable the vital statistics registrars to provide information to the three federal departments using common technical and data standards. Use of the National Routing System makes it possible to transmit data in close to real time.

45. It should be noted that the processes of producing and disseminating vital statistics, along with the standardization of identity management at the national level, where the administration of civil registration is fully decentralized, usually requires at least one agency at the national level to enforce and standardize the work of civil registration and vital statistics, and another to handle identity management and the issuance of resulting legal tenders (e.g., passports).

46. Within a decentralized administrative structure for civil registration, the organizational options for the vital statistics system may be centralized or decentralized. A centralized system comprises a model in which there is a national statistical office at the central level of government in charge of consolidating all inputs from various institutions at the subnational level. That approach requires strict compliance with harmonized definitions, classification and data formats.

47. Another configuration is represented in other models. In a decentralized structure, state or provincial governments are responsible for both civil registration and vital statistics within its jurisdiction, independent of the national Government. Individual states or provinces make arrangements with the national Government to supply data, which are then aggregated at the national level. Those data are used to prepare national vital statistics and civil status information, and to address national issues related to legal, health and population programmes. In such structures, a national government agency is designated to conduct the vital statistics system. In any event, there must be only one entity authorized by law to publish official statistics and figures.

48. As mentioned above, in decentralized systems it is essential to establish relationships between the states or provinces and the national government agency responsible for the use of national data for vital statistics purposes and national civil registration information. In any decentralized model, collaboration at all levels is key to avoiding fragmentation. There is a need, at the state or provincial level, for consistency in civil registration interaction with national programmes. Programmes such as immigration and naturalization, identity management, passport control, national health and social benefits, population registers, education, conscription, identification services and electoral rolls may have requirements with which civil registration must be consistent.

D. Legal framework for civil registration and vital statistics

49. Establishing the legal basis for civil registration and vital statistics systems requires the incorporation of definitions of all the elements and components into the statutes, rules and regulations of the country.¹² They must cover all the administrative and technical aspects of establishing, operating and maintaining the systems throughout the country. The civil registration and vital statistics statutes may be set out in sections of the law related to the specific ministries responsible for notification, registration and statistics. When more than one agency is involved, the specific functions of each should be defined in the law governing that agency.

50. It should be noted that the legal aspects of the civil registration and the vital statistics systems differ significantly in nature and purpose. The two systems are frequently subject to different, often conflicting, laws. The most practical means of addressing that conflict is through lower-level legal instruments, such as rules and regulations, memorandums of understanding among agencies and so forth. Conflicts between laws can also be resolved through legal reforms; however, the associated legislative processes may take a long time.

51. The specific definitions relating to birth, death, fetal death, marriage, divorce, adoption, legitimation and other vital events, and the related reporting time frames

¹² The issue of a legal framework is thoroughly examined in *Handbook on Civil Registration and Vital Statistics Systems: Preparation of a Legal Framework* (United Nations publication, Sales No. E.98.XVII.7) and *Guidelines on the Legislative Framework for Civil Registration, Vital Statistics and Identity Management Systems, Rev.1* (United Nations publication, forthcoming).

are essential for an effective programme. The United Nations specifies that the definitions should be consistent with international standards.¹³ The stipulated time frames for registering events must be sufficient to ensure that the information is complete, accurate and consistent with other related functions of the system. The law should also specify some type of punitive action should the responsible reporting sources and registration units fail to comply with requirements.

¹³ *Principles and Recommendations*, para. 2.

1. Organizational infrastructure and related legal status

52. When there is a centralized structure and the national registration office administers the registration system, the legal requirements of the national office can directly address all registration activities. If, however, the registration programme is under the auspices of another agency, such as the ministry of health or of internal affairs, the legal issues may be included in the relevant sections of the national laws governing that agency. Conversely, the national civil registration law may indicate the roles and responsibilities of the various ministries. The differences resulting from these diverse administration approaches are described below.

53. For the decentralized structure, the legal framework is set out in the laws of the states or provinces. In cases where the national Government establishes specific requirements for registration, states or provinces must also incorporate them into their laws. When the national Government is not involved in the registration system, each state or province drafts the laws laying down specific requirements for the programme. In instances where city or regional offices control the registration process, states or provinces establish the requirements for the local programme.

54. Laws are, almost without exception, adopted by the representative body and usually require considerable time for adoption. Hence, rules and regulations enacted by the executive branch of the Government are often used to deal with specific issues identified during the operation of the registration programme. The registration units generally develop such rules and regulations to address legal issues such as delayed registration, adoption, paternity or other record changes that occur after the original registration of the event. The use of rules and regulations ensures more timely operation and adaptation to real-life circumstances.

55. There are specific matters that should be covered by these laws at every level, including matters relating to adoption, filiation, procedures for correction and amendment, paternity, delayed registration specifications, legitimation and civil status. The law, rules and regulations should also cover such matters as access to records, confidentiality of selected information, fees for record searches, copy preparation and changes, as well as the security, storage and retention of records. For all these matters, the law should also specify details and requirements regarding the different formats in which the registration records may exist (e.g., paper, electronic, other formats).

56. The legal framework should define the required legal documents, court decisions, and other information sources that are acceptable for adoption and filiation, and address access to registration records for vital statistics purposes and research activities (see chapter VI for information on confidentiality requirements). It should also define permissible use of the records by health programmes and other government agencies for administrative purposes, and specify the fees for certain activities, such as late registration, certified copies, legal changes to the record, preparation of data for research and for legal or administrative uses.

57. Many countries include the above-mentioned components in laws governing their existing legal and administrative system. The first step to be taken in streamlin-

ing the civil registration and vital statistics systems is to obtain information on the current legal structure. Then an analysis should be made to determine the presence of the necessary components for sound civil registration and vital statistics systems. If the analysis indicates deficiencies in the legal framework, a thorough revision of the framework should be made and government support sought to enhance the law and regulations. That may take time, but it is a fundamental step.

58. When working to improve the civil registration law and regulations, vulnerable groups such as refugees, internally displaced persons and stateless persons should not be overlooked. Civil registration should cover the whole population of a country, including those who might not be citizens or recognized permanent residents. However, this is often not the case. Some countries have discriminatory laws and practices which do not allow certain groups to register their vital events. Also, displaced persons are not always aware of the importance of registering vital events or do not have access to the national systems owing to financial, social or physical barriers to civil registration. There could also be reluctance to register out of fear of being expelled from the country or suffering other negative consequences. Making provision for refugees, internally displaced persons and stateless persons in the legal framework of civil registration and vital statistics will help to ensure their protection and integration in the host country and in the event of their repatriation. Civil registration also helps to combat human trafficking.

2. Purpose, function and utility of a legal framework

59. The inclusion of the components of a civil registration system in the laws of a country or its states or provinces serves a number of very important purposes. It makes specific agencies responsible for registration activities and for establishing and maintaining reporting systems. It specifies standards and quality-control conditions for the use of the records and information collected through the system. The legal framework also offers a consistent and structured basis for performing all the tasks associated with the legal uses of the records of events. Legally underpinning the programme in that way is essential to ensuring its ability to operate successfully throughout the country.

60. Another important purpose of the legal framework is to ensure that the registration system is a high-quality data-collection medium for the development of vital statistics. The legal framework for the civil registration system establishes a continuous source of information, serving a broad range of activities and programmes. Thus, the legal framework should also specify the conditions for data sharing with other government agencies. Without a legal basis for the system, the continuity, quality and consistency of reporting can, over time, be affected by changes that have an impact on resources and staff. The system's operation is sustained by the fact that registration is a legal requirement.

61. The specific provisions covering civil registration in the laws, rules and regulations ensure that the population of a country has relevant information about civil registration. Individuals and families can determine what steps to take to resolve problems relating to civil registration. The law provides a description of the required legal documents, information sources or court actions to address a particular issue. If those specific areas were not covered by the law, it would be difficult to determine what actions or strategies to take.

62. A legal framework for the processes and procedures of civil registration ensures that results are comparable throughout the country. For this purpose, the law provides detailed descriptions of the civil registration functions, thus preserving the integrity of the system and guaranteeing that legal issues, wherever they arise, will be handled

in a consistent manner. Whether the issues being addressed occur in different geographical locations, under different administrative conditions or for whatever social or economic reasons, the legal specifications (e.g., in rules and regulations) applicable to the issue remain constant. For that reason, it is important that the provisions in the laws that address civil registration issues be carefully reviewed.

63. Establishing the civil registration programme within the laws of a country, its states or provinces serves multiple purposes and will ensure an effective, consistent and productive system. The benefits are clear, but significant difficulties can arise if only portions of the system are incorporated into the laws, rules and regulations.

E. Civil registration, population registers and vital statistics¹⁴

64. A “population register” is defined as “an individualized data system, that is, a mechanism of continuous recording, and/or of coordinated linkage, of selected information pertaining to each member of the resident population of a country in such a way to provide the possibility of determining up-to-date information concerning the size and characteristics of that population at selected time intervals”.¹⁵ Thus, the population register is the product of a continuous process, in which notifications of certain events that may have been recorded originally in different administrative systems are automatically linked on a current basis. The method and sources of updating should cover all changes so that the characteristics of individuals in the register remain current. Because of the nature of a population register, its organization and operation must have a legal basis.

65. The linkage of the population register with the civil registration system makes it possible to reconstruct the history of the life events of single individuals. When the date of the events is properly recorded, this high level of detail can also be used for the estimation of both the duration of a demographic state (e.g., duration of such states as “married” or “parity one”,¹⁶ and so forth) and the related probabilities of transition, and also for longitudinal studies. In addition, it may make it possible to define specific geographical aggregates of interest, such as population living in the coastal areas, or in particular disadvantaged localities, whose boundaries do not necessarily conform to the administrative boundaries.

66. In practice, a population register cannot be described as such without being linked with the registration of vital events, which constitute information fundamental to its updating, together with changes of address. In that respect, population registers are a kind of continuous census, encompassing the structure of the population at any given point in time, with all modifications occurring within it on a moment-to-moment basis. For example, the population register makes it possible, at any given time, to produce population stock information, in other words, information on population by sex and age. In a perfect system, the accounting of the demographic balance would be intrinsically correct for any given interval of time, be it a year, month, week, and so forth. In fact, factors such as registration delays, lack of coordination, difference in definitions, among others, may diminish the quality of the population register. Thus, making the civil registration system a vital component of a computerized population register would offer the most appropriate and advanced means of generating relevant, accurate, timely and comprehensive vital statistics. While building such a system would initially be resource intensive, its dividends would extend over a prolonged period of time.

67. For decades, population registers have been effectively used as a statistical data source, and they may be considered the logical product of the evolution of civil reg-

¹⁴ This subsection draws substantively on chapter III of the *Principles and Recommendations*.

¹⁵ *Methodology and Evaluation of Population Registers and Similar Systems* (United Nations publication, Sales No. E.69.XVII.15), chap. I.A.

¹⁶ In demographic contexts, the “parity” of a female at a given point in time may be defined as the number of live births of babies to the female up to that point.

¹⁷ See *Report of the Delegates to the International Statistical Congress Held at St. Petersburg in August, 1872* (Washington, D.C., Government Printing Office, 1875), p. 46.

¹⁸ United Nations publication, 2017.

¹⁹ For the procedures to report an address change in Norway, see www.skatteetaten.no/en/person/National-Registry/Moving/.

²⁰ For further details on the relationship between civil registration, population registers and identity management systems, see section F.

istration and vital statistics systems. The interest in population registers dates back to the nineteenth century, when the International Statistical Congress recommended their introduction.¹⁷ Some forms of population registers already existed in various societies at that time and over the course of the nineteenth and twentieth centuries, several countries established such systems. However, full exploitation of the population register as a statistical source has become more feasible with computerization.

68. The essential premise of population registers and their functioning is that the civil registration system is uniquely positioned to provide reliable data to be entered into the population registers. Specifically, population registers are initially constructed from an inventory of information on the inhabitants of a certain area (often census information) and the continuous updating of information on births, deaths, adoptions, legitimations, recognitions, marriages, divorces, annulments and judicial separations, change of name or sex or residence.

69. Information about place of residence is an important part of a population register. It is recommended that the definition of usual place of residence found in *Principles and Recommendations for Population and Housing Censuses, Rev. 3*,¹⁸ be used to ensure consistency with international standards. Information on residential address is used at the subnational level for administrative and statistical processes. Address changes are usually reported to the population register by the residents themselves and, in certain countries, are required by law (or rules and regulations). That is the case in Bhutan, Mongolia and Norway.¹⁹ Furthermore, in some countries, a married spouse is not allowed to register a change of address if it is not also registered by the other spouse (e.g., in Norway).

70. The incentive for registering a change of address is the need to receive mail, income cheques and social security transfers, and to exercise the right to vote in local elections. There may be cases in which residents may try to avoid registering a change of address, such as when they move to an area with a higher tax rate or when there are tax deductions associated with the costs of commuting.

71. It is therefore of paramount importance for the quality and the usefulness of a population register that it be continuously updated. For that purpose, the authority operating the population register must, at the very least, receive timely information about live births, deaths and changes of residence (including of immigrants and emigrants). An efficient connection with the civil registration authority is therefore a fundamental element for the proper functioning of the population register (see box 2 for a brief description of the Central Population Register of Norway).

72. It should be stressed that the primary function of the population register is to provide reliable information for government administrative purposes, particularly for programme planning, budgeting and taxation. Population registers are also useful in other administrative areas, such as establishing personal identification,²⁰ voting, education, military service, social insurance and welfare, and for police and court reference.

73. In general terms, a population register is not required to be an itemized list (in paper or electronic format) of individuals that is made available in a defined place. A population register can take the form of a network of local registers, but they need to be linked in a coordinated way. Furthermore, an overall, consolidated population register may well refer to units (e.g. families) other than individuals, but in such a way as to ensure that the information related to individuals within such units is also always retrievable. To assist in locating a record for a particular person, household or family in a population register, an identification number could be provided for each entity.

Box 2

Norway: population register

The Central Population Register of Norway was established in 1964, based on the 1960 population census and unique 11-digit personal identification number (PIN) was introduced for everyone. The register includes everyone who has ever been a legal resident of Norway since 1960, regardless of their citizenship. Persons who die or emigrate are not deleted from the register; only the code indicating their status is changed.

The most important stock (or status) variables in the Central Population Register are: PIN (which includes date of birth and sex), residence status (resident, deceased, emigrated, no permanent address, disappeared), address, municipality, dwelling number, place of birth (municipality or country), name (including first and middle names), surname prior to marriage, citizenship, country of immigration, country of emigration, marital status, PIN of spouse, mother and father.

All vital events, as well as migrations and address changes are logged in the Central Population Register. The most important flow variables are births, deaths, marital changes (including same-sex marriages, separations, divorces and annulments), emigrations and immigrations, internal moves in Norway, address changes, name changes, citizenship changes, gender changes and PIN changes. All reports of change received by the registrar are checked to verify, for example, that the spouses of a new marriage are not already married.

Inclusion in the register of the PINs of parents and spouses makes it possible to establish links between siblings, cousins, children, grandparents and other relatives. That is very useful for statistics and research in such areas as hereditary diseases and behaviours (e.g., early childbearing, marriage, divorce and longevity).

The PIN is used in a large number of other administrative registers, which makes it possible to link information in different registers for statistical and research purposes. The Central Population Register is also used to draw samples for sample surveys. The contents, coverage and quality of the administrative registers have become so comprehensive that it is no longer necessary to conduct traditional population and housing censuses for statistical purposes. The last regular census was conducted in 2001, whereas the 2011 census was based completely on register data.

74. At minimum, a population register includes an array of individuals with whom the local or national administrations of the country need to communicate. Although the national population register may be a virtual entity created by linking together population registers established at the local level (following the decentralized system), its overall geographical coverage must include the entire territory of the country. If that condition is not met, the national population register is not an appropriate system for the production of statistical data for the country.

75. Likewise for specific territories, the entire resident population, regardless of migration status, must be included in the main population registers, whether they are centralized or local. At the same time, over-coverage errors may occur in a population register if data are not properly filtered during the data compilation process. For instance, in a decentralized system based on local registers, there may be a higher risk of duplication of records of individuals when the data are consolidated at the national level.

76. In the recent practice of countries and areas introducing and maintaining population registers, assigning a unique personal identification number (PIN) to each individual upon birth and retiring it only after the individual's death, has proved to

be a critical instrument for ensuring the quality of individual information, linkages between various registers, avoidance of duplication and more reliable control of the quality of the registers' content. The importance of the PIN is even more pronounced in the context of identity management mechanisms that are being developed in a growing number of countries for the purpose of issuing secure identification for all.

77. From the point of view of generating regular, accurate, timely and reliable vital statistics, the introduction and functioning of population registers represent a substantial step in the right direction. As noted above, population registers are operated by the Government for administrative purposes. That approach results in systematic procedures where all the protocols and responsibilities of all involved institutions—public and private health institutions, registrars, operators of population registers and official statistical offices—are well developed and integrated as everyday routine. Population registers used as a source of vital statistics ensure up-to-date access to individual information, together with an opportunity to link individual information with other sources of data, which enhance the quality of the information in the process.

78. For example, a significant advantage of computing vital statistics from population registers is the possibility of directly calculating specific demographic rates with potentially no numerator-denominator bias. For instance, it could be possible to compute specific fertility rates for particular disaggregations, such as employed or immigrant women, parity progression ratios, life expectancy by educational attainment, indicators on mixed marriages by ethnic group or foreign background, and divorce rates by social and economic class of the spouses. That requires full matching between civil registration and population register data and the same level of detail of information in the two sources, meaning that the certificate of the event (e.g., birth) must contain the same topics (variables), with the same classifications, as those available in the population register. In general, the use of the population register widens the chances of correctly identifying the population at risk of an event.

F. Civil registration, identity management and vital statistics

79. While there is no internationally agreed definition of identity management, the term most commonly refers to the issuance of proof or legal tender of identity to individuals and the maintenance of systems for managing information and documents associated with such identity. Various estimates have been made of the number of people in the world without any official confirmation of their identity. Irrespective of the sources of such estimates, in all cases, a substantial number of people are unable to prove their identity and, accordingly, to have access to a number of services, including public- and private-sector services.

80. With the accelerated development of advanced technologies for identity management, increased prominence is being gained by such concepts as “digital identity” for all individuals, building on the original notion of individual identity, which was primarily analogue in nature and expressed in the form of such physical documents as birth and death certificates. The extraordinary computing power available nowadays to both public and private institutions enables the extremely fast and efficient manipulation and processing of digital identities for a large number of purposes, including taxation, education, conscription and national security, to name a few. Thus, growing importance has been attached to the development and implementation of modern identity management systems as a tool for protecting and serving the population.

81. At the same time, that is by no means a one-way process that serves only the government's administrative and related purposes; quite the contrary. Documented personal identity is an essential prerequisite of the present-day social and economic

paradigm. Without it, individuals are deprived of access to services that are or may be available to them, from basic health care to bank accounts. That fact alone, properly presented and documented, provides a powerful incentive for eventually achieving the ultimate goal of leaving no one behind.

82. In that context and in line with the *Principles and Recommendations* (para. 286), the essential purpose of civil registration is to furnish legal instruments of direct interest to individuals. Societies today, even the least developed among them, exhibit considerable complexity in interpersonal relations and increasing bureaucratization in dealings between individuals and the State. Hence, it is important, to ensure certainty in legal matters, that individuals be provided with probatory instruments which allow them to prove, with ironclad certainty, the facts relating to their existence, identity, and personal and family situation. The principal reason for the existence of civil registration—its basic purpose and one that must be facilitated by the State—is to serve as an institution capable of disclosing facts relating to civil status based on technical legal principles, through which individuals can be assured of the legitimacy and authenticity of civil status-related facts in order to accredit them to other individuals or the administration itself, by means of public registration documents known as certifications.

83. Consequently, in the contemporary paradigm, civil registration provides both the certification of identity for a newborn child and critical entry of the child's identity into the identity management system, whether through the stand-alone population register or, in the case where population registers are subsumed by the identity management system, directly into it. At the other end of the life cycle, civil registration plays a critical role in notifying the occurrence of death in the population register and the identity management system, so that records can be amended accordingly and those identities can be withdrawn or marked as "deceased".

84. Moving on from there, the identity management agency will, in due course, add layers of additional and relevant information, as prescribed by law, including photographs, fingerprints and other biometric elements. The issuance of identity cards, which, in turn, give individuals access to government and private services, together with other documents, such as driver's licences, passports, bank cards and so forth, is within the authority of the identity management agency. In a number of countries, the integration of the civil registration system with the identity management system has been a key factor in the creation and maintenance of a secure, efficient and interoperable population data system. That integration has reaped benefits for both the government and individuals in terms of access to social rights, improved control of public expenditures and improved underlying data quality for the production of vital statistics.

85. In countries where the civil registration system has been neglected for prolonged periods of time, the identity management agency will initially have to respond to a particularly substantive challenge: issuing identity documents to living individuals, both adults and children, whose birth was never registered or who never received their birth certificates. Thus, the agency will have to develop mechanisms to ensure the registration of every birth and every death in the country, while at the same time issuing identity documents to those who never had one. This, in particular, affects late birth registrations, which need to be tabulated separately from the current vital events. It is important to have provisions in the law that allow for the registration of deaths of individuals whose births had never been registered. Ultimately, however, it is expected that the agency will turn its operations into routine procedures for issuing birth and death certificates and identity cards.

86. Another challenge faced by an identity management agency, in particular if it has subsumed the civil registration function, is ensuring the production of regular, accurate and reliable vital statistics. All the information regarding the occurrence of the event and the characteristics of the relevant stakeholders as per international statistical standards needs to be incorporated into the reporting protocols and procedures. Establishing the regular channels of communication with the national statistical authority is yet another critical component of the whole process of instituting a holistic civil registration, vital statistics and identity management system at the national level.

87. Figure 4 presents a model that is currently being introduced and implemented in a number of countries that are developing holistic approaches to this process by linking the civil registration, identity management and vital statistics functions.²¹ By its very nature, the civil registration function, in terms of its legal implications, is still distinct because its procedures for issuing legal tenders related to the civil status of individuals require adequate and strict protocols. The establishment and maintenance of population registers in this model go hand in hand with the civil registration function. The vital statistics function remains with the national statistical authority, which is responsible for producing regular vital statistics based on records submitted by the population register or the civil registration agency.

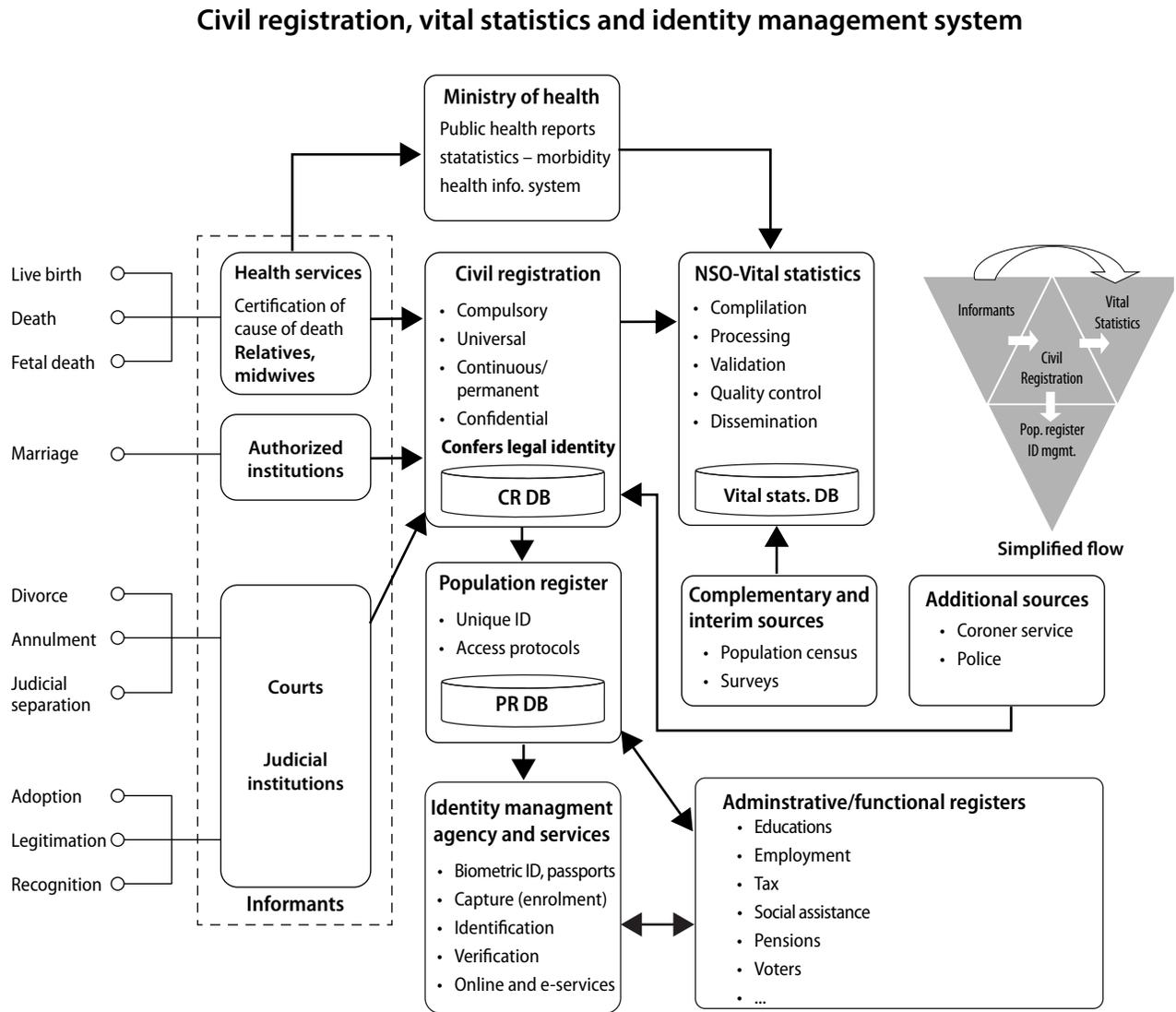
88. The underlying logic of the model, as in the civil registration and vital statistics systems that were developed in a number of countries at the end of the twentieth century, is that the occurrence of all vital events, such as births and deaths, and all their relevant characteristics, is reported by the authorized and responsible institution to the civil registration authority, which verifies the actual occurrence of the event and the identities of persons involved, and officially registers the occurrence of the event and issues a certificate that is legal tender. The civil registration authority also collects all the relevant information for statistical purposes and forwards it to the national statistical authority. The civil registration component then makes an entry in the population register based on the change in the civil status of the individual concerned. The identity management agency uses the population register to provide additional biometric information, as prescribed by law, and to maintain the civil identification database, and issues the basic personal identity document. In this model, assignment of a PIN to each newborn child and retirement of the PIN of each deceased person (by flagging the PIN or changing its status from “living” to “deceased”) is the function of the civil registration component. The assignment of a PIN to each registered person makes it much easier to link the occurrence of vital events to particular individuals, notwithstanding the requirement for a sound legal underpinning, data security and protection of confidentiality.

89. Several countries²² have integrated their civil registration, vital statistics and identity management systems. An important advantage of the model is that it makes it easier to assign a PIN at birth, rather than requiring individuals to reach a certain age before one is assigned (usually at age 15, 16 or 18, when they need to obtain an identification (ID) card). Late assignment of PINs makes it harder to capture children who die before the threshold age and to link their deaths to other data sources, such as the population register. Introduction of a PIN at birth would increase registration coverage of infant deaths and improve estimates of infant mortality.

²¹ Further information on identity management systems, see the CRVS e-learning course, available at <https://olc.worldbank.org/content/civil-registration-and-vital-statistics-systems-basic-level-self-paced-format> and <https://olc.worldbank.org/content/civil-registration-and-vital-statistics-systems-advanced-level-facilitated-1>.

²² Including Bhutan, Botswana, Mongolia and the Nordic countries.

Figure 4
Overview of civil registration, vital statistics and identity management interlinkages



This model represents a holistic approach to civil registration, vital statistics and identity management recommended by the United Nations, adapted from *Principles and Recommendations for a Vital Statistics System, Revision 3*; it can be adjusted to national circumstances and governing structures as necessary.

Source: Implementation of the United Nations Legal Identity Agenda: United Nations Country Team Operational Guidelines, May 2020. Available at <https://unstats.un.org/legal-identity-agenda/documents/UNCT-Guidelines.pdf>, fig, 1, p. 22.

Chapter II

Civil registration operational functions and activities

A. Introduction

90. Irrespective of whether the civil registration function is established as an independent centralized or decentralized system or whether it is incorporated into the larger institution that also manages the identification of individuals, there are a number of operational standards that need to be established and set in operation. Consequently, this chapter looks at the specific details of the daily operations of the civil registration and vital statistics systems. Section B, “Functional components”, examines the detailed procedures for gathering, storing and editing information. Section C, “Civil registration system activities”, examines how to respond to the public and their needs concerning the vital records in the system, considers the needs of those who are reporting data to the system and discusses how to manage the use—and address the fraudulent use—of personal documents issued by the civil registration authorities. Section C also considers methods of integrating the functions of civil registration and vital statistics under the various structural arrangements explored in chapter I. Finally, it considers how data are incorporated into and stored in the system. Guidance on how to check data for accuracy and completeness can be found in chapter IV.

91. As mentioned in chapter I, the national agencies in charge of vital statistics and civil registration are separate entities, but it is crucial that they be established, maintained and developed as components of a coordinated and coherent system for registering and producing vital statistics. In addition, the emergence of interconnections between civil registration and identity management systems adds yet another dimension to the structure of the civil registration and vital statistics system. A graphical representation of those relationships and functioning is presented in figure 1 (see chap. I).

92. Civil registration is defined as the continuous, permanent, compulsory, universal recording of the occurrence and characteristics of vital events pertaining to the population, as provided through decree or regulation in accordance with the legal requirements in each country, with full respect for the rules regulating the protection and privacy of individual information.²³ It is important to highlight the quality of universality in relation to people’s rights regarding the registration of vital facts. Everyone has the right to be recognized as a person before the law. That is enshrined in article 6 of the Universal Declaration of Human Rights and reaffirmed in several other global accords and international human rights instruments.²⁴ In this regard, laws, policies, rules and regulations must not be a hindrance to the realization of this right. In particular, the registration of events must be performed even if the time frame given by law has elapsed, regardless of a person’s migratory status, and any other request that may act as an obstacle to registering the vital facts that have occurred in the territory.

93. Civil registration is carried out primarily for the purpose of registering vital events and therefore establishing documents in accordance with national law. The

²³ *Principles and Recommendations*, para. 279.

²⁴ See 1948 Universal Declaration of Human Rights, arts. 6 and 15; 1951 Convention relating to the Status of Refugees, arts. 25 and 27; 1954 Convention relating to the Status of Stateless Persons, arts. 25 and 27; 1961 Convention on the Reduction of Statelessness, arts. 1–4; 1969 International Convention on the Elimination of All Forms of Racial Discrimination, art. 5 (d) (iii); 1966 International Covenant on Civil and Political Rights, art. 24; 1979 Convention on the Elimination of All Forms of Discrimination against Women, art. 15; 1989 Convention on the Rights of the Child, arts. 7–8; 1990 International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families, art. 29; 2006 Convention on the Rights of Persons with Disabilities, art. 18.

²⁵ *Principles and Recommendations*, para. 274.

usefulness of these records as the best source of vital statistics is well established. The procedures for recording vital events are equally important for civil registration as a legal requirement and for vital statistics as a source of statistical information; hence the tasks performed by civil registrars and those of statisticians are interdependent.²⁵

B. Functional components

94. The present section describes the procedures for registering births and deaths occurring in various settings. Consideration is also given to special processing requirements, the matching of registration records, and the work of units for processing record changes and responding to users' requests.

²⁶ *Ibid.*, para. 355.

95. The appropriate informant or source of information, and suggested alternates, in priority order of preference for the various types of vital event, are given below:²⁶

Live birth and fetal death: The head of the institution (or designee) if the birth occurred in an institution, or the mother, the father, the attendant at the delivery, the nearest relative of the mother or any other adult person having knowledge of the facts.

Infant death: The head of the institution (or designee) if the death occurred in an institution, or the mother, the father, the nearest relative of the mother or any other adult person having knowledge of the facts.

Death of an adult person: The head of the institution (or designee) if the death occurred in an institution, or the nearest relative of the decedent or any other adult person having knowledge of the facts.

Marriage: The bride and the bridegroom.

Divorce: Either one of the parties, or the petitioner of divorce.

1. How to register vital events

96. The manner in which the record of a vital event is registered and transmitted from where the event occurs to the civil registration and vital statistics system depends on three major factors that cause variations in the process. The first is the type of vital event involved: whether the event is a birth, death, fetal death, marriage or divorce will make a difference in the registration and transmission process. The second is the type of structure of the system, whether the system is centralized, decentralized or local plays a key role in the registration and transmittal processes. The third type is the place of occurrence, whether the event took place in a health facility or not.

97. Vital events may be registered by place of occurrence or by place of usual residence. Most countries have adopted the place of occurrence as the norm for the registration of births, deaths and fetal deaths. The registration of vital events by place of occurrence facilitates and accelerates the registration process. As electronic systems become more advanced and networked within countries, a degree of flexibility is possible, allowing registration at any point from which the registrants can gain access to the system. This can improve access and therefore coverage. In any event, when recording information, it is important to include both place of occurrence and place of residence, so that tabulation by both places can be produced.

(a) Registration of births

(i) Birth in a health facility under a centralized system

98. When a birth occurs in a health facility under a centralized system, it is best to use the hospital's medical record procedure for the reporting of the event to the local registrar. Information is gathered from the mother using a birth notification form (or a medical certificate form) to supply answers that will be placed on the official registration record. If the birth notification includes statistical data, medical information may be sought about the prenatal history of the mother. In any event, it is best to obtain data from records submitted to the hospital or medical records unit by the patient's doctor just before the expected delivery date. The information required for legal purposes of the birth registration is a subset of the information that may be provided in the birth notification form, which in all likelihood will include a great deal of health statistics information, such as birth weight, type of birth and so forth.

99. The completed document should include certification by the hospital administrator or that person's designee that the birth did take place as stated in the document. That provides the evidentiary proof that a birth has occurred on that date.

100. The hospital keeps a copy of the notification form, gives another copy to the family and sends the original notification form to the local registrar by physical or electronic means. The— local registrar reviews it for accuracy and completeness, then prepares the registration record, which is, in principle, different from this notification form, as it includes additional information that accompanies all official records, and signs or approves it physically or electronically. The birth is now considered registered and the birth certificate is issued. The local registration office retains a copy of the birth record and files it so that the registrar can issue copies of it. In view of the possible legal implications, the registration system requires the act of registering a birth to be a formal one, performed by the parents or authorized persons and based on a birth notification form certified by the hospital, medical doctor or midwife who attended the birth. Although the presence of both parents is important, efforts at administrative or regulatory levels need to be made to remove obstacles to the registration of births out of wedlock, as the civil registration system should be universal.

101. The process of hospitals reporting events to the local registrar can be very efficient in terms of information quality and timeliness. That may be affected, however, by the extent to which hospitals comply with the requirement to forward notifications to the registrar. That is particularly relevant in countries where health care is provided by private and public institutions, or where the health sector is fragmented. The procedures of some health institutions may be stricter than those of others. That highlights the importance of defined roles and data-sharing between health and registration authorities (in both directions) so as to avoid processes that are onerous and discourage completion of registration topics. An impressive solution to the problem is offered by the bedside registration system in Jamaica, described in box 3, wherein registration is completed at the bedside and hospital records can subsequently be updated with the legal identity of the child.

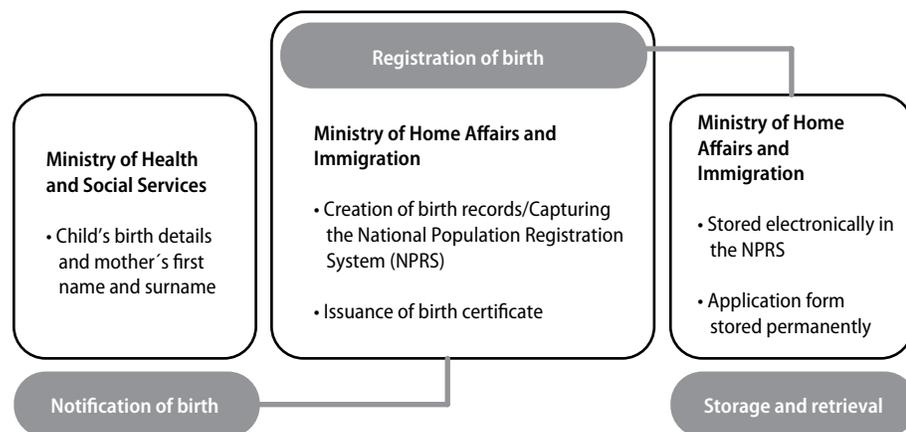
102. If the civil registration of the country is not automated or only partly automated—for example, in major cities only—the copy of the registration record that remains at the local office may be a photocopy, a carbon copy or an entry in a bound book, and it should be recalled that entry in such a book would require the preparation of a separate statistical birth form. The original record is then forwarded to the national registration office or authority for review, indexing, processing, storage and other procedures. If the national office also operates a statistical system and uses a combined

civil registration and vital statistics form, the civil registration office can forward the birth record once it is computerized. In order to avoid duplication, normally the civil registration authority at the central level has the responsibility to report to the national statistics office. In countries where there is no Registrar General, the civil registration offices at subnational level (state, province or other major civil division) report to the central-level statistics authority. Regardless of how a country and its civil registration and vital statistics system are organized, to avoid having fragmented or duplicated flows of information, it is essential that the approach be holistic and integrated.

103. These days, all the transactions and transmissions are expected to be digital, using local area networks or the Internet. Upon the occurrence of the event, the hospital sends an electronic notification form to the local registrar, who will verify the information for accuracy and completeness, log it as an official registration record and issue the birth certificate to the family. That registrar then forwards the record to two addresses: the central civil registration authority and either the provincial or central statistical service, depending on the arrangements and the structure of the national statistical system. The central authority maintains the civil registration database and submits it as an input into the national identity management system on a regular basis—a daily update is now the frequency of choice in many national settings. As an example, see the process map for Namibia in figure 5. In a digital scenario, it is much easier to assign a PIN at the time of the birth registration.

104. In principle, situating a local civil registration office within a major hospital or health facility where births and deaths most often take place is the most advantageous approach in terms of efficiency and accuracy and service to the public. That option speeds up registration and improves the accuracy, timeliness and completeness of registration. In such a case, the reporting of vital records and statistical forms is made directly to the national authorities for civil registration and vital statistics by staff members of the hospital who are, by virtue of their responsibilities, directly familiar with the event and the persons involved. An example of the practice is the Bedside Registration Programme operated by the Registrar General's Department of Jamaica (see box 3 for details).

Figure 5
Registration process for births in a health facility in Namibia



Source: Workshop on the *Principles and Recommendations* for African English-speaking countries, held in Addis Ababa, 2–5 December 2014 (see https://unstats.un.org/unsd/demographic/meetings/wshops/Ethiopia/2014/list_of_docs.htm).

Box 3

Jamaica: Improving civil registration and vital statistics coverage through the Free First Birth Certificate Initiative and the Bedside Registration Programme

The Government of Jamaica, through the Registrar General's Department, launched two initiatives to enhance its civil registration system: the Free First Birth Certificate Initiative and the Bedside Registration Programme. In the former, all children born on or after 1 January 2007 who have been registered with a name are entitled to one free copy of their birth certificate. In the latter, the Department has deployed registration officers in hospitals to conduct birth registration at the bedside to improve coverage.

Before the advent of those initiatives, several issues plagued birth registration, including lengthy delays in receiving birth notifications from hospitals or, in some cases, hospitals failed to submit any notifications. That was because many institutions withheld birth notifications for mothers who had outstanding hospital payments. In addition, in the case of registrations based on notifications received from hospitals, many children were registered by the Department without a name, as their mothers had failed to visit the registrar's office to complete the registration formalities. Lastly, a large percentage of fathers were not providing their particulars on the birth records of their children.

The initiatives significantly improved civil registration on many levels, in particular by:

- Increasing the percentage of fathers including their particulars in the child's birth record at the time of registration;
- Increasing the percentage of children named at birth;
- Reducing delays in birth registration, since registration was now being completed, so to speak, "at the bedside".

See below the average percentages for hospital births before and after the launch of the Bedside Registration Programme:

On average	Before Bedside Registration (2005)	After Bedside Registration (2017)
Percentage of fathers providing their particulars at registration	51.0%	70.6%
Percentage of children named at birth	27.8%	98.7%
Percentage of births registered within three months	90.0%	99.7%

(ii) Birth outside a health facility under a centralized system

105. In the case of a home birth where the civil registration system is centralized, the person attending the birth is responsible by law for completing the notification form. The order of preference as set out in *Principles and Recommendations* is for the document to be completed by the mother; the father; the attendant at the delivery (a medical doctor, midwife or traditional birth attendant, if literate); the nearest relative of the mother; or by any other adult person having knowledge of the facts, if no one else is able or available. That document is then brought to the local registrar, who prepares the birth registration record and signs it. If those attending the birth are unable to complete the notification form, then the mother, the father or a close relative should report the event orally within a stipulated period to a local registrar, who prepares the official birth record. Many countries require one or more witnesses in

order to register a birth where no notification form exists. The original birth record is transmitted directly to the national registration and vital statistics authorities, and a copy is retained for the local registrar files for the issuance of the certificate and other registration functions.

106. In the case of a home birth, the information provided in the registration record may not be as accurate as that in the case of a hospital birth, in particular if it was not attended by a medical doctor or midwife. That is one of the reasons why *Principles and Recommendations* includes “attendant at birth” as a core topic.

107. It is important to ensure that a birth is registered within the time frame stipulated by the registration law. In general, the shorter the stipulated time frame the more accurate the information provided in the birth record. The time frame stipulated for a live birth may range from the date of occurrence to one month. According to the size of the jurisdiction in question, however, if an informant does not report a home birth for a considerable length of time after the event, it would be categorized as a late registration. “Late registration” is the registration of a vital event after the prescribed time period, but within a specified grace period, usually one year after the occurrence of the event; “delayed registration” is the registration of a vital event after the expiry of the period prescribed in existing laws, rules or regulations, including any grace period.²⁷

²⁷ *Principles and Recommendations*, paras. 369–370.

108. By keeping the number of delayed registrations to a minimum, the likelihood of errors creeping into the statistical reporting of births will be reduced. A country that, in principle, has many home births should take a series of actions to ensure the reporting of such events as soon as they occur. The active involvement of local registrars within a society and their working in collaboration with community health and social workers are indispensable to this process.

(iii) Births in and outside health facilities under a decentralized system

109. In a decentralized system, the registration of births is handled in much the same way as in a centralized system. The difference is that the local registrar transmits the original vital record directly to the state or province registration office instead of the national office. Then the state or provincial registration office forwards the information to the national office for the production of vital statistics for the country as a whole.

110. It is important to register events in a standard way in all provinces, states or other major civil divisions. It should be emphasized, however, that, in a decentralized system, registration records or forms may not be identical in content in the various provinces or states, as such content is determined by provincial and state legislation, rather than by uniform national provisions. To ensure such uniformity would require a substantive effort at the national level to harmonize both the legal aspect of civil registration—for example, the information that must be presented in the birth certificate for it to be recognized by all provinces or states—and for the production of comprehensive vital statistics, such as the variables that must be included in all the records from all the provinces or states.

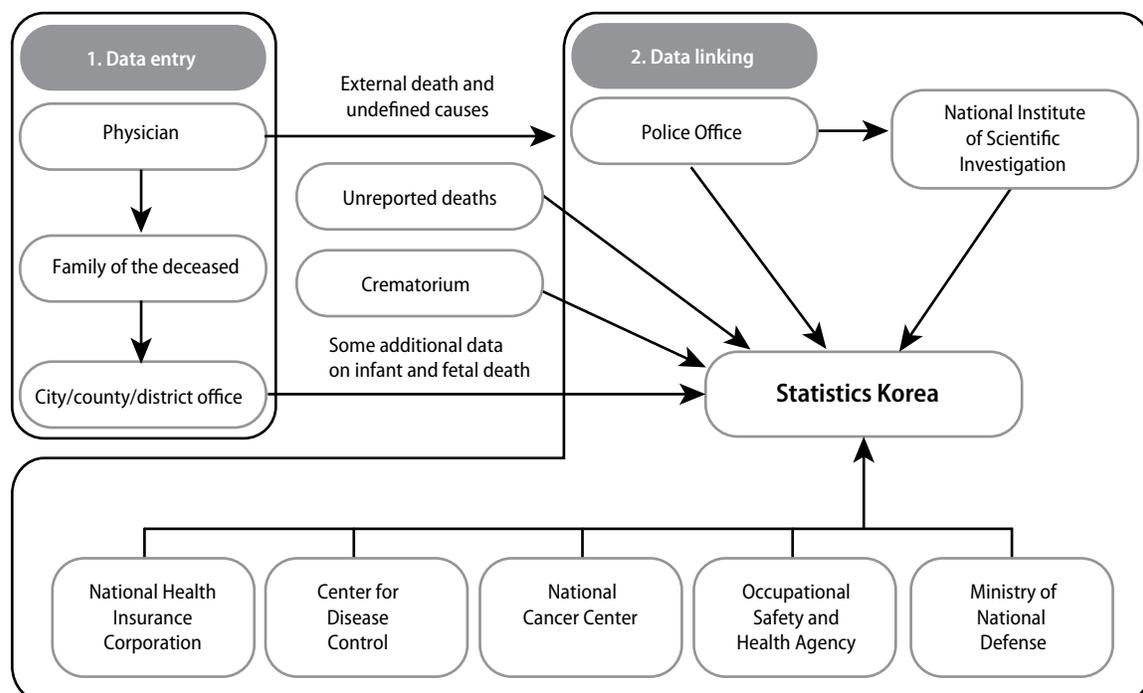
111. Equally important, each record or form needs to have a harmonized and unique identifier, which is more successfully achieved in a centralized system or a decentralized system with uniform legislation, than in a fully decentralized system. As elaborated in chapter I, contemporary civil registration systems in many countries are authorized to assign a unique PIN to each individual at birth and to retire it upon the death of the individual, which makes possible the exact matching of records from different sources and, by definition, enhances the quality and accuracy of the information. Not all countries assign PINs to individuals, however, hence the importance of the unique identifier of each record or form that can be used for computer matching and for spotting duplications and omissions.

(b) Registration of deaths

112. The registration process for deaths depends on the particular arrangements for such events in each country. It may be common to have a countrywide system of professional morticians, funeral directors, medical examiners or coroners. In such cases, a coroner or medical examiner reviews every unattended or sudden death. In other instances, the family is responsible for notifying authorities about the death. Depending upon the circumstances of the event, the method of registering and reporting deaths varies. Another factor to be considered is whether the legal death certificate is required for the processing of legal claims for insurance or inheritance. That is often the case in developed countries or in large metropolitan areas of many countries. If that is the case for most deaths, then it encourages families to report the occurrence of a death and provide the data promptly and as completely as possible.

113. Building a sustainable data collection system for the registration of death, including cause-of-death data, can involve multiple agencies and records. See the process maps for the Republic of Korea and Australia (figures 6 and 7, respectively), and for Canada (box 4). Since the process for collating mortality data is critical and sometimes complex, it is important that an inter-agency committee be established and include the civil registration authority, ministry of health, national statistics office and other stakeholders, to identify the appropriate process for collecting mortality information, including death registration and cause-of-death data, based on the guidance provided in *Principles and Recommendations*, and advice on the International Classification of Diseases and the application for a verbal autopsy from WHO. The national civil registration and the multisectoral coordination committee for vital statistics should include representatives of the police and judicial authorities so that they are aware of their roles in the system.

Figure 6
Registration of death and cause-of-death statistics system in the Republic of Korea



Source: Statistics Korea.

114. A technique that is used to promote the accurate registration of death is requiring the institution where the death occurred, such as hospitals, clinics, nursing homes or elderly care centres, to prepare listings of deaths occurring in the institution each week or month. Those lists can then be used by the local registrar to determine whether the death was reported and the death record prepared. In addition, the requirement of a death registration prior to the issuance of a burial permit is often used to encourage universal registration. That is particularly useful in urban settings where regulated cemeteries perform the majority of inhumations and cremations. For further details on this practice see subsection vi below.

(i) Cause of death

115. *Principles and Recommendations* includes the rubrics “Certifier”, “Type of certification” and “Cause of death” as core topics to be collected on deaths. That is significant, among other things, in relation to the quality of the information contained in the registration record. The circumstances and medical causes of death are of utmost importance for the vital statistics system, which explains the requirement, in principle, that the civil registrar should issue a death certificate only if the notification of the cause of death is accompanied by a completed medical certificate on the cause of death.²⁸ Despite efforts by the health sector and the registration authority, there will be deaths that have no medical certification of their cause, in particular those occurring without medical attention and in rural areas. In those cases, the event must be registered and the field for cause of death should be marked “pending” by the local registrar at the time of registration. The local registrar must follow up on the registration until the cause of death is established, update the death record accordingly and forward the information to the statistics office.

²⁸ Ibid., para. 491.

116. In order to provide a comprehensive and comparable tool for identifying causes of death and diseases in general, WHO developed and maintains the International Statistical Classification of Diseases and Related Health Problems (ICD),²⁹ which includes a start-up mortality list³⁰ designed as an entry point to the full classification. The purpose of the Classification is to permit systematic translation of the underlying cause of death specified in the medical certificate of cause of death into a statistical code in order to facilitate the analysis, interpretation and comparison of mortality and morbidity data that is collected by countries and which they agree to report to WHO. The Classification is designed to translate diagnoses of diseases and other health problems from words into a code, which permits the easy storage, retrieval and analysis of data.

²⁹ See www.who.int/classifications/icd/en/ for the history of the Classification, its different versions and other details.

³⁰ See www.who.int/healthinfo/civil_registration/smol/en/ for further information on the start-up mortality list.

117. The original use of the Classification was to categorize causes of mortality as recorded at the time of the registration of death. It was only later that its scope was extended to include diagnoses for morbidity. Mortality data coded using the Classification make a substantial contribution to national and global public health policies.

118. For deaths attended by a medical doctor (mostly in hospitals), physicians complete the international medical certificate of cause of death form,³¹ recommended by the World Health Assembly. It is the responsibility of the medical practitioner who signs the medical death certificate to indicate the sequence of morbid conditions leading directly to death from the tentative underlying cause to the immediate cause of death.

³¹ Available from www.who.int/healthinfo/civil_registration/ICD_10_SMoL.pdf?ua=1. See also annex I below.

119. Once the form has been filled out and signed by the medical practitioner, it is the responsibility of the civil registrar to ensure that the form—either in paper or electronic format, depending on the prevailing system—is combined with other information needed for statistical purposes and submitted to the statistical authorities for

processing and the production of vital statistics. It should be emphasized that the cause of death, as specified by the medical practitioner, may be disclosed to the closest relatives only. Statistical authorities may, however, share anonymized cause-of-death data with government and international agencies for epidemiological and public health purposes, in line with privacy and confidentiality agreements in place in the country.

120. Coding takes place as the last step in the process as it is a separate activity from cause-of-death certification. Coding staff, often situated in central health or statistical agencies, use the Classification to assign and code the underlying cause of death, 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”³²

121. When deaths occur at home or where medical certification of the cause of death is not possible, WHO has developed international standards on verbal autopsy (VA)³³ (see also subsection iii below, on death outside a health facility).

122. In cases of external causes of death, there will be a police investigation or coronial enquiry, which inevitably takes time to finalize. In order to ensure the registration of these deaths, it is crucial that the coronial and the civil registration and vital statistics systems be linked. If that is not achieved, epidemiological studies may, for example, show misleadingly low levels of deaths attributed to road traffic accidents and violence.

123. As mentioned above, building a sustainable data collection system for cause of death, including death registration and cause of death data, can involve multiple agencies and records. As the example from Australia illustrates (figure 7), when a coroner certifies the cause of death, it is important to have a process in place whereby the coroner informs the civil registration authority and the statistics office, so that their databases are updated and harmonized. In turn, the Canadian (box 4) example shows how the central and the provincial level interact with each other and with certifiers in order to code the causes of death accurately.

(ii) Death in a health facility

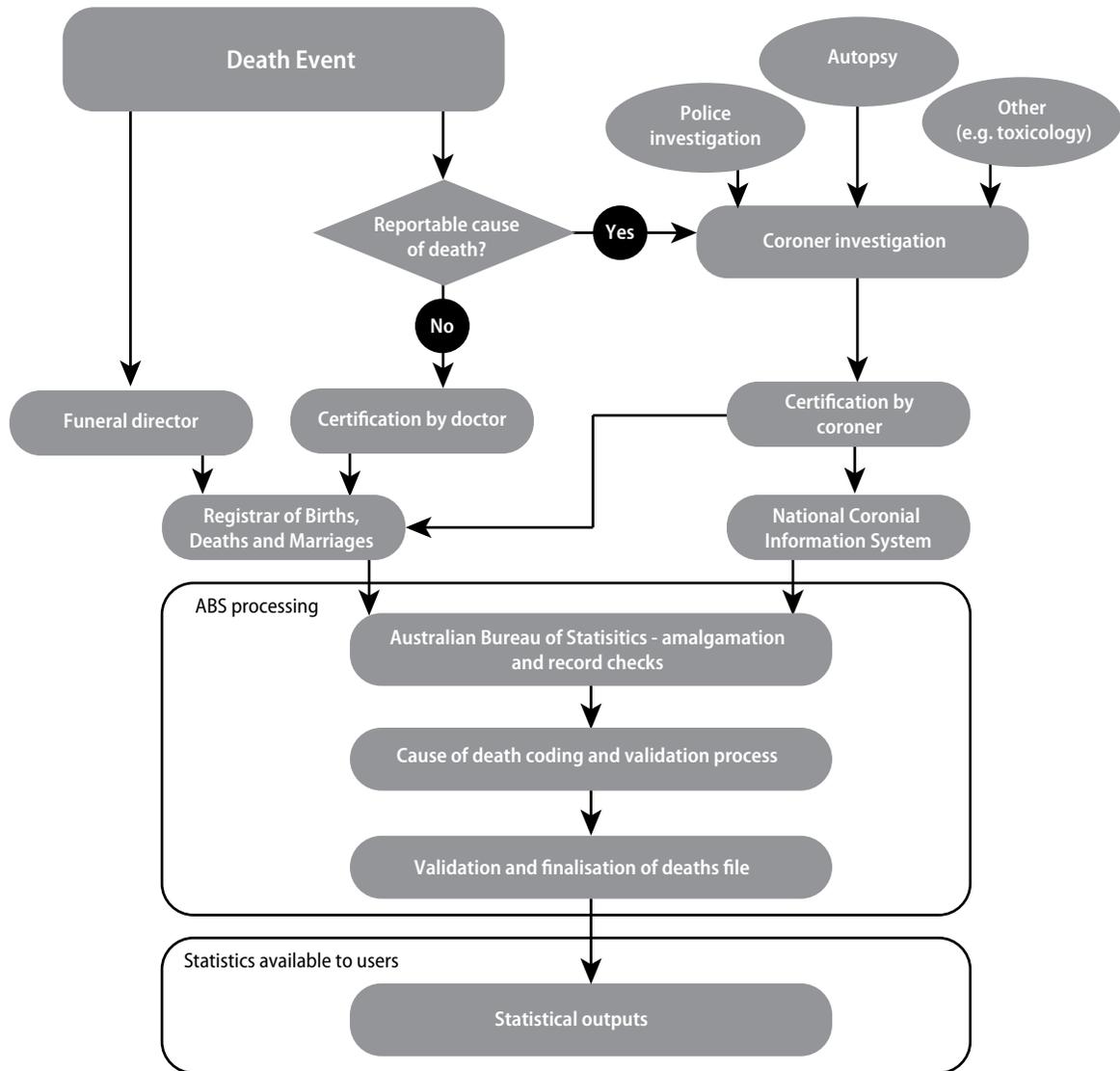
124. If the death occurs in a hospital, the attending physician is responsible for supplying the medical certification of cause of death, filling out the notification of death and informing the civil registration authority of the occurrence of the death. The hospital keeps a copy of the notification form, gives another copy to the family of the decedent and sends the original notification form to the local registrar by physical or electronic means. As mentioned above, one copy of the notification of death is issued to the decedent’s family in order for them to complete the death registration process and request the death certificate and, if applicable, the burial permit (see subsection vi on burial permits). The local registrar reviews it for accuracy and completeness, then prepares the registration record and signs or approves it, physically or electronically. The death is now considered registered and the death certificate is issued.

125. A member of the family or someone close to the deceased individual must supply personal facts about the decedent to ensure accuracy of the information contained in the notification of death. Those facts are generally reported separately from the medical certification information completed by the physician or coroner. The personal data are provided to the hospital, which forwards the notification of death to the local registrar. Coordinating the filing processes and eventual matching of the information contained in the medical certification of cause of death with that in the notification of death in a timely manner may not be an easy task. Many factors influence the choice

³² World Health Organization, *International Statistical Classification of Diseases and Related Health Problems*, 10th revision (ICD-10), fifth edition, vol. 2 (Geneva, 2016). Available at www.who.int/iris/handle/10665/246208.

³³ See www.who.int/healthinfo/statistics/verbalautopsystandards/en/ for latest version.

Figure 7
Cause-of-death statistics system in Australia



Source: WHO/Statistics Australia.

of procedure for doing so. For example, how is the hospital system organized? Are many individuals brought for care from rural areas to a central hospital in a large city? When individuals die far from their residences, the family may report the event to a local registrar geographically remote from the point where the medical certification information for the death is completed. Inclusion of the same information about the decedents' place of residence and PIN, if they have one, on both the death registration record and the medical certificate of cause of death are of particular importance in this situation for matching the separate records.

126. There will also be situations in which a death occurs outside of facilities, most often at home, where neither a physician nor a coroner is available. In such instances, which frequently occur in rural areas, an arrangement should be made between the local registrar and the local law enforcement authority. The law enforcement authority should assume the coroner's duties and the local registrar should gather the necessary

Box 4

Canada: Cause-of-death querying

Cause-of-death coding is done centrally in Canada; however, the provincial and territorial vital statistics offices screen the medical death certificates before submitting them to Statistics Canada. A querying process is performed at the provincial level, whereby certifiers are contacted in order to resolve cases presenting the situations listed below:

- Illegible entries
- Abbreviations (missing the full text)
- Missing age of decedent
- Missing sex of decedent
- Missing manner of death
- Missing or unclear circumstances in which the injury was sustained (if injury is reported)
- Missing or unclear condition for which the surgery was performed (if surgery is mentioned)
- Missing or unclear condition for which the drug was taken (if drugs are mentioned; this does not include drug poisonings)

information from a close relative of the deceased to complete the death record and the issuance of the death certificate. Sometimes the local registrar may need to assume both roles to guarantee the completeness of the death record system.

(iii) Death outside a health facility

127. It is highly likely that natural deaths occurring outside a health facility will have no medical certification of the cause of death. In that case, the event must be registered and the cause of death field should be marked “pending” by the local registrar at the time of registration. The local registrar must subsequently follow up until a cause of death is established, update the death record accordingly and forward such information to the statistics office.

128. For unnatural deaths, such as a suicide, homicide or accident, the coroner, medical examiner or investigating authority supplies the cause of death certification after completion of an examination of the facts surrounding the death. Coronial investigations usually take a long time and the cause may not be determined until sometime after the event. Thus these deaths should be registered without a medical cause and marked as “pending investigation”.

129. As mentioned above, when deaths occur at home or where a medical certification of the cause of death is not possible, WHO has developed international standards for a verbal autopsy.³⁴ Verbal autopsy is an interview carried out with family members or caregivers of the deceased using a structured questionnaire to elicit signs and symptoms and other pertinent information which can later be used to assign a probable underlying cause of death. Verbal autopsy is an essential public-health tool for obtaining a reasonable direct estimation of the cause structure of mortality at a community or population level, although it has not been validated as a method for attributing causes of death at the individual level. For studies, it is essential that the collated database clearly indicate the source of the information on the cause of death (medical certificate or verbal autopsy) to ensure that it can be analysed properly at a statistical level.

130. For that purpose, verbal autopsies involve the use by trained interviewers of a questionnaire designed to enable them to collect information about signs, symptoms

³⁴ See www.who.int/healthinfo/statistics/verbalautopsystandards/en/.

and demographic characteristics for a recently deceased person from a person familiar with the deceased. Under WHO standards for a verbal autopsy, any of three questionnaires may be used: for the death of a child aged less than four weeks, for the death of a child aged four weeks to 11 years, and for the death of a person aged 12 years or older. To minimize recall bias, it is recommended that verbal autopsies be conducted as close to the death date as is culturally appropriate, through a meeting with a close family member no later than one year after the death.

131. It is important to note that a medical certificate for cause of death or a verbal autopsy record may be used by a registrar as notification of death where the death has not been otherwise notified.

132. The question arises whether the verbal autopsy method should form part of civil registration in cases where there is no possibility of obtaining a medical certification of cause of death. In that regard, it should be pointed out that the verbal autopsy method is fairly complex, and involves the selection and thorough testing of a sample population. The interview needed for filling out the appropriate questionnaire is time-consuming, and cultural traditions might not favour such engagement with a government official. That results in the need for substantial investment in data collection and supervision, along with the comprehensive training of civil registrars and health workers in the verbal autopsy method to identify a population-level cause of death for individuals without medically certified deaths. All those factors must be taken into account when attempting to answer the above question.³⁵

133. The cause-of-death findings yielded by the verbal autopsy method differ from medically certified deaths and require careful determination in their presentation at the individual level on medical death certificates, and at the population level in the vital statistics reports in which causes of death are presented. A verbal autopsy is by no means a replacement for a medical certificate of cause of death. A cause of death derived by the verbal autopsy method should never be included in any legal document.

(iv) Disposal of the deceased

134. In the event that a funeral director or comparable official, such as a professional mortician, crematorium officer or cemetery manager, is responsible for processing most dispositions, responsibility for filing the death notification form is likely to rest with the funeral director. In that situation, the funeral director obtains the necessary personal information from a close relative or person who lived with the decedent, the cause of death and medical certification from the attending physician or coroner, if available. The funeral director presents a completed death notification form to the local registrar, who completes the death record and signs and issues a burial or transit permit (sometimes called a final disposition permit). The latter enables the funeral director to proceed with final disposition of the body. To facilitate that process, a good practice followed in some countries is to establish a local registration office inside or next to large funeral homes.

135. Not all national systems have fully functioning networks of morticians or professionals responsible for funeral homes or crematoriums. There are, however, local registrars to whom the family submits the information regarding the death and from whom it receives authorization for burial. Such local registration offices must be situated in convenient locations and open at all times. They perform the same function relative to the burial permit as the funeral director.

136. Obtaining a burial permit or proof of registration as a precondition for disposing of the deceased in the cemetery is not a universal practice. In a number of countries, burial occurs without any official paper trail. The first step in establishing such

³⁵ For a comprehensive discussion on the integration of a verbal autopsy and civil registration, see Don de Savigny and others, "Integrating community-based verbal autopsy into civil registration and vital statistics (CRVS): system-level considerations", *Global Health Action*, vol. 10, No. 1 (January 2017).

a practice would be to incorporate that requirement into the civil registration law; it would then be incumbent on the local authorities managing cemeteries to ensure the enforcement of those rules.

137. Procedures such as those described herein usually set specific time limits for obtaining medical certification of the death and for filing the completed death notification form with the local registrar. Generally, such requirements specify that the physician or coroner must sign the certificate before burial, cremation or removal can take place. That requirement guarantees that all necessary information about the nature of the death is obtained while the body is still available for testing. Depending on the cultural practices surrounding death and the final disposition of the body, those time limits can vary. If it is normal cultural practice to dispose of the remains quickly, then a time limit of 24 hours may be imposed. Normally, where a professional is handling the final disposition, the time limit for obtaining certification of the cause of death is no more than three days. The time limit within which the complete notification form is to be filed with the local registrar may be five days. The local registrar completes the death registration record and forwards the original to the national registration office in a centralized system, or to the state or provincial registration office in a decentralized system. Fixed time limits should be set for reporting to the higher level, and those limits should be rigorously observed.

(v) Alternative procedures

138. Alternative procedures refer to protocols that are established in the absence of funeral directors, professional morticians or even cemeteries for the purposes of obtaining the necessary details about a death. If a physician was attending the decedent for the illness that led to the death, that physician should complete the medical certificate of cause of death. If that was not the case, various types of community and health workers may be assigned a formal role in the civil registration system as notifiers. In addition, informal notifiers may include religious authorities and other local leaders. Such informal notifiers do not normally have legal responsibilities in the registration process, however, which makes them less than ideal as sources able to accurately and sustainably provide the necessary details about the death. For a start, they will be unable to provide cause-of-death information. At best, the practice of using informal notifiers of deaths might be useful as an interim measure in cases in which the level of completeness of death registration is very low, in particular in rural and remote areas.

139. Thus, the death certificate is an essential document, which not only provides a final and permanent confirmation of the fact of death but also makes possible the inheritance and settlement of an estate and, in many jurisdictions, the burial of the deceased, along with other entitlements pursuant to the legal arrangements in force, such as a pension.

(vi) Use of a burial or transit permit

140. Use of a burial or transit permit can be useful in enhancing the completeness of death registration. It provides for an additional check to guarantee that the physician or coroner provides medical certification of cause of death on the death certificate in a timely fashion. A burial permit is usually issued by a local registrar once the death record is correctly completed, including the signed and completed cause-of-death certification. In settings where the immediate disposal of the body is a legal or religious stipulation, the requirement for an accurate and completed medical certificate of cause of death at the time of registration may lead to distortion and an inaccurate cause

of death. To ensure that the cause-of-death entry is reliable, the medical practitioner may call for bioclinical tests or a clinical autopsy. That will delay final determination of the cause of death. In such cases, the event of the death should be registered, and the cause-of-death information may be marked as “pending investigation” and added once the results are available.

141. The crematorium or cemetery requires the permit or a proof of registration before final disposition of the body. That system is truly effective only in jurisdictions where the cemetery or crematorium is properly fenced and guarded and a sexton or some similar individual is on duty to collect the permit. If the registration of death is a mandatory requirement for burial, it is essential that the registration processes be facilitated by providing more registration points or by having electronic systems in place.

142. One variation on the issuance of the permit by the local registrar is the use of self-issued permits. That is accomplished by having a carbon sheet placed behind the section of the death record that lists name and date of death and behind the box where the certifier’s signature is placed. The carbon copy can then be used as the burial or transit permit. It will show that the physician or coroner has completed a medical certification of death. This variation solves the problem of a local registrar or recorder not being available outside business hours, at weekends or during holidays. The death record must, however, be completed with the local registrar on the next working day.

(c) Registration of marriages

³⁶ *Principles and Recommendations*, para. 2.

143. As stated in the *Principles and Recommendations*,³⁶ a marriage is 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 recognized by the laws of each country. Countries may wish to expand the definition to cover civil unions. In that case, the term “registered partnership” usually refers to a legal construct, entailing registration with the public authorities according to the laws of each country that becomes the basis for legal conjugal obligations between two persons. The registration of marriages provides tangible proof of the official recognition of the process of family formation.

144. Thus, unlike births and deaths, marriages are social constructs and are conducted in a manner that is completely dependent on particular societal conventions. Accordingly, there is no standard registration procedure that is valid across countries. Marriages can be celebrated by a variety of authorized individuals and institutions, the most common being religious leaders, justices of peace, court clerks and community leaders (see chap. I, fig. 1). Those authorized individuals or the spouses themselves have the obligation to inform the civil registration authority about the event in order for it to be properly registered.

145. It is not possible to provide a more specific recommendation regarding the information process and flow, given the wide diversity of marriage practices, including common law marriages. Nevertheless, the key recommendation is that all marriages occurring in the country must be accounted for and registered according to the law.

2. Special processing requirements for registration records

146. The present subsection considers some special processing requirements and methods used to amend records, register adoptions, and process legal changes to records. Most of these methods are concerned with birth records, but there are some changes that must be processed for deaths, too. Some countries may also maintain

amendment procedures, for marriage records, for example, to note when a marriage ends in divorce or in a judicial separation.

(a) Amendment of records

147. Amendment of records refers to corrections made to records that contain incorrect information; amendments are specified and stipulated in the law. Usually administrative procedures are much more expeditious than judicial procedures when amending a record. The choice of procedure depends, however, on the legal and normative framework in place. Recently, and for certain types of amendments, countries have favoured administrative procedures in order to improve services to the public and response times. There are several levels at which corrections are made, depending on how much time has elapsed since the event in question was registered. Some mistakes can be caught almost immediately, for example, when the record is first processed in the local registration office. That level may be termed the “early query level”. A second set of errors is also dependent on the provision of additional or corrected information by an individual outside the office. That second set cannot usually be detected immediately, although many such errors become apparent during the first year of the record’s existence.

148. An administrative procedure is best suited for the amendment of manifest mistakes or omissions, whereas a legal procedure is the optimum path for amendments that may have legal consequences, such as those related to maternity, paternity or change of sex. Consequently, it is advisable to have separate methods for amendments during the first year of the record’s existence, that are distinct from those made further along in the existence of the document. The one-year mark can also be useful in determining the approach to be followed in filing a delayed registration of birth.

149. A log should be kept of all changes to a record. Also, the system for referencing amendments must allow for the reconstruction of the record’s history, that is, must make it possible to trace back chronologically to the original record. That process is explored in further detail in chapter III.

150. The local registrar may be empowered to take care of early query corrections. For example, it might be noted, upon inspection of the birth record, that a parent’s date of birth is recorded as the same year as that of the child. That is an obvious clerical error. A telephone call to the hospital or a note to the informant usually enables the local registrar to obtain the correct information. In addition, in most contemporary registration systems, the local registrar has a set of computer tools to assist in such early-query changes. As the records are created or transferred digitally, a series of computer edits alerts the registrar to the existence of a potential error, such as that described above. In that situation, the early query corrections are incorporated in the computer application for the creation of a registration record. Digital validations and alerts minimize errors when information is entered in the civil registration system, as does the use of a PIN, because there are certain fields and pieces of data that are attached to every individual PIN that cannot be easily modified, such as parents’ date of birth, as in the example cited above.

151. However, there is still a need to carefully check the content of the registration record before it is submitted as a final entry in the system. The spelling of names needs to be carefully checked. While computer applications can be helpful in this process, the final decision has to be made by the registrar and individuals involved.

152. Aside from early corrections, amendments that fall in the “current year” category may be needed. One of those refers to the establishment (recognition or legal acknowledgement, either voluntary or compulsory) of the maternity or paternity of a

child born out of wedlock. The particular laws governing a country (or state or province) covers how paternity is established. Some jurisdictions allows the addition of a father to a record by affidavit of the unwed parents. Other jurisdictions may require some sort of court or legal action to establish the paternity. In any event, a method of adding the father's information to the birth record must be developed and used consistently throughout the civil registration system. The civil registration authority must prepare instruction manuals detailing the procedures, rules and regulations pursuant to the laws on the establishment of paternity, the use of a surname and other related matters. In the same spirit, a series of training measures for local civil registrars, medical record officers, foreign service officials and other concerned staff must be conducted by the civil registration authority to ensure the uniform implementation of the laws, rules and regulations.

153. The simplest case is when no previous information concerning the father appears on the record. Once the appropriate legal requirements have been met (affidavits or court determination), the information can be added directly to the original record. Copies of the required legal documentation are placed in a file that must be linked to the birth record by the unique record number already assigned to the birth. When making changes to current year records, it is important to forward the amended records to the statistical agency so that the vital statistics accurately mirror the content and the information in the civil registration database.

154. In some cases, another man's name and information may already appear as the father on the birth record. It may be that the mother was married at the time of birth but the husband was not the natural father. There may have been a court case contesting the paternity of the child. In such cases, a new birth record must be prepared, reflecting the new facts of parentage. The original record should be placed in the file with the associated legal documents used to establish the amendment. For traceability purposes, the new birth record must bear the same number as the original, sealed birth record, including the PIN assigned to the newborn infant, if a PIN was assigned. It is particularly important to ensure that the new record is forwarded to the central civil registration database and to the statistical agency, and that the old one is removed.

155. Other amendments during the first year may include addition of first or middle names for the child, changes to the parents' age or place of birth, or spelling corrections. According to the type of system that is in place, those corrections follow the same logic as that presented in the preceding paragraphs: correcting the records and ensuring that the corrections are reflected in the main civil registration and vital statistics databases, and that a log is kept of all such amendments.

156. Other amendments may be made at a later stage, such as change of name or sex, and may typically involve some sort of court decision. If legally available, the procedure for a change of sex must be dealt with as an amendment, not a replacement of records. It may trigger the issuance of a new PIN, if the country uses PINs that contain an indication of sex.³⁷ In any event, a linked file must be created to ensure a permanent link between the original and new identities.

³⁷ For this reason, it is recommended that PINs do not contain an indication of sex, geographical area, date of birth or any other personal details.

157. In many communities across various countries, children are named only after a certain period of time following birth. The gap between the date of birth of a child and the child's actual naming can range from a few days to even several weeks and is mainly linked to, and can vary according to, religious practices and social norms of different communities. In many countries, registration laws provide that every child has to be registered with a name. That is often a serious hindrance to the registration of birth in those countries. Often the period of delay in naming exceeds the cut-off period for registration as provided for in the law. That causes significant hardship for parents, as

in such cases they have to follow the more complicated process of late or delayed registration. With the increasing number of institution-based deliveries, more and more countries are providing registration facilities within health institutions for the delivery of prompt registration services, including the issuance of birth certificates to mothers before they are discharged from the hospital. In countries where the delayed naming of children is common, however, the whole purpose of creating such services within a health facility is defeated. Consequently, mothers (who do not name the child before or immediately after birth) are denied registration, resulting in a huge missed opportunity.

158. In order to overcome that bottleneck, some countries are encouraging parents to decide the name of their children before or immediately after birth. Religious practices and social norms cannot be quickly changed, however, and such change may not even be desirable. Some countries have found a way around that problem by making provision for the registration of birth without a name, for example, as “Baby Girl” or “Baby Boy”, and then providing a separate cut-off date for insertion of a name following a due process. In such situations, however, it would be incumbent on the registrar to obtain a written request with accompanying documents, if needed, and, having verified that the request is bona fide, to insert the name of the child and also make an appropriate annotation in the remarks column of the register indicating, among other details, the date of insertion. Following that method, a certificate of birth showing the name of child can be issued promptly to the parents.

(b) Adoption and other legal changes

159. Adoption is another major class of record changes to be considered. Again, the practices of countries (or states or provinces) vary in accordance with their legal regulations and arrangements for adoption. Most jurisdictions have a provision for sealing from view the pre-adoption facts of birth, and keep the adoption confidential. Where the birth record is concerned, that is accomplished by preparing a new birth record reflecting the new parents’ information. In principle, the place and date of birth of the child remain unchanged, as does the child’s PIN, if one was assigned. The unique identifier or number of the new record should also remain unchanged. The original record and the supporting legal documents relating to the adoption are sealed, and the unique record number is used as a cross-reference. That practice is important, especially if it should be necessary to retrieve the original record if the adoption is later annulled, or if it is necessary to refer to it for administrative purposes. The original information regarding the parents of the adopted child may be of crucial importance in the event, for example, of genetically transmitted diseases, where unsealing the original record can be of critical importance for medical treatment.

160. Mention should be made of the illegal practice known as “simulated births”, which is aimed at avoiding the lengthy and complex legal adoption procedure. In those cases, the adoptive parents, with or without the consent of the natural mother or father, register the birth directly in their own names, as though they were the child’s birth parents. If the adoptive mother is still within child-bearing age, and since the function of the local registrars is purely administrative, the registration of a simulated birth may not be detected. Procedural safeguards must be in place to prevent that practice.

161. Delayed birth registrations represent another class of records to be considered within the category of amendments and corrections. A late registration is the registration of a vital event after the legally specified time period but within the grace period; the grace period is usually considered to be one year following the vital event.³⁸ Delayed registration is the registration of a vital event after the grace period has expired. Even in the best of civil registration systems, delayed registrations are likely

³⁸ *Principles and Recommendations*, para. 369.

Box 5

Surrogate motherhood

Surrogacy, an arrangement between a woman who agrees to carry a pregnancy for another person or persons who, after birth, become the newborn's parents, is becoming more common in the contemporary world. National laws regulating surrogacy vary substantially, ranging from totally banning the practice, to allowing it, specifying conditions to include in the agreement between parties.

By definition, surrogacy raises a number of ethical issues, primarily related to the fact that women are compensated for initiating or maintaining the pregnancy of a baby to be adopted by unrelated individuals. Equally important is the moral dimension of the core arrangement: to what extent are women's rights over the use of their own bodies affected by surrogacy agreements? What are the ethical implications of an induced abortion in such an arrangement, or if a health issue arises in the woman or the fetus during the pregnancy? It also raises a number of questions about motherhood in both natural and social terms.

From the point of view of legal theory, the legal arrangements for surrogacy are also subjects of increased discussion. The core of the issue is the nature of the surrogacy contract: is it akin to contracting labour? Such an arrangement requires the specification of rights and obligations for each contracting side. In addition, should both altruistic surrogacy (when pregnancy-related expenses are reimbursed) be treated in the same legal framework as commercial surrogacy (when compensation extends beyond pregnancy-related expenses)?

Irrespective of how and if surrogacy is regulated, the essential logic of civil registration, in the cases in which surrogacy is legal, would call for the registrar to complete a birth registration record with all the information on the birth mother, as the legal assumption is that she is the child's legal mother. Only after that would the surrogate parents initiate the process of legal adoption and the procedures described above be implemented.

to occur. Depending on the extent of the delay, such registrations may result in omissions from the tabulated vital statistics if they are made after the file of records for a particular year has undergone final processing.

162. It should be stressed that, strictly speaking, delayed birth registration is neither an amendment nor a correction. It is mentioned here because there are similarities to a corrected record in that specific documentation is required beyond that normally required for the filing of an original birth record. The process of registering a birth after the legally stipulated registration period has elapsed is generally broken down into several categories, depending on the length of the delay.³⁹ If the delayed birth is filed within one year of the date of birth, the procedure is simple. It may happen that, while a physician or midwife was present at the birth or the birth took place at an institution, for some reason the record was not registered in a timely manner. In such cases, completion of the birth record by the appropriate attendants and by the local registrar is generally acceptable.

163. In the case of a home birth, the record can usually be completed with the help of the local registrar during the first year. After a year has passed, additional proof of the facts of birth is usually required, given the legal nature of the record. It is not unusual for affidavits to be required of those present at the birth. A medical record during pregnancy or a record of a subsequent paediatric visit would prove that a pregnancy had occurred. A utility, tax or rent bill may serve as proof of residence at the time of birth.

³⁹ *Ibid.*, paras. 369–373.

Those requirements are designed to ensure not only that the information supplied is accurate, but also to prevent the filing of a false birth record for fraudulent purposes.

164. For longer delays, registration of a delayed record of birth requires several substantial additional proofs of the facts of birth. In some instances, it may require judicial procedures and decisions. The filing of a delayed record so many years after the event is a service to citizens who would otherwise have to supply alternative proofs of birth to various requesting agencies throughout their lifetime. In designing the list of required documents for late registration of a birth, the registration law should therefore require, as a minimum, the documents that the most stringent outside agency would require. The registration office lists on the delayed birth record the specific documents presented as proof of birth and guarantees their authenticity. Thus, the individual needs to go through this procedure only once. The imposition of less stringent requirements would be a risk to the integrity of the registration system.

165. Delayed registrations filed more than one year after the event are not generally included in the vital statistics for the year of occurrence. If there is a large percentage of such cases, vital statistics can be distorted. Public relations campaigns should try to keep delayed registrations to a minimum so that the accuracy of vital statistics remains high. In countries where PINs are assigned to every individual at the time of birth registration, and the PIN is required by all service providers, in particular health care providers, the proportion of delayed registrations is almost negligible.

C. Civil registration system activities

166. This section describes ways to respond to the public's need for vital records, looks at the needs of those who are reporting legal, demographic or statistical data to the system, and considers record flow and the prevention of fraudulent use of the documents in the custody of the civil registration authorities.

1. Services to the public

167. At the time of a vital event—birth, death, fetal death, marriage or divorce—the careful and detailed recording of the facts surrounding the event is decisive confirmation that the event actually occurred. Accordingly, the free registration of the vital events occurring in the jurisdiction is the bureau's first service to the public. In that respect, it is the responsibility of the registration authority to reach even the most remote and hard-to-reach geographical areas of the country. In such areas, where the population has limited access to registration centres, mobile registration units can enhance the coverage of registration. In that approach, registration staff travel—for example, by boat, small aircraft or otherwise—to various rural sites at scheduled times and register events occurring during the interval since the previous visit. Village leaders, local health workers, traditional birth attendants or families themselves may report the information. That approach is considered an interim measure until it becomes possible to maintain permanent local registration offices in those areas.

168. The bureau's second service is issuing a certificate free of charge that confirms not only the occurrence of the event, but also the identities of all persons concerned. Preserving the records—ensuring that they are safe from disasters, both natural and human-caused—is an equally important service to the public.

169. Today, civil registration records are, in most cases, digital in nature. They are stored in servers maintained by the civil registration office. The preservation of the records essentially entails undertaking all the procedures necessary to ensure that servers are backed up regularly and that a fully developed mechanism is in place for that purpose. The practice of installing servers with identical content and updating

procedures in different geographical locations in the country has proved advantageous in the event of disasters, as it is seldom the case that the whole country is affected by the same disaster at the same time. In some cases, the mirror servers have been situated in a distant country, thus ensuring even more certainty in preserving the records. The privacy and confidentiality risks arising in those cases and the measures needed to minimize them must be thoroughly studied.

170. Computerization of the civil registration process is a recent development and in many countries, civil registration records have been preserved using analogue technologies, such as microfilms. That has resulted in a hybrid approach, combining elements of two or more systems, in which the current system is maintained, while a more efficient system is gradually introduced. It is common practice for microfilm to be used as a backup while the switch is gradually made to a computerized system of issuance. A dual system combining computerization and optical disk technology can offer the best features of both systems.

171. Production of certified copies of the records that have been registered and preserved is another major activity of civil registration offices. That service can include the preparation of abstracts hand copied from a paper record (in the case of old records that were not computerized) to issuance of the record from the computer in a choice of formats. The size of the jurisdiction's file, the level of demand from the public and the availability of resources determine the response in that area. There should be a policy directive, established in law and regulations, stating that information on individual vital event records is not to be disclosed except to specifically authorized persons, such as the registrants themselves; their legal representatives; a close relative, such as a spouse, parent or a son or daughter; or other person having a direct and tangible right to the facts set out in the record.⁴⁰ Checks and safeguards should be put in place for the retrieval of records (both paper and electronic format) to minimize fraud. An example of effective checks and safeguards can be found in the electronic retrieval system implemented by the Civil Registration and Identification Service of Chile (see box 6).

172. With modern equipment, the issuance of certified copies is based on a fully automated procedure whereby the search engine identifies the appropriate record in the

⁴⁰ Principles and Recommendations, para. 394.

Box 6

Chile: Checks and safeguards implemented by the Civil Registration and Identification Service in the production of certified copies

In Chile, the Civil Registration and Identification Service performs registration and certification of vital events by means of a centralized database. When the registrant's PIN is introduced, the system automatically fills in the fields that can be retrieved from family members' records. Those fields are hard-coded, so only authorized registrars can modify them.

In order to obtain certified copies, users can access a public database online, where documents can easily be retrieved. Downloaded documents contain a digital verification code that can be read and validated by other service providers, such as health, insurance and education institutions, among others.

Thus, the security features of the paper are given diminished attention in comparison with the digital seal, chain or code, which enables not only verification of the validity of the information contained in the document, but also electronic transmission of the data. This system also makes it possible to obtain certified copies, recognized by the Convention Abolishing the Requirement of Legalisation for Foreign Public Documents (Apostille Convention), from overseas.

database, retrieves it and sends it to the printer. The paper used for printing must have features that are difficult, if not impossible, to replicate, in order to protect against forgery, counterfeiting or tampering. Such features include watermarks, intaglio printing and holograms, among others.

173. Another consideration in a copy issuance programme is the format offered to the customer. Offices can provide full-size and wallet-size copies of certificates. Of course, the more options offered, the more resources are needed. In a computer-based system, it is feasible to offer both a full-size and a wallet-size computer copy. An additional computer program is needed to generate the wallet-size copy and, usually, an additional printer with wallet-size paper. Depending on its capacity, the system could also be calibrated to produce and disseminate soft copies or digital identities.⁴¹

⁴¹ For a more detailed discussion of “digital identity”, see chapter VII.

174. While the traditional method for retrieving a certified copy of a civil registration record involved going to the local civil registration office and requesting a copy at the counter, contemporary situations require the development of a range of procedures to accommodate the public. Requests by mail, for example, would require a manual check of each request to verify whether all the necessary items are included, such as details about the requester, the fee and so forth. The option of submitting requests for certified copies of civil registration records by telephone must also be carefully weighed against a number of factors, such as the modality for processing the fee and checking the identity of the requester.

175. More specifically, the civil registration system must ensure that requests can be made online; the omnipresent and growing use of the Internet for transactions of all kinds makes developing such services a necessity. Development of the Internet option is also complementary to that of electronic government (or e-government), that is, the use of current information and communication technologies to improve the service delivery and functioning of public sector services—in essence, the process of digital interactions between citizens and the government. To that end, the civil registration authority must invest in developing online electronic forms for the submission of requests for certified copies of civil registration records, together with delivery mechanisms and thorough safeguards. An electronic portal that offers multiple services to the public, including requests for copies of certificates, with a secure logging-in system is highly recommended.⁴²

⁴² Norway’s portal is called “Altinn” (www.altinn.no).

176. Concerns that need to be addressed in developing such interfaces range from ensuring the privacy and confidentiality of transactions and maintaining efficiency in terms of delivery to mobilizing the resources necessary to guarantee uninterrupted communications, meeting the costs of maintenance and backup, and providing appropriate staffing.

177. See box 7 for an overview of civil registration services in India, and box 8 for lessons learned from a cross-agency project to improve civil registration services in New Zealand.

178. An amendment programme is also a necessary part of the vital records response to the public. Vital records are dynamic documents that require correction and change. Addition of a father’s information, preparation of new documents in cases of adoption, updates to reflect legal name changes, corrections of erroneous information and annotations on the records are all actions that would fall under the amendment programme. Subsection B.2 outlines the specific methods to be used in the special processing that such a programme requires. A special fee is customarily charged for those actions, which are time-consuming and detail-oriented.

179. The civil registration system must have a delayed registration programme for members of the public whose events, for one reason or another, are not registered in a timely manner. It should be applicable to any type of vital event. The most common

Box 7

India: Services to the public

The registration of births and deaths are permanent records in India. The registrar of births and deaths at the local level is required to maintain the registers of births and deaths and send periodic reports based thereon to the relevant higher-level authority, such as the district registrar, for the compilation of requisite vital statistics. The registration of births and deaths is carried out both online and offline. In some states, registration is conducted using civil registration system software. The chief registrar of births and deaths is required to publish a statistical report on the births and deaths registered during the year. A vital statistics report based on the civil registration system is published at the national level by the Office of the Registrar General.

Despite mandatory registration, the country has not yet achieved the target of 100 per cent registration of births and deaths. To evaluate the completeness of the civil registration system in India, the level of registration of births and deaths is calculated in terms of percentage, by measuring the number of registered births and deaths against the estimated number of actual births and deaths. The estimated number of births and deaths is calculated using the sample registration system. The level of registration determines the performance at the level of individual states and at the level of the nation as a whole.

In accordance with the latest registration data released by the Office of the Registrar General for the year 2014, at the national level, the level of registration of births was 88.8 per cent and that of deaths, 74.3 per cent. In 2000, the level of registration of births was only 56 per cent and that of deaths was lower, at 49 per cent.

cases are delayed registration of births. The registration law and regulations should provide instructions for processing those cases, including the fees. Long delays may also occur: for example, an individual who is 45 years of age may request to register his birth. That request will set the delayed registration programme in motion.

180. When delays are very long, and given the legal nature of the birth record, a judicial procedure is necessary to prove the facts of birth. To accelerate the process, submission of the following documents may be helpful: an old school record, a baptismal record, a voting record, a hospital record or a combination of these records that show the individual's facts of birth. Before the judicial order is issued, the local registrar shall proceed to record the birth. The system should specify the fees for delayed registration: a scaled fee is recommended according to the length of the delay.

181. By design, and according to international standards, the civil registration system should serve the public universally and not discriminate against nor target particular population groups. In practice, however, there are certain population groups for which special procedures and considerations may be needed.

182. Where refugees are concerned, legislation and practice in different countries may vary in the way that citizenship is registered at birth. In some countries, children born in the country of asylum to refugee parents are registered as refugees, while, in others, they are registered as ordinary residents or citizens. If the legislation allows refugees to become residents, civil registration should not pose any problems. In countries where refugees are accorded special status, the civil registration system needs to be flexible enough to accommodate that, either through a specific variable specifying that status or by assigning a different type of identity number.⁴³ In any event, civil registration must be universal and all vital events occurring in the territory of a country must be registered.

⁴³ See Helge Brunborg, "Civil registration and vital statistics for refugees", in UNHCR, *Statistical Yearbook 2014*, chap. 5, pp. 67–73. Available at www.unhcr.org/56655f4c16.html.

Box 8

New Zealand: Lessons learned from the first cross-agency life event project (SmartStart)

With SmartStart, parents have access to an online tool that facilitates access to services and support during their pregnancy and the baby's first years. SmartStart provides parents and caregivers with easier access to relevant information and services for themselves and their babies from conception to early childhood, through the delivery of customer-centred, cross-agency digital tools and processes.

SmartStart is a multi-agency initiative delivered by the Department of Internal Affairs, Inland Revenue, the Ministry of Social Development and the Ministry of Health. The initiative went live on 5 December 2016. In the first month, 15,000 people had interacted with this life-event service (see smartstart@dia.govt.nz for more information).

At the project level, it has been learned that:

- Customers know what they need and want. Early communication with them is necessary, together with a mechanism to obtain frequent feedback on the project's progress.
- Delivering a working prototype for feedback has a profoundly positive impact on the scope and quality of the life event service.
- The relevant government institutions need to change how they are organized and how to lead work. They must accept that there will be new roles and teams created within their own organization and across the agencies involved.

At the system level, it has been learned that:

- A new funding model to meet the needs of an iterative service delivery project delivered by multiple agencies is beginning to emerge.
- Meeting the governance requirements across partner agencies should not be underestimated.

Decision-making checklist:

- Agree on a lead agency and respect the decision-making authority that it entails.
- Find customers, meet with them regularly and authentically nurture those relationships throughout the programme.
- Approach customers with a working prototype early, and go back often to get their feedback on development.
- Value employees and recognize their success.
- Co-design the governance approach with partner agencies, taking care to incorporate each agency's specific requirements.
- Schedule time for the people working on the project to get to know one another and establish connections that they can call on.
- Design and implement an approach to sharing project progress openly, consistently and on demand.
- Build a team of stellar story-tellers to passionately share the vision and encourage others to participate in or support your work.
- Engage widely to gather ideas and generate supporters.
- Transformation is not complete until customers are using the product.

183. The Office of the United Nations High Commissioner for Refugees (UNHCR) and other humanitarian organizations have established systems for registering vital events and providing identification documents for refugees. Authentication of an event is usually more effective, however, if the event is registered with a national civil registration system. In Kenya and Uganda, work is currently under way on transferring the UNHCR refugee registration data to the Government. It is up to the Government to decide whether those registers will continue to exist as separate registers or whether they can be integrated into the national civil registration system.

184. In some countries, stateless persons find it difficult or impossible to register their vital events, often because the local registration officers are not aware that everyone has the right to register their vital events, or because of national legislation. Stateless persons are particularly vulnerable if they have no access to civil registration, since a birth certificate is an essential document for acquiring legal status in the country of residence, and the right to acquire an identity card, live in the country and become a citizen.

185. For internally displaced persons, the issue of citizenship does not arise, but they often face obstacles relating to identification as they may be unable to obtain copies of vital records at their place of origin. It might be too dangerous to go there or the records may have been destroyed in armed conflict or a natural disaster. Consequently, they may face the same challenges as refugees and stateless persons. An electronic civil registration system with a nationwide database (or network of databases) enabling access to records throughout the country can alleviate the situation of internally displaced persons. Box 9 presents a study of civil registration of refugees, stateless and displaced persons in Norway.

186. At least two programmes should be established to respond to the internal uses of civil records: one for the certification unit of the registration bureau, and another for the monitoring and operations unit.

187. From the point of view of internal use of civil records, there is a whole set of operational statistics that are usually generated by the civil registration office with the

Box 9

Norway: Refugees, stateless and displaced persons and civil registration and vital statistics

All vital events that occur in Norway, including those of refugees, asylum seekers and stateless persons, are registered in the Central Population Register. A birth certificate is sent to the parents of a child if they have provided an address, otherwise it is issued on demand. The same applies to family members of a deceased person.

There are, however, differences in how the Central Population Register handles those events: all persons formally residing in Norway, including foreign nationals, are given a unique PIN and are registered in the Central Population Register. Asylum seekers, on the other hand, are given a temporary PIN (known as a "D-number"), issued to non-residents with obligations or rights in Norway. That includes children born while their parents' asylum applications are being considered. If the parents are subsequently recognized as refugees and given a permit to live in Norway, the child will be registered as an immigrant. Children born in Norway to refugee parents are not considered to be refugees, however, their residence status is identical to that of their parents, if both are foreign nationals.

Persons living in Norway, but who are non-residents, including those who are born in Norway, are not included in the annual vital statistics.

purpose of assessing and monitoring operations in terms, for example, of the average workload of registrars—that is, how many records they enter per day; the average time needed to process and enter a civil registration record; the average number of edits and corrections that are introduced; and the number of late and delayed registrations by region and civil registration district. All those are critical pieces of information that could contribute to improving the services and functioning of civil registration offices. See subsection C.3 on monitoring for details.

188. Another part of the internal uses programme should deal with appropriate ways of making the data available to researchers and relevant officials within the civil registration and vital statistics system. From a statistical point of view, the internal use of vital records data includes the production by the national statistics office of an annual statistical report on birth rates, death rates, the leading causes of death and so on. Data should be available to researchers in the maternal and child health programmes, the epidemiology programmes, the planning and evaluation sections of the registration department, the Ministry of Health or the national statistical agency, among other pertinent governmental agencies. See chapter VI for further details on the applications and use of civil registration information.

189. In addition to those governmental uses of vital records data, the programme must also be able to respond to public users of the data. That involves reviewing the right of access to the data with regard to confidentiality and privacy. It also involves the review of research protocols to assess the value of the proposed research and the researchers' qualifications. Another necessary element is the development of efficient methods to share data with approved external users. See chapter VI for more details on the release of data, anonymity and other considerations.

190. Some external uses may be mandated by statute. For example, the demographer in the jurisdiction may need data to prepare population estimates or there may be a statutory requirement that death records must be linked to voter records to purge the voting rolls.

191. The programme for internal and external uses of data is a varied one that must respond to many kinds of requests from a wide assortment of users. Such a programme serves a very important function and justifies the investment of considerable resources in the proper collection of data so that the data can be successfully used in operating the many services required by society.

2. Field programme

192. "Field programme" refers to a set of activities aimed at enhancing the efficiency and coverage of civil registration at the local level. A field programme is a necessary component of the management of the registration services and the efficient operation of the system. That is true for both centralized and decentralized systems. The programme's importance is particularly evident, given the individuals that the field programme is designed to help, including local registrars, morticians, personnel in charge of hospital medical records, coroners, physicians, midwives, court personnel and any others who might be involved in recording or reporting a birth, death, fetal death, marriage or divorce. In either a centralized or decentralized system, reporting is made to local registrars who register the events. In addition, the other individuals are part of the system and need the services of a good field programme.

193. A good field programme has several essential components. An initial product of the field programme is the set of instruction manuals and standard operating procedures (SOPs) needed by local registrars and all those who supply notifications to the

system. The SOPs should very carefully spell out the specific responsibilities of local registrars and each of those notifiers. Since the majority of civil registration systems rely on local registrars, the first instruction manual to be prepared is for them, because the local registrar must have oversight of the entire array of procedures for correctly registering vital events. The instruction manual should include such functions as preparing and filing records, handling the legal requirements for their preparation, keeping the records safe, issuing certificates, making amendments and corrections, transmitting vital records to the registration authority and collecting data for statistical purposes.

194. Local registrars must be familiar with the laws and regulations governing civil registration and vital statistics in the country or state or province. As such copies should be made available to them and they should receive adequate training and continuous education thereon.⁴⁴ An important part of the manual is the description of the duties and responsibilities of registrars, as they are the cornerstones of the registration system. As the vital records are legal instruments, local registrars must have solid knowledge of family law so that they are able to participate efficiently in the process of family organization to which civil registration contributes. The local registrars should be furnished with all necessary instructions to enable them to competently address a range of registration-related matters, including the possibility of modifying the vital records in those cases provided by law, without the need to consult a higher civil registration authority.

⁴⁴ See chapter III, subsection B.4, for details on maintenance of field operations.

195. The manuals and standard operating procedures for notifiers (morticians, coroners, midwives, hospital personnel, physicians, court clerks and marriage officers) are specific to the responsibilities of those individuals. For example, the manual for funeral directors or morticians deals only with the requirements for filing death notification records, while, the manual for physicians contains sections on recording the cause of death and cause of fetal death, and on completing birth records. All the manuals should include copies of the specific documents for which the particular notifier is responsible. Besides specific instructions on how to complete each field, an explanation of the importance and use of the field is required. Such explanations, combined with training would help to elicit more complete and accurate responses.

196. Preparation of the manuals and standard operating procedures is a time-consuming task but one that is likely to pay real dividends. To continue reaping those dividends, it is essential to keep the manuals updated. Manuals must reflect changes in forms or administrative policies as soon as they occur. Consequently, if hard copies are being produced, it would be advisable to issue them in loose-leaf format so that new or updated pages can be easily inserted without the need to reprint the entire document. While electronic formats and online versions (soft copies, wiki-type guides and other online resources and interactive software, among other options) of handbooks are the formats of choice, hard copies may still need to be printed for local registrar offices with limited access to the Internet. Regardless of the format of the manuals, provision must be made for updating and revising their content as effortlessly as possible, and in a consistent manner across the entire country.

197. An adjunct to the instruction manuals, which would help to keep local registrars and notifiers informed and serve a number of useful purposes is a monthly or quarterly newsletter. It would keep staff up to date on changes and alert them to any common errors that are detected. It can also provide a medium in which to ask questions and provide answers, and can present motivational material, such as timeliness reports or helpful hints from local providers. The newsletter can also notify educational meetings or seminars throughout the jurisdiction. Other channels for discus-

sion and exchange among peers could include communication through an intranet, a dedicated electronic forum (e-forum) or a more generic electronic bulletin board on which registrars can post comments and queries.

198. Field visits are a crucial part of the civil registration programme. Serving both educational and motivational purposes, field visits let the local registrars and the providers in the field know that they are an important part of the civil registration records team. Periodic checks of the local registration offices should form part of the annual work plan of the system's administering office, verifying that local registrars are recording and reporting vital events in strict compliance with the law. Since visits to the field are costly, careful planning is necessary to maximize their benefit while keeping their frequency within resource limitations.

199. There are several types of visits. Routine visits should be made to ensure strict compliance with laws and regulations, checking that such items as logs and registers are being kept up to date, register files are being maintained in order and in a secure fashion, and the reporting of vital events runs smoothly. Routine visits also address any problems that may have come up in the particular area. When making routine visits, staff members should try to hold meetings not only with local registrars but also with as many key providers and notifiers in the area as possible, including midwives, morticians, coroners or hospitals in the area. If physicians are experiencing problems with reporting vital events, that is the right occasion to visit them.

200. Initial visits are made when new registrars, coroners, morticians or medical records personnel start working in a particular area. An early start with on-the-spot training will make the transition more efficient.

201. Educational visits need more preparation and are more formal in nature, and may involve a full team of trainers from the office. Examples of educational visits are regional seminars and annual meetings; both are worthwhile investments of staff time. A regional seminar might be preferred if the geography of the jurisdiction makes it easier for a group of individuals from one section of the jurisdiction to gather for in-depth training. Several such seminars may be held in different geographical areas dur-

Box 10

Philippines: National workshop on civil registration

The Philippine Statistics Authority (PSA) organizes a national workshop on civil registration every two years. Participants include local civil registrars, local executives (mayors, village captains), PSA staff and other stakeholders. The national workshop serves as a venue for updating the local civil registrars on the latest laws, rules and regulations and disseminating memorandum circulars and other information on civil registration. Papers on topics using vital statistics are also presented.

Awards for the best local civil registrar offices are also presented during the national workshop. Local civil registrar offices are rated on the timeliness and complete submission of civil registration documents to PSA, and on the quality of the information on the documents in terms of accuracy and completeness.

In between successive national workshops, PSA organizes a National Convention of Solemnizing Officers. Target participants include religious ministers, mayors, judges, sharia court judges, imams, tribal chieftains and other persons authorized to solemnize marriages. Local civil registrar's offices may also participate in the National Convention, at which updates on marriage laws, rules and regulations for the registration of marriages and other related topics on marriages are discussed.

Box 11

Civil registration and vital statistics in emergencies

Emergencies pose specific challenges to formal civil registration and vital statistics systems. Infrastructure may be damaged, documents destroyed or lost and pre-existing weaknesses in the formal registration systems may be exacerbated. Those challenges require action from government and non-government stakeholders, such as the revision, adaptation or development of systems, measures and techniques for civil registration.

To ensure effective civil registration in emergencies in current and future disaster responses, it is recommended that:

- Governments ensure that civil registration and vital statistics line ministries work closely with disaster risk management line ministries and humanitarian actors, to identify appropriate measures for preparedness and for strengthening civil registration and vital statistics systems in emergencies;
- Humanitarian stakeholders ensure that a situation analysis for civil registration and vital statistics becomes an integral part of humanitarian assessments, and that they incorporate civil registration actions as part of emergency preparedness, response and recovery;
- Donors allocate funding for civil registration as part of preparedness in humanitarian response and recovery. While civil registration may not be an immediate, life-saving priority in humanitarian response, it is clearly an important tool for protection before, during and after emergencies. Funding for civil registration efforts in emergencies may, however, need to link to longer-term funding initiatives.

Good practices in preparing civil registration in emergencies:

- Work in child protection alliances with United Nations agencies and non-governmental organizations;
- Conduct a situation analysis or baseline assessment;
- Raise community awareness;
- Use information to develop action plans;
- Involve children and communities in the design of civil registration interventions.

Good practices in conducting civil registration in emergencies:

- Build on existing systems to make them accessible to affected populations;
- Establish systems for issuing vital events notifications;
- Exploit the use of mobile phone technology;
- Integrate civil registration with primary health-care services.

Good practices in ensuring sustainability of civil registration systems:

- Adapt or formalize temporary civil registration mechanisms;
- Decentralize civil registration down to subdistrict level;
- Advocate legal reform;
- Ensure continuous monitoring

ing the year to respond to the particular needs of each area. The annual meeting may be used to bring together as many local registrars in the entire jurisdiction as possible, together with a provider. That would enable a free exchange of ideas and experiences that can be very beneficial to general communication throughout the registration system. Developing e-learning tools to complement educational visits would enlarge the

impact of the learning process for all levels of staff. See box 10 for details on how the Philippine Statistics Authority carries out its educational events.

202. The maintenance of the field programme of civil registration is particularly vital in emergency situations. A child's vulnerability to abuse is very high when an emergency is unfolding; boys and girls routinely become separated from their families or caregivers and are vulnerable to physical abuse, neglect, sexual and economic exploitation, discrimination, violence and recruitment into armed groups. Civil registration as a functional system can help build a protective environment for children in many ways. If vital events, predominantly births, are registered and the records are well kept, family tracing for separated children becomes easier, as there is documentation on their parents and their origins. In cases of child marriage or the worst forms of child labour, proof of age can help children and facilitate the prosecution of perpetrators. Birth registration can also help children to claim their inheritance rights. See box 11 for details on good practices in the context of emergencies, drawn from a report published by Plan International.⁴⁵

203. While it may not be possible to include all the above-listed components in the field programme, immediately, it is essential to work towards a programme that includes each component in as much depth as possible. The dividends for the general health of the civil registration system will be visible very quickly.

⁴⁵ Plan International, *Birth registration in emergencies: a review of best practices in humanitarian action*, April 2014

3. Monitoring

204. A performance monitoring programme must be an integral part of the civil registration system. Periodic information on system performance should be generated in order to ensure that the civil registration system is being conducted effectively. The four principles of civil registration can serve as a frame within which system performance can be understood and performance indicators can be formulated. As set out in the *Principles and Recommendations*, civil registration must be compulsory, universal, continuous and permanent, and confidential.⁴⁶

⁴⁶ See *Principles and Recommendations*, chap. II.

205. Before elaborating on the possible performance indicators that might be used in monitoring the effective conduct of a civil registration system, it should be emphasized that generation of this kind of information is not related to the production of vital statistics. Performance indicators, or process statistics, are intended as an aid in the management of a civil registration system.

206. The first issue to be considered is the principles of compulsoriness and universality. It is recommended that the total number of registrations of each type of vital event be tracked at least on a monthly basis, and at every geographical or administrative level. Similarly, the total number of certificates issued for each type of vital event should be tracked periodically and at every geographical and administrative level. With those simple indicators, a national or local manager will be able to detect unexpected drops or spikes in the registration flow. Comparison with the expected or historical number of vital events, in particular at the local level, also sheds light on the extent of registration. In the same fashion, comparison of vital events reported by hospitals (primarily births) with the events actually registered can provide useful insights. The computation of crude and net rates indicates whether the levels of demographic phenomena are within expected ranges, and pinpoints certain areas or types of events where the registration system is falling short. The ratio of registrars to the size of the population in each locality and the average distance to the local registration centre can also serve as useful indicators for monitoring the capacity of the system to serve the entire population.

207. For determining the extent to which the system is continuous and permanent, other performance indicators can be formulated. A national and local manager must know the average number of registrations undertaken per registrar (e.g., monthly or weekly), or the average amount of time it takes to register each type of vital event. Those statistics may be used as benchmarks for monitoring the actual output of registrars and identifying areas for improvement, and for making adjustments to workloads or other administrative arrangements in order to improve services to the public. In addition, time use reports on the registration software in each registration centre may be used to monitor the actual time that local or remote offices are open to the public. The availability of an online system for the registration of a vital event and its consequent efficiency may also be an indicator of a continuous and permanent civil registration system.

208. Finally, with regard to confidentiality, performance indicators may be embedded in the registration process and subsequent flow. For example, the following questions could be raised: Is there a protocol in place for protecting information on cause of death from being disclosed? Are there safeguards in place for accessing online records? Are the physical settings of the local registrar and registration centre facilities conducive to confidentiality? Are records made anonymous before being transmitted to other agencies? Are staff trained in confidentiality and disclosure rules and regulations?

4. Coordination activities and functional relations of the civil registration and vital statistics systems

209. Whether the structure is centralized or decentralized, coordination activities must be built into the civil registration and vital statistics systems from the start, whether or not they are in separate agencies. The very nature of the vital statistics function requires it to use local registrars, providers and notifiers and the same records to collect information for legal purposes and for statistical uses. That necessitates close coordination and collaboration among the various components of the civil registration and vital statistics systems. The health sector, certification, registration, statistics units and local offices must coordinate their activities for an efficient operation. In centralized systems or under a single-agency configuration, leaders of the central offices involved (certification, registration, statistics, health and justice) should meet at least every two weeks to discuss matters of an overlapping nature. As mentioned in chapter I, an inter-agency committee, with representation from appropriate programmes, can be established to deal with coordination issues. It is often at committee meetings that it is learned that changes planned by one unit may drastically affect another unit. For that reason, open discussion and coordination are essential so as not to duplicate efforts. Committee meetings are even more important when the units are in separate agencies. Coordination efforts should be as strong as possible, as illustrated in the examples below.

210. The design and use of collection forms is an area in which all stakeholders (the civil registration authority, the national statistics office and the Ministry of Health, at the very least) of the civil registration and vital statistics systems must be in close coordination. Some jurisdictions have different forms for collecting legal information and statistical information. Other jurisdictions may use one single form (electronic or paper), which has clear advantages. In either case, the certification and the statistics agencies must contribute to the initial design of the collection instruments so as to guarantee that the required information is collected on the form.⁴⁷ The registration agency must be directly involved in the structuring of the instruments, which will make data collection much easier and the transfer of data to the master files much

⁴⁷ The topics and themes to be covered in a vital statistics system are comprehensively set out in *Principles and Recommendations*, chap. III.

more efficient. Similarly, all three stakeholders must be involved in any changes to the collection instruments.

211. In the configuration whereby the notification function, the civil registration function, the vital statistics agency and the identity management agency are connected in a holistic manner, coordination is still of crucial importance, not only in the initial development of the system and formatting of the electronic records and their content, but also in the operational phases, in terms of establishing and perfecting editing procedures and protocols, correcting entries and harmonizing products. Successful examples include the establishment of inter-agency coordination committees that meet at regular intervals, the exchange of field visits and the organization of joint seminars involving registrars, statisticians, health personnel, information technology and identity management experts. Given that there is an extensive set of international standards for civil registration and vital statistics, establishment of an inter-agency coordination committee will make possible more efficient and comprehensive implementation of those standards at the national level. See box 12 for information on this type of coordination committee in the Philippines, Uzbekistan, Chile and Canada.

212. In recent years, a number of countries have created national agencies entrusted with issuing identity cards to all individuals residing therein. The process involves collecting photographs, fingerprints and other biometrics, such as an iris scan. Those agencies usually incorporate the civil registration function—for births, deaths, marriages and divorces—and maintain a population register, including the address of usual residence and other characteristics. In that context, it is of paramount importance to apply international standards related to both civil registration and vital statistics, so as to produce comprehensive and regular vital statistics and, at the same time, ensure compliance with compulsory, universal, continuous and confidential principles of civil registration.

213. The civil registration function should not be treated as secondary to the identity management function. The two functions should interoperate, and mechanisms should be put in place so that vital statistics can be generated on the basis of civil registration information. The production of relevant and regular vital statistics is assured by the regular—even daily—transmission of new records to the statistical agency for editing and processing, and it should be ensured that all the information, in line with international standards, is incorporated in the records. Concurrence with international principles of civil registration must be embedded in the core functions of the identity management agency.

214. As noted previously, one of the principal objectives of the present *Handbook* is to provide guidance on the workings of vital statistics and civil registration processes. Although they are being presented as two separate entities, the ultimate goal is to establish, maintain and exploit the two entities as components of a coordinated and coherent system for registering vital events and producing vital statistics. The procedures for recording births and deaths are equally important for civil registration in legal terms, and for vital statistics as a reliable source of statistics. As such, the work of civil registrars and statisticians is interdependent.⁴⁸

215. Vital statistics generated out of a coordinated and coherent civil registration system offer the most valuable regular, accurate and relevant information on fertility and mortality, including for small areas. They enable the computation of proximate population estimates and projections and the identification of fertility patterns at small-area levels, and they serve as the basis for cohort studies and the construction of life tables—to name but a few of the many uses of vital statistics generated directly from civil registration. That illustrates the critical importance of civil registration in providing relevant statistical information.⁴⁹

⁴⁸ *Principles and Recommendations*, para. 274.

⁴⁹ *Ibid.*, para. 275.

Box 12

Inter-agency coordination mechanisms for civil registration and vital statistics

- The Philippines have an Inter-Agency Committee on Civil Registration and Vital Statistics. Its members are permanent representatives from the Departments of Health, Education, Justice, Foreign Affairs, the Interior and Local Government, the National Commission on Muslim Filipinos, the National Commission on Indigenous People and the Philippine Statistics Authority (PSA). PSA serves as the technical secretariat of the Inter-Agency Committee, which is responsible for implementation of the work plans for the Asian and Pacific Civil Registration and Vital Statistics Decade 2015–2024 (proclaimed at the Ministerial Conference on Civil Registration and Vital Statistics in Asia and the Pacific). It is also entrusted with generating the Sustainable Development Goals indicators for civil registration and vital statistics, among others.
- In Uzbekistan, a resolution was adopted instructing the Ministry of Justice (responsible for civil registration), the Ministry of Health and the State Statistics Committee to conduct quarterly comparisons of figures at the regional level. The resolution is aimed at achieving complete and accurate compilation of vital statistics.
- In Chile, an inter-institutional agreement was signed in 1982 by the Ministry of Health, the Civil Registration and Identification Service and the National Statistics Institute for the elaboration of vital statistics. Pursuant to the agreement, a tripartite committee was created to oversee the vital statistics system. The Civil Registration and Identification Service is tasked with collecting statistical data when registering vital events using the layouts and forms agreed by the tripartite committee. Thus, all required information (health-related, legal and statistical) is included in a single form for each type of event, and is collected from the registrant at the time of the occurrence of the event if the event occurred in a medical facility or at the time of registration. The Civil Registration and Identification Service grants both the National Statistics Institute and the Ministry of Health secure electronic access to its database, for the compilation of vital and health statistics. The publication of all official statistics is the exclusive responsibility of the National Statistics Institute. That agreement has proved to be a dynamic model conducive to successful inter-agency cooperation, and has improved vital statistics coverage and timeliness.
- In Canada, the cornerstone of the national system of vital statistics is the cooperation and collaboration among provincial and territorial civil registrars and the federal Government. That partnership was created in 1919, following two conferences on the establishment of a national system of vital statistics, at which the principles of mandatory registration and national–provincial collaboration were affirmed. In 1945, the Vital Statistics Council for Canada (VSCC), which comprises representatives from all provinces and territories and from Statistics Canada, was established as the official body responsible for ensuring the uniform collection, compilation and dissemination of vital statistics across the country. Although Canada is a mosaic of cultural backgrounds with two languages, a vast geographical area, a relatively small population and many jurisdictions, VSCC is able to surmount those challenges in ensuring reliable information sources. See www.statcan.gc.ca/eng/health/vital/vscc for more information.

216. Civil registration, in turn, is “the continuous, permanent, compulsory and universal recording of the occurrence and characteristics of vital events pertaining to the population, as provided through decree or regulation in accordance with the

legal requirements in each country”. Civil registration is carried out primarily for the purpose of establishing the documents provided for by law. The usefulness of those records as the best source of vital statistics is well established.⁵⁰

⁵⁰ *Ibid.*, para. 279.

217. None of the major components of vital statistics and civil registration systems exist in a vacuum. Civil registration and vital statistics systems must coordinate with other functional units of Government. To do that effectively, vital statistics and civil registration staff must serve on various committees throughout Government. For example, if there is a birth-defects register, it is important that a CRVS staff member attend the major organizational or board meetings of such register. That would help to coordinate what input should be mutually provided, and to find out if there are any ways in which the birth-defects register can contribute to the civil registration system. Since the such a register is most likely the recipient of information from other sources besides the birth record, it can probably serve as quality control for the completeness and accuracy of data in the birth record.

218. There are a number of countries in which the civil registration and vital statistics components are located in separate government institutions. Efforts to maintain open communication in such situations are essential and can pay many dividends. Duplication of efforts can be kept to a minimum when each component knows what the other is doing or is planning to do. Furthermore, redundant registration data and overlapping and inconsistencies in data files can thereby be minimized. In such structures, coordination can best be achieved by establishing an inter-agency committee for civil registration, vital and health statistics that operates on a permanent and continuous basis. Mutual cooperation and collaboration are essential among collectors of data and producers of vital statistics. It is in the interest of countries to establish such committees and to provide them with all necessary support. Inter-agency committees also have an advisory role. The ultimate goal of all such undertakings is to develop and maintain one single database or population register at the civil registration authority that can be used in statistical and health-related contexts, in the compilation of electoral rolls, and in the provision of identification services, among other purposes.

219. Review committees provide another framework for coordination with other health agencies. It is advantageous that staff members of the civil registration authority and the statistics office serve on committees that review maternal deaths or perinatal deaths. They will help to familiarize these committees with some uses of the vital statistics data and the civil registration system and, in turn, their attendance at these committee meetings also broadens their own perspective and alert them to the needs of other areas of the health field.

220. Besides coordinating with other agencies in the health and juridical fields, it is also important that the vital statistics and civil registration programmes coordinate their activities with similar programmes at the national and international levels. By assigning staff to serve on committees and to join professional associations, civil registration agencies and statistical offices will be enriched with new ideas and new methods.

221. The use of standard classifications, nomenclature and common codes is a *sine qua non* of a holistic system of civil registration, vital statistics and identity management. Standardization of those functions is premised on the consistent use of a unique code for all localities and administrative subdivisions of the country. If the designated territory of a civil registration district differs from that of its administrative subdivision, it will not be possible to harmonize and present small-area statistics that are crucial for decision-making at the local level. The code that refers to the place of residence of the mother, in the case of births, for example, and that forms part of the registration

⁵¹ ST/ESA/STAT/SER.F/79, United Nations publication, Sales No. 00.XVII.12, available at https://unstats.un.org/unsd/publication/SeriesF/SeriesF_79E.pdf.

⁵² ST/ESA/STAT/SER.F/103, United Nations publication, Sales No. E.09.XVIII.8, available at https://unstats.un.org/unsd/demographic/standmeth/handbooks/Series_F103en.pdf.

⁵³ See *Principles and Recommendations*, para. 2.

⁵⁴ See ICD-10, available from www.who.int/iris/handle/10665/246208/. The 11th revision is forthcoming.

⁵⁵ See www.cdc.gov/nchs/ppt/nchs2012/li-14_minino.pdf.

⁵⁶ Examples of such software include Iris, the Mortality Medical Data System, STYX and the Automated Classification of Medical Entities, among others. A brief description and features of some computer applications for assisting in the coding of the underlying cause of death can be found in annex II to the present handbook.

record, must come from the same code book that is consistently used by all the components of the system, including the health sector, and is compatible with other data collection exercises, such as population censuses. The principal sources for cartography and geographical coding are the *Handbook on Geographic Information Systems and Digital Mapping*⁵¹ and the *Handbook on Geospatial Infrastructure in Support of Census Activities*.⁵²

222. The same requirements apply to the definitions of vital events. Those definitions are presented in detail in the international standards⁵³ (see also, para. 7 above) and should be fully implemented as such in national practices. The importance of using the same definition for the same event cannot be overemphasized, not only by all components of the system, but also throughout the entire country.

223. The classification most pertinent for civil registration and vital statistics is the International Statistical Classification of Diseases and Related Health Problems (ICD).⁵⁴ The Classification is a system of categories to which morbid entities of either external or pathological causation are assigned according to established criteria.⁵⁵ It is important that the specialists in disease classification, or nosologists, applying the ICD codes for cause of death have training in the universal methods for translating the literal causes listed on the death record (sequence of morbid events) into an underlying cause of death code from the Classification. Such consistency is necessary to make the data comparable throughout the system. Efforts to coordinate the activities of individual nosologists is alleviated by technology; however, although computer software for selecting and coding underlying cause of death is available⁵⁶ and used widely, it cannot completely replace nosologists. The use of computer software for coding requires support from trained coders to analyse the cases that the software is unable to process.

224. Aside from the International Statistical Classification of Diseases and Related Health Problems, a number of other relevant classifications need to be firmly incorporated into all the components of the system. Some of those classifications are developed at the international level and are implemented in national statistical practice. That is the case with the International Standard Classification of Occupations (ISCO). The current version, ISCO-08, comprises 43 sub-major groups, 131 minor groups and 425 unit groups of occupations. Similarly, the International Standard Classification of Education (ISCED), a statistical framework for presenting information on education, in its current revision (ISCED 2011), which consists of nine levels (compared to seven levels in the previous version), needs to be fully implemented throughout all components of the national statistical system.

225. Particular attention is required in intra-agency coordination as each office carrying out registration, certification and statistics activities needs to have a sound understanding of the other components' needs and responsibilities. For example, when the certification component completes a new record following an adoption, it must be aware of the importance of communicating the information to the registration component. It must communicate exactly what changes have been made to the document so that the registration component can reflect those changes in the registration record and, ultimately, the master file. In turn, the registration component must be aware of the needs of the statistical component concerning changes to the statistical database that are necessitated by the adoption. Although changes to the child's name or the parents' names are not of particular interest to the statistical component, the demographic characteristics associated with the birth of the adopted child certainly are. The adoptive parents may not be of the same age(s) of the biological parents, and the statistical component does not need to reflect that in the statistical database. For statistical purposes, other data on the biological parents are needed. At the same time,

the certification component needs the age of the adoptive parents to appear in the copies of the certificate that it issues. The registration component must be aware of those disparate needs relating to the same data item and routine protocols in order to be able to respond to them in an appropriate manner.

226. Although that is a particularly compelling example of the need for communication among system components, because it involves all the components, it is not the only instance in which such communication is essential. Other examples for which communication among components is indispensable were highlighted above, in the discussion of the delayed registration programme and the correction and amendment programme.

227. In order for the registration component to run a successful field programme with a view to ensuring completeness and accuracy in reporting, it is essential that each of the other components discuss exactly what information each question on the vital records is designed to obtain.⁵⁷ For example, the educational level of the deceased is a topic on the death record. This is an important variable for the statistics component as it is an indicator of socioeconomic status. It is essential that this be communicated to the registration component, which in turn must explain this to the responders, local registrars and other collectors of information. An effective way to ensure and maintain the collection of certain topics is to insert them in the legal framework. That would minimize the risk of important topics being suppressed without due consideration of the repercussions. Of course, the legal framework should mirror international standards, as elaborated in chapter I.

228. There are many examples of the importance of communication, and as demonstrated above, smooth and effective intra-agency communication is of particular significance. Managers should encourage cross-communication and cross-training among the various components of the system to ensure an efficient workflow and to enable the teams to produce high-quality work. To that end, the staff in each component should know as much as possible about the workings of the other components.

⁵⁷ See *Principles and Recommendations*, chap. III, section D, and annex II, for definitions and recommended tabulations.

Chapter III

Maintenance of civil registration and vital statistics components

A. Introduction

229. The topics covered in the present chapter relate to the maintenance of established civil registration and vital statistics systems. Particular attention is given to the operational requirements of maintaining effective and reliable systems. The operational requirements of a maintenance programme include modification of records; internal review of the system's functions; preservation of stored records; and maintenance of field operations. Modernizing and maintaining the operational requirements is a prerequisite of contemporary government functions, essential to improving services to the public at the individual level, and to enhancing the efficiency of the State at the macro level. A detailed discussion of the process of digitizing civil registration and vital statistics can be found in chapter VII.

230. As noted earlier, vital statistics and civil registration are separate entities, but it is crucial that they be established, maintained and used as components of a coordinated and coherent system for registering and producing vital statistics. In addition, the emergence of interconnections between civil registration and identity management systems adds another dimension to the civil registration and vital statistics system. A graphic representation of these relationships and functioning is presented in chapter I, figure 1.

231. Civil registration is defined as the continuous, universal recording of the occurrence and characteristics of vital events pertaining to the population, as provided through decree or regulation, in accordance with the legal requirements in each country.⁵⁸ It is important to highlight the quality of universality in relation to people's rights regarding the registration of vital facts. As established in the 1948 Universal Declaration of Human Rights and reaffirmed in other global accords, every person has the right to an identity as bestowed through civil registration. In that regard, laws, policies, rules and regulations must not be a hindrance to the realization of this right. In particular, the registration of events must be performed even if the time frame prescribed by law has elapsed, and regardless of migratory status or any other request that may act as an obstacle to registering the vital events that occur in the territory. Civil registration is carried out primarily for the purpose of registering vital events and establishing the documents as per national law. The usefulness of those records as the best source for the production of vital statistics is well established. The procedures for recording vital events are equally important for civil registration as a legal exercise and for vital statistics as a source of statistics. Consequently, the tasks performed by civil registrars and those of statisticians are interdependent.⁵⁹

⁵⁸ *Principles and Recommendations*, para. 279.

⁵⁹ *Ibid.*, para. 274.

B. Operational requirements

232. Most countries are switching to electronic methods as the means of operating and maintaining their civil registration and vital statistics systems, as part of a general shift towards e-government. That technological transition should be accompanied and supported by an appropriate legal framework that determines and regulates the operation and design of technology-based civil registration and vital statistics systems.

1. Modification of records

233. A country's original records may be modified in accordance with strict procedures laid down by its civil registration law and in certain circumstances, as described in chapter II, section B. The present section examines the methods of making those corrections to the file and the ways of maintaining the integrity of the file and keeping a log of all such changes. The discussion focuses on ways of accomplishing those modifications for each type of medium in which the records are stored.

(a) Hard-copy files

⁶⁰ While it is assumed that most contemporary civil registration systems are based on the use of computer networks and technology, the description of methods of modifying hard-copy records has two primary purposes: to provide guidance for systems that are still paper-based and, more importantly, to explore the essential logic and rationale behind the modification of official records.

234. Hard-copy files⁶⁰ refers to records stored on paper. There are several ways of making the required modification to such records. The first possibility is to prepare a completely new record. That is done, for example, in the case of an adoption where a substantial change is made to the birth record and confidentiality must be ensured. The original birth record is removed from the files and, using the information the original record, in combination with the changes necessitated by the adoption order, a new birth record is prepared. The new birth record shows the names of the new parents and the child's adopted name, and should bear the same unique file number as the original. The new record then replaces the original in the birth record files. The original record and the adoption order are then placed in a sealed file, which can be opened only by order of a court or for the registrar's administrative needs. The sealed file is assigned its own number, which is placed inconspicuously in the new record as a reference. In that way, the registrar can locate the original record in the event of a court order to open the sealed file or the future annulment of the adoption.

235. That procedure preserves the integrity of the birth record file since only one record remains on file for the adopted individual. The original record has been removed and placed in a sealed file, and the new record bearing the unique birth record number is now filed in its place. In addition, the association of the sealed file number with the new birth record now in the file enables the registrar to trace the process back to the original document, should it be necessary.

236. A second method of correcting hard-copy files is to make an addition to an existing record in the file. That is often done to add the name of a father to a record after the parents of a child born out of wedlock are married, for example, or after the father acknowledges paternity and requests that his name be added to the record. In such cases, the original record is retrieved from the paper copy file, and the father's name or other missing information is added to the record. The record is marked "amended" and the date of the amendment is noted on the record. The record can be designed to include a special section for amendments. In the case of a paternity affidavit, the affidavit itself should be permanently preserved in a separate file, in case any question should arise later which might involve amending the record.

237. A third method, which is often employed in the case of a legal change of name, is simply to strike through the original information. The new information is entered in the space above the struck-through text. This method is often employed in legal

name changes in order to preserve an identity trail connecting the original name to the amended name. A dated annotation should also be included in the corresponding section of the record.

238. The above methods are illustrations of certain types of amendments or corrections, but it should be noted that none of the methods is the only one that can be used for that type of amendment. The registrar determines the best method to use in the given circumstances, in accordance with the instructions in the registrar's manual and the law.

239. The methods described above are most efficient when the hard-copy records are in loose-leaf format. If the records are in bound books or bound ledgers, additional steps may be necessary.

(b) Microfilm files

240. The amendment and correction of registration records kept on microfilm⁶¹ presents specific challenges. For example, in the case of an adoption, the copy in the file must be replaced with a new record. How is that done with a microfilm record? In the past, solutions included punching a hole in the microfilm where the original record resided. Besides being an intrinsically laborious task, the punched hole also weakened the microfilm, which was then liable to break at the point where the hole had been punched. A similarly impractical approach was to try to splice in the new record. That not only weakened the microfilm in the area of the splice but often damaged adjoining records on the film.

241. Ultimately, the most appropriate solution for amending microfilm registration records is to create a separate roll of microfilm containing the amended records only and leave the original record on the original microfilm roll. In order to ensure that the original record still on the microfilm roll is not accessed accidentally, a searcher must be directed the location of the amended record on the new microfilm roll, referred to as the "relocation roll". Each amended record assigned to the relocation roll is given a relocation number, which may be called, for example, the "R" number. The "R" number enables the searcher to locate the amended record on the relocation film. The "R" number replaces the unique birth record number in the record index (but not on the amended record itself, which retains the original unique number). The original number, therefore, no longer appears in the index. That prevents the searcher from accidentally going to the original record rather than the amended record.

242. To illustrate the procedure, consider the following hypothetical example. A child born as John Smith is adopted by Mary and George Brown. A new record is prepared showing the new parents' names and the child's new name as John Brown. The unique record number which appeared on the original record is used on the newly prepared paper record. That new record now becomes the official birth record for John Brown. A copy of the original record for John Smith is printed from the microfilm and placed in the sealed file with the adoption order. The number of the sealed file is placed in an inconspicuous place on the amended record. In that way, the registrar can refer back to the original record, should it be necessary.

243. The newly prepared amended record showing John Brown with his parents Mary and George Brown is now placed in the relocation file and assigned the next sequential "R" number. It might, for example, be the 1,678th amended record, in which case it would be assigned the number R1678. The "R" will alert the searcher to look for the record in the relocation files. The number is placed in a specific place on the roll (e.g., the lower left corner) so as to facilitate the search of the microfilm roll. That number

⁶¹ As with the hard-copy records described in subsection (a) above, the sole purpose of describing the procedures followed in cases where civil registration records are kept on microfilm is to provide examples for those civil registration systems that still employ that medium.

now identifies the record. The original number is removed from the birth index and replaced by the newly assigned “R” number. When there are a sufficient number of “R” records to fill a microfilm roll, the set of relocation records is filed and becomes the next microfilm roll in the relocation file. There should of course be separate relocation files for live births, deaths, marriages and divorces.

(c) Computer files

244. Computer files are entries or records in a database, not to be confused with scanned images of civil registration documents. Computer files are amended in a database (either online or on local computers). For example, to make the changes necessary to reflect the adoption of John Smith described above, a copy of the original record must be made and stored with the adoption documents in a sealed file, and the corrections must be made in the database. If a sex change (vital event) is permitted under the country’s laws, it must be treated as an amendment and may trigger the issuance of a new PIN if the country uses PINs that contain the indication of sex.⁶² In any event, a link file must be created in order to ensure that the original and the new identities (and PINs) are permanently associated with each other in the master database.

245. Where there are interactive applications that can be used to manipulate the register database and numerous physical locations within the system where such interactions can occur, it is of critical importance to ensure that access to the database is subject to strict protocols. In the case of paper files, remarks or annotations are written in the margin of the original document. The same logic applies to computer files in a database. Thus, it is necessary to develop routine procedures and to keep a log indicating the amendment made to the record, the person who amended it and the documentation that triggered the amendment.

246. As maintaining confidentiality is one of the major principles of civil registration, access to the applications for amending the records must be restricted to a certain number of registrars. In addition, computer routine procedures should be developed so that each amendment is reported to the system’s management for quality control purposes.

2. Preservation of stored records

247. Depending on the size of the population that it serves and the organizational structure of the civil registration system, a central registration office for a district or province may process 100,000 new records each year and will, in the course of a single decade, have well in excess of 1 million records in its files (including corrections and amendments). Many jurisdictions generate records at rates that makes these illustrative numbers look quite small. The present subsection is devoted to methods for preserving different types of stored records—paper-based, microfilm and computerized.

(a) Paper-based records

248. Paper-based records⁶³ are often the initial format in which the civil registration record appears. Whether at the local office or the central office, a paper record is subject to damage by fire or water or to simple wear and tear. In cases where the record is in loose-leaf form, it is also subject to loss or misfiling. Those risks are reduced when the records are stored in bound books. However, as computerization evolves, the use of bound books will gradually disappear and only historical books will need to be preserved.

⁶² It is recommended that PINs not contain any indication of sex, geographical area, date of birth or any other personal details.

⁶³ As noted above, currently, civil registration records are predominantly computer-based and stored in databases such as population registers; however, the practice of keeping paper records is still followed. There are a number of transitional methods in which new records are computerized, but not all the existing paper records have been scanned and entered into the database, because the process is so resource-intensive. That is also true of microfilms, which were—and, in some cases, still are—used for the general archiving of civil registration records. Hence the need to give consideration to all three record formats.

249. Guarding against fire or water damage is extremely important. Often the paper record, in addition to being on a fragile medium, may also be the only existing copy of the record; even in cases where a copy is kept at both local and central levels, the loss of a copy at one level means that the other copy becomes more vulnerable. For those reasons, the digitization of all paper civil registration records, notwithstanding the complex and resource-demanding nature of the process, must be incorporated in the initial set-up of the holistic notification, civil registration, vital statistics and identity management system. Until the digitization of all records is achieved, measures to manage and protect paper records should be put in place. To guard against fire damage, paper records should be stored in a room or vault constructed of materials that can resist fire and heat long enough to allow the fire to be extinguished before damage is done. To equip the vault with a water spray would introduce another type of hazard. Some offices have used halon fire-extinguisher systems in the vault area, but that practice is on the decline because of its cost and environmental impact. There is also a danger of water damage resulting from floods and heavy rains.

250. Wear and tear from the handling and refiling of paper records is also a threat to those documents. Paper records stored in a normal-sized file drawer will not easily survive the pushing and pulling that handling, refiling, opening and closing the drawer entail. A good method is to use expandable folders, holding 75–100 records each. The folders can be labelled with the range of record numbers contained in each folder and then placed in the file drawer. That will greatly diminish the wear and tear caused by opening and closing the drawer; it also makes it easier to locate a particular record and refile it properly without unduly disturbing the adjacent records.

251. Nonetheless, even those precautions are time limited because of the innate fragility of paper, hence the need to digitize paper civil registration records as swiftly as possible. Once digitized, the original paper records can be transferred to the national archives. The registration law should address, among other matters, the need to back up and preserve civil registration records, as well as recognition of digitized and scanned copies in lieu of original records. The option of transferring the paper copies to the national archives after a certain period, once a population register has been established, should be carefully considered in places where climate conditions render paper particularly subject to deterioration or where there is lack of storage space. The genealogical information that they contain is highly valuable and must be preserved for continued future use.

252. Paper records with vital events data from the past may be a valuable source for future statistics and research and should not be destroyed. Those historical records become more accessible if they are scanned, which also stops the physical deterioration of records on paper and microfilm. To make old records more accessible for computer use, they must be converted to a computer-readable format, using optical character recognition (OCR) software. Such software generally transcribes printed paper records well, but handwritten paper records often cannot fully be converted with the use of available software. Thus, some of those data may have to be input manually into the computer. Recent methodological developments will reduce transcription costs significantly, and OCR software is usually able to recognize handwritten dates. Moreover, since the family name is often the same for all family members in a household, which also reduces the amount of manual work and costs. There are many cases in which old records have been computerized, relating both to vital events and population censuses. See box 13 for a description of preserving historical records in Albania and Norway.⁶⁴

⁶⁴ Vibeke Oestreich Nielsen and others, *Status Analysis on Civil Registration and Vital Statistics (CRVS)*. Documents 2014/41 (Oslo-Kongsvinger, 2014). Available at www.ssb.no/en/befolkning/artikler-og-publikasjoner/status-analysis-on-civil-registration-and-vital-statistics-crvs.

Box 13**Importance of storing and preserving old records**

Work by Statistics Norway furnishes two interesting examples of storing and preserving historical records.

First, in Albania, after the country's new civil register was established in 2011, Statistics Norway helped to scan the old handwritten books so that the historical records of every person, including the deceased, would be available. That proved to be very useful for, among other purposes, the determination of property rights.

Second, in Norway, the Historical Population Register plans to transcribe and link all data recorded on individuals in censuses, parish registers and other sources, from the country's first nominal census in 1801 until the present day, including linking historical data with the contemporary population register that was established in 1964. The Register aims to include as many of the 9.7 million people as possible who were born in or immigrated to Norway between 1735 and 1964. In principle, the project consists of three parts: first, the scanning of original documents; second, the transcription of data, i.e., digitizing data to make them machine readable; and third, the linking of records using the name, the date and place of birth and other available information as matching criteria. The Historical Population Register is an important source for statistics and research. The linking of data from different sources makes it possible to establish links between family members and other relatives. That is essential for research in areas such as hereditary diseases, as the register includes information about parents, grandparents and other relatives.

(b) Microfilmed records

253. In previous decades, microfilming techniques were widespread tools of choice for archiving and safekeeping a variety of documents, including civil registration records. Consequently, a number of civil registration systems hold countless rolls of microfilms containing records of births, deaths, marriages and divorces. Retrieving the information from a microfilm is a straightforward process, requiring fairly basic apparatus and a meticulous indexing system. However, processing microfilmed records for statistical purposes or amendments is practically impossible; those records need to be digitized.

254. The digital conversion of microfilms (including microfiche or flat sheets) requires the use of an optical scanner that captures the film in raw digital format. OCR software is also needed to ensure that the digital record contains exactly the same information as the microfilm. While the equipment and the process are becoming less and less expensive as technology advances, each scanned record still needs to be carefully checked against the original record on the microfilm to ensure that the two are identical.

(c) Computerized records

255. In the case of digital civil registration records, the procedures for storing and preserving records are based on general current practices for maintenance and backup. A common approach is to have two servers simultaneously online and mirroring each other so that both record each interaction and each input of new records. Another common practice is to have daily backups from the main server maintaining the database and population register, thus ensuring the preservation of records. The mirror or backup servers are often located in a different geographical area, even a dif-

ferent country, as a risk mitigation strategy. If that method is adopted, data protection measures for the mirror server must be taken, in particular if the service is outsourced to a private company.

256. As mentioned above, in a number of cases, at least two systems would need to be in operation at the same time. One consists of the modern approach of automated, digitized entry and storage of records using computer networks; the other would be storage of records in the old format, either on paper or on microfilm or both, that would need to be digitized and incorporated in the database. However, automation may not be an option available in all areas of the country, because they are too remote or lack the necessary infrastructure. In those cases, the use of portable electronic devices to record the occurrence of vital events and to issue certificates would be needed. The records would then need to be uploaded in bulk into the main database. In addition, diplomatic and consular missions abroad would transmit files recording the occurrence of vital events of nationals of their country, hence the need to design appropriate protocols for inputting and storing all the entries in a consistent and routine manner.

3. Internal review mechanisms for system functions

257. The present subsection outlines certain internal review mechanisms that should be put in place to maintain the uninterrupted functioning of systems and to detect aberrations. The mechanisms need to be in place in all parts of the system: notification, registration, certification and statistics. Internal review mechanisms at both management and staff levels will be examined: first, looking at those needed in notification and registration, second, in certification and, lastly, in the vital statistics component.

(a) Notification

258. It should not be assumed that information about the occurrence of vital events and their characteristics will automatically reach the registration offices. Nor can it be assumed that the information that does reach the registration office is thorough, complete or accurate. Accordingly, the registration agency must actively engage notifiers and informants—primarily health personnel, court personnel and marriage officers—in the process.

259. Notification protocols need to be clearly spelled out in the rules and regulations for each type of notifier, and regular training on the subject should be provided to both registration staff and notifiers. Other information material, such as instruction manuals, leaflets or targeted multimedia resources, can be prepared for that purpose. That will ensure that health and court personnel and marriage officers are aware of what is expected from them in terms of vital event notification, who their counterparts are at the registration agency and where they can find help, if needed.

260. Moreover, checks and balances need to be in place to ensure that the notification protocols are being followed. Reports on the quantity and quality of information relayed by notifiers are helpful tools for identifying training needs and improvement areas.

(b) Registration management

261. Identifying patterns and anticipating workload are among the major responsibilities of registration managers. Consequently, managers need to gather and analyse information regarding the monthly frequency runs from the civil registration register, with a view to assessing the completeness and accuracy of the registration process. The number of each kind of event that should be reported during a particular month can be anticipated on the basis of previous history and population levels. Similarly, a set

of variable ranges can be developed, such as age of mother, birth weight, number of deaths by cause; and, when the frequency is outside the range or when a specific variable, such as the mother's age, is outside the expected range, a query should be initiated. The monthly frequency checks can also be used by management to monitor the number of missing or unknown values. A higher than anticipated number of missing or unknown values could signal a failure in the reporting system, which would then require immediate attention.

262. It is also important that the patterns (in term of frequency and type) of edits made to records during the data entry process are carefully monitored by the production of periodic reports. Editing applications are being developed for use when information is entered in electronic forms that then become registration records in the civil registration register. For example, if the person entering the data erroneously enters "male" for the sex of the mother, or provides a birth date for the mother that is not plausible (e.g., that the mother is aged 10 or younger), the embedded editing application will interrupt the data entry and signal the need for correction. The report of each such intervention serves as a valuable source of guidance to management, enabling improved data entry training, or shedding light on the cause of data entry errors.

263. A long list of other operational management statistics should be generated on a regular basis. For example, the timeliness of data reporting from field offices or suppliers should be tracked to learn whether the prescribed time limits for completing cause-of-death certification are being met; whether local registrars are reporting events to the central office in a timely manner; whether hospitals are forwarding birth data to the registrar in a timely manner; or what the average workload of a registrar's office is. In that context and for additional information, see chapter II, subsection C.3 on monitoring. Those and other operational management statistics should be analysed and sent back to the respective local registrar offices with a view to ensuring quality improvement.

264. In areas outside the civil registration component, managers have to use other sources of information to assess how well the system is functioning. A commonly used approach in that regard is to compare the number of births and deaths with the population estimates and projections produced by demographers in the national statistical office or similar entity. Preparation of those estimates and projections is a routine exercise, usually based on population censuses and sample surveys, and they are particularly useful for assessing the coverage of civil registration at subnational levels. The estimates of the number of births and deaths are compared with the number of events registered and the discrepancies indicate where remedial action is needed.⁶⁵

⁶⁵ Chapter IV deals with methods of assessing both the completeness of the coverage of the civil registration system and the quality of the information that it collects. Reference to those methods is made here to highlight the need to plan and administer them as a regular and routine part of the operation of the civil registration system.

(c) Registration staff

265. As highlighted throughout this *Handbook*, the vital record is a dynamic document, even if in digital format, that is often amended or corrected throughout the lifetime of an individual, and even after death. Many of the correction procedures are carried out when the record is at the registration processing stage. It is therefore necessary to develop a set of applications that can be used to check that required changes to the record have in fact been made. The procedure for changing a record should have two components: in addition to entering the required change in the system, a log should be generated to indicate that the change has been made. That is of particular importance in registration, where the majority of changes are processed in batch mode. When the change is made in an online system, it is usually displayed immediately, the resulting visual check serves as the monitoring system. It is still necessary,

however, to keep a regular log listing all the changes and the records affected, for the purpose of understanding the frequency with which records are amended and the reasons for such amendments.

266. There are two key points in the registration process when a reminder flag should be inserted in the record. The first relates to the query process: it is often necessary to send a query to a physician regarding the information listed on the death record. Triggers for sending a query to the certifying physician include illegible entries for cause of death; the use of non-standard abbreviations for cause of death; failure to indicate the age or sex of the decedent; circumstances of an injury (if an injury was reported); reasons for surgery (if a surgery was reported); and condition for which a drug was taken (if drugs are mentioned). The query process should include a reminder flag that will alert the nosologists if no response has been received from the physician within a reasonable period of time. Without such a reminder, in the daily process of coding records, the nosologist may omit to follow up on the query in question.

267. The second situation in which a reminder flag should be inserted is similar and arises with records that arrive in the office with cause of death marked as “pending” or “pending autopsy results”. A final record with a complete cause of death should be filed within a specified and reasonable period of time (e.g., one month). If no such record is filed, the reminder flag should alert the registration staff to request an updated record so that processing may continue.

(d) Certification management

268. Where certification is concerned, managers have the responsibility of ensuring efficient customer service to the public. To do so requires having in place internal system-review mechanisms that yield both workflow data and revenue data. Monthly workflow data should be generated by management in each service area. Those data should indicate how many adoptions, corrections and paternities were processed; how many certified copies were processed by mail; how many were done over the counter and how many online; and the turnaround time for each of those services—in other words, how many workdays it took to service each type of customer request. That information is necessary for management decisions concerning where best to use the office’s human resources and how to improve efficiency and service delivery. It alerts management as to whether a seasonal overload of business requires the recruitment of temporary help in a particular area of the operation.

269. Management also needs monthly reports on the amount of revenue generated. That information is particularly important for comparing revenue generated in the current year with that generated over the same time period in previous years, in order to make decisions about required changes in the workforce and in fees for the various services provided.

(e) Certification staff

270. Certification staff are responsible for a number of areas in which internal review is important. The increased use of fraud- and counterfeit-resistant paper to issue certified copies of civil registration records has also increased the need to protect blank certificate forms from theft. That is usually achieved by the development of applications to match the preprinted control number on each form with the civil registration record for which the copy is issued, and to store the information regarding the issuance of the copy in the database, together with the control number of the paper certificate. In addition, the system should generate a daily log that records the starting and ending control numbers for each day, which should be checked against the number of copies

issued and the cash register sales information system. Allowance is made for copies that have been ruined or voided for other reasons. The control system should also include a record of all paper stored in the office; and the paper should be stored in a secure area at all times. Should a theft occur, thanks to the internal control system, the authorities can be alerted to the exact numbers on the stolen papers, and possibly prevent their misuse.

271. Another quality assurance mechanism in this component involves matching, on a daily basis, the number and type of certificates issued with the cashier's receipts of administrative fees (for services that carry a fee). That matching procedure should be incorporated as a daily exercise carried out by each registrar's office to ensure that all the fees have been properly collected and processed. In the event that a registration office is operating without computer support, or with only rudimentary support, the matching would be more cumbersome and time-consuming, but it is still essential to prevent possible fraudulent acts by staff.

(f) Statistics staff

272. Staff in the statistics component of the system are responsible for instituting a number of internal quality-control mechanisms primarily related to the generation of vital statistics. That requires checking individual records for errors, then aggregating them into tallies at different levels of aggregation. If there is a very large volume of data, the procedures should be carried out on a sample of records. The essential difference between the work of registration staff and statistics staff is that registration staff focus on individual civil registration records and, for that reason, follow a case-study approach, while statistics staff use a quantitative approach because statistics is about aggregates and comparing records. Potential errors can be spotted using aggregated data by means of scatter plots, cross-tabulations, box plots and distribution graphs. The careful use of descriptive and diagnostic statistics enables identification of outliers and suspicious values. Statistics work also involves comparing the content of records for similarities across different areas of the country: for example, tabulating the number of live births by age of the mother and the district where the mother resides may result in the identification of a certain district as one where mothers are considerably younger than in others. That may be due to the population structure of that particular district, where there is a larger proportion of younger people. It may also be the consequence of errors in compiling the information at the stage when the original civil registration record was compiled, or the result of a glitch in the computer application used for data entry or for data editing.

273. Since statistics staff have extensive experience in processing individual statistical records originating from a population census or a survey, including complex editing procedures to which each record is subjected in order to ensure internal consistency, it is necessary to solicit their input during data entry and data editing in the civil registration component. The involvement of statistics staff is particularly important since much of the information about the event and persons involved that needs to be collected and entered involves statistical variables, such as age, sex, marital status, educational attainment, economic activity and so forth.⁶⁶ Statisticians have already developed a checking system that alerts them when, for example, an 18-year-old is registered as holding an advanced university degree. The system should be used in developing data entry edits for civil registration records, so that flags indicate the need to go back to the source and identify which of the two pieces of information (age or educational attainment) needs to be corrected.

⁶⁶ For the complete list of variables, see *Principles and Recommendations*, para. 60.

4. Maintenance of field operations (local registrar)

274. Generally speaking, “quality assurance” refers to all the measures undertaken in the process of delivering results aimed at minimizing errors and optimizing the quality of the final product. In the case of civil registration at the local level, in addition to the internal monitoring and review mechanisms that must be in place to maintain the civil registration and vital statistics systems, in general, quality assurance is also necessary for the development of a number of elements relating to those operations at the local level. Those elements include standard operating procedures (SOPs), handbooks, registration forms, training, guidelines, seminars, newsletters and site visits. The present subsection looks at those elements and considers how they can be used to assure the quality of records at the local registrar level.

(a) Handbooks

275. The availability of handbooks for local registrars help to ensure consistency throughout the system as they contribute to consistency between operations in the central office and the local offices, and among local registration areas. The handbook for local registrars should be considered a dynamic document, and managers should give it close attention. When it is being prepared, it should be understood that the handbook will be changed and updated on a frequent basis. For that reason, it is recommended that hard copies of the handbook be constructed in loose-leaf format, rather than bound, as that would make it possible to replace individual pages when updates are needed, and new pages can be added when additional sections become necessary. While, electronic formats and online versions of the handbook (soft copies, wiki-style guides, other online resources and interactive software, among other options) are the vehicle of choice, printed copied may still be needed for local registrar’s offices that have limited access to the Internet.

276. The handbook provides guidance on the various steps of the registration process, including recording, reporting and certification; preservation and safekeeping of civil registration records; and security measures. It should also include the text of laws governing the operation of civil registration and vital statistics systems, along with any specific rules and regulations on the matter. Furthermore, the handbook should include the text of any policies that have been devised to interpret or clarify the laws and regulations. For example, the law might specify that copies of civil registration records can be issued “to citizens demonstrating a tangible interest in the record”. A subsequent regulation might define those having a tangible interest as “the registrant, certain members of the registrant’s immediate family or the legal representative of one of the aforementioned”. A policy should be developed to define immediate family as being “parents, grandparents, siblings, legal guardians and children”, in accordance with the country’s family law and other relevant pieces of legislation. It is important that each local registrar have copies of the law, the regulation and the policy to be able to process certified copies to be issued in a manner that is consistent with the central office and other relevant offices in the country.

277. It is important that the handbook include the latest version of all the forms needed to maintain the efficient operation of the system. Those should include not only the official documents to be completed, but also any worksheets that may be helpful in completing the official forms, administrative forms for communication between the local registrar and the central office (e.g., supply orders, order sheets for blank documents, report sheets, log sheets and others). Each official form should also be accompanied by step-by-step instructions for their completion. For example, if a form has a field for date of birth, there should be specific instructions indicating whether or

not the month can be abbreviated; if only numbers should be used; the order to be used for the date (e.g., month/day/year or day/month/year).

278. When appropriate, the instructions for collecting information for a topic should indicate why the information is required. For example, if the mother's age is required, the instructions might indicate that this is a variable to be used in compiling statistics for studies on ages that may prove to be risk factors for a successful birth. Explanations of this kind are important guidance for registrars and can prove very valuable especially if an informant should object to providing a certain information. The explanation should also indicate how the data will be used. That would be important information to include, if it is available. All rules, regulations and explanations should be embedded in the software that is used for the registration process and in the daily registration procedures.

279. Communication is the underlying theme of all handbooks. A good handbook should include a list of the individuals who can be contacted when problems arise: not only staff at the central office who can respond to questions in particular areas of expertise, but also registrars, funeral directors, coroners and health professionals who might have to be contacted to enable the accurate completion of a specific form. Management should assign someone in the central office the responsibility to ensure that changes, corrections and updates are sent to individuals who use the handbook. That means that an up-to-date list of every individual who has a handbook must be maintained, so that updates can be forwarded to everyone in the registration network. That can be done effectively with the use of email circulars and through a dedicated e-discussion forum among registrars or an intranet bulletin board.

(b) Mini-guides

280. Subject-specific mini-guides may be useful when an entire handbook is neither needed nor efficient. For example, many doctors only occasionally fill out death registration forms, therefore a ready guide to do that would be very useful as few doctors would want to take time to go through a full-size handbook for that purpose. A useful approach would be to prepare a two-sided laminated instruction sheet specific to completing the death registration form, including cause of death.⁶⁷ The sheets can be distributed to hospitals, individual physicians, funeral directors or wherever they are likely to be needed. Feedback from users of such sheets has been positive and appreciative. Other mini-guides may include instructions for coroners on how to complete the manner of death field (e.g., natural, suicide, homicide, accident and so forth); for marriage officiants on how to complete the marriage records; or for court clerks on how to insert a divorce decree in the civil registration system.

281. Registration forms are used by local registrars and informants on a daily basis. Thus, they are, in and of themselves, educational tools and can constitute mini-guides. Registration forms should be clear and self-explanatory, and contain precise instructions, as needed, on how to complete them. Forms should be simple, user-friendly, and easy to read and follow. It is strongly recommended that registration forms be developed taking into account certain population groups, such as persons with disabilities and indigenous persons.

(c) Newsletters (electronic and paper)

282. Newsletters are another useful communication tool that could help to ensure the quality of the registration process in local offices. While new or revised laws, regulations, policies and protocols must be included in the handbooks, information about those new directives can be conveyed to local registrars and other stakeholders quickly

⁶⁷ See WHO, "Cause of Death on the Death Certificate Death Certificate – in line with ICD-10: Quick reference guide" (Geneva, 2010). Available at http://apps.who.int/classifications/apps/icd/icd10training/ICD-10%20Death%20Certificate/html/ICD-10_Resources/causeofdeathflyer.pdf.

and with accompanying explanations by means of a quarterly newsletter. Newsletters can also serve to notify that amendments to the handbook are in the pipeline. They are an excellent vehicle for keeping everyone in the system up to date on the latest staffing changes in both the central and local offices.

283. Newsletters provides a useful means of disseminating timeliness reports, which would probably be most effective if positive participation in their production is encouraged. For example, a newsletter might list the 10 hospitals or local registration areas that have produced records within the shortest time frame. That might encourage competition among providers eager to rank among the top scorers, and would not undermine team spirit by pointing to any underperforming area or institution. One feature that has proved popular and useful in newsletters is tips on how to do some aspect of work, based on good practices of local registrars; and it is always a good idea to include a question-and-answer section in each newsletter. A good example of a newsletter is that of the Registrar-General of New Zealand to funeral directors.⁶⁸ It contains sections on preparing for and managing bereavement, new requirements for paper death registration, the birth-to-death matching process, the fees review, an update the SmartStart project.⁶⁹

⁶⁸ See March 2017 issue, available at <http://createsend.com/t/j-20AF7E74C477B50F>.

284. Although the features described above are particularly relevant to a newsletter produced by the registration component, some of them are also relevant to a newsletter prepared by the statistics component. A statistics newsletter would tend to focus on how data are collected and used. By so doing, it may encourage more careful and complete reporting of data by professionals in the field. A vital statistics newsletter would also include reports of studies and publications using collected data. A section on quality assurance is also a popular feature of vital statistics newsletters.

⁶⁹ For more information on the SmartStart project, see chap. II, box 8.

(d) Training

285. The importance of continuous and comprehensive training as a means of ensuring the quality of civil registration and vital statistics processes cannot be overemphasized. The development of training curricula must be a routine responsibility of the central office. Training programmes should be tailored to specific audiences and refresher courses should be incorporated into the routine work programmes of civil registration offices countrywide.

286. The training plan should distinguish between internal training—which is oriented towards civil registrars, vital statisticians and other technical and administrative personnel—, and external training—which is oriented towards policymakers, local officials, medical and health personnel and others concerned with and responsible for the quality and uses of civil registration and vital statistics. Internal training should emphasize techniques, methods, skills, processes and the filling of forms, and address matters such as professional roles and functions. External training should be designed to inform groups about the needs and functions of civil registration and vital statistics systems, and seek to develop improved understanding and cooperation. External training is a crucial improvement mechanism and should not be neglected and it helps to ensure the cooperation and support of users of the systems. In the case of medical and health personnel, for example, who provide data to the system, the quality of the information provided is contingent on their understanding the importance of accurate data and the uses to which they will be put. For those reasons, both internal and external training programmes should be an integral part of the civil registration and vital statistics systems. The responsibility for training programmes, which should be carried out on a regular rather than an ad hoc basis, must be shared between both systems.⁷⁰

⁷⁰ *Principles and Recommendations*, para. 632.

287. Thus, training should not be limited to civil registrars and statisticians. Specific courses should be designed for medical personnel, who fill out certain forms, for staff members who function as informers and file the information regarding an event and the persons involved, and for physicians who certify the cause of death.

288. The establishment of a nationwide professional association of civil registrars and vital statisticians for the purpose of promoting the exchange of views on the administration of registration laws, devising strategies for improving registration, among other goals is an important means of enhancing the quality of the work of registrars, statisticians, health workers and researchers. This approach is advantageous for both centralized and decentralized civil registration systems, but is especially useful in countries where the administration of civil registration is decentralized. A single professional association has the particular advantage of bringing together all the personnel engaged in the registration and analysis of a country's vital events, either physically or through written communication, and therefore promotes uniformity, good registration practices, problem-solving and professionalism.⁷¹

⁷¹ *Ibid.*, para. 337.

289. Annual meetings of the national professional association are strongly recommended, as they will provide opportunities for the free exchange of ideas and experiences that can be very beneficial to the civil registration and vital statistics system. The meetings can take the form of academic conferences, with the voluntary submission of papers, presentations of case studies, innovative solutions, lessons, posters and other activities.

Chapter IV

Evaluation of the quality of civil registration and vital statistics systems

A. Introduction

290. Over two thirds of the world's countries do not have valid and reliable vital statistics derived from civil registration records—the optimal source for such data. Given the critical need for such data need, a drive has been launched at the international level to strengthen civil registration and vital statistics systems, in particular in developing countries. The importance of generating complete, accurate and timely vital statistics from the civil registration system cannot be overemphasized, as such statistics are of key importance in assessing population characteristics for planning and policy purposes and for evaluating various programmes. As system strengthening initiatives take shape, there will be an increasing need for robust methodologies to measure and monitor progress in data-quality improvements in vital statistics at the national and subnational levels.

291. The present chapter sets out a broad framework for evaluating the quality of civil registration and vital statistics, and provides a practical guide to the implementation of various methods and techniques for that purpose.

B. Considerations on quality of civil registration and vital statistics systems

292. In considering the evaluation of the quality of civil registration and vital statistics systems, particular attention will be given to two aspects of the systems: first, the quality assurance mechanisms inherent in the legal, administrative and technical elements that operationalize the civil registration and vital statistics systems; and, second, the actual data in terms of coverage, the completeness of registration and errors in data content.

293. Because data quality ultimately depends on the structure and operational status of the systems, the evaluation of the first aspect (quality assurance mechanisms) will help to identify system-wide factors that affect the quality of both civil registration services and records, and vital statistics. Taken together, the evaluation of both aspects (quality assurance mechanisms and actual data) will assist in guiding the design of strengthening interventions and identifying data biases that could prompt adjustment of statistics with the aim of deriving empirical estimates of specific vital rates and indicators.

1. Importance of quality evaluation

294. Civil registration is the optimal source of information on identity, civil status and routine and reliable vital statistics that can be used to inform human development policies and monitor progress towards the achievement of periodic targets and goals. Presently, the vital statistics, including rates and indicators, for many developing countries are largely comprising modelled estimates, rather than empirically

derived measures from civil registration systems. That shortcoming is attributable to poorly functioning civil registration and vital statistics processes and systems in those countries. Strengthening initiatives are being taken accordingly to improve the quality of those civil registration and vital statistics systems, to enable them to serve as reliable sources of accurate individual registration records and robust vital statistics.

295. The evaluation of data quality is a critical primary step to be taken before analysing and using data. The evaluation of the quality of civil registration and vital statistics is necessary to serve as a basis for planning and measuring the impact of strengthening initiatives. A standard framework of parameters and indicators is necessary to evaluate and compare quality over time and across populations.

296. Findings from data-quality evaluation are useful from two perspectives:

- (a) To identify and quantify data biases that can be corrected or adjusted to derive more reliable estimates of demographic indicators;
- (b) To identify system-wide issues that result in data biases, which could prompt interventions to prevent weaknesses in data quality.

Data-quality evaluation is a constant requirement, even in countries with good-quality vital statistics.

2. Confidentiality and privacy in the context of quality evaluation

297. Data-quality evaluation should preferably be conducted with a degree of independence on the part of the evaluation team. That will help to ensure an objective assessment of system operations and data produced, free of the influence of any stakeholders whose performance may be evaluated or inferred.

298. Quality evaluation exercises produce statistical indicators of performance and data quality. In turn, the interpretation of statistical indicators should factor in systemic issues, which should be discussed broadly in terms of processes and designations, rather than by naming specific institutions or staff members, so as to protect confidentiality and privacy and to maintain trust among stakeholders. In summary, the findings from evaluation exercises should be discussed and used in a constructive manner, and should be stated in conjunction with clear and feasible recommendations for quality improvement.

C. Quality framework of the civil registration and vital statistics systems

299. The evaluation of the quality of civil registration and vital statistics is important as a basis for planning and measuring the impact of initiatives to strengthen the systems. A standard framework of parameters and indicators is necessary to evaluate and compare civil registration and vital statistics quality over time and across populations. A civil registration and vital statistics quality framework would involve the following:

- (a) Quality-assurance evaluation to review the structural design, business processes, infrastructure, management and operations of the systems for vital event registration, issuance of legal documents and compilation of vital statistics;
- (b) Data-quality assessment of several elements, including completeness, accuracy, ability to generalize results, relevance, comparability, timeliness, and availability and accessibility of vital statistics and data.⁷²

⁷² Prasanta Mahapatra and others. "Civil registration systems and vital statistics: successes and missed opportunities" *The Lancet*, vol. 370, No. 9599, pp. 1653–1663 (2007); Chalapati Rao and others, "Evaluating national cause-of-death statistics: principles and application to the case of China", *Bulletin of the World Health Organization*, vol. 83, No. 8, pp. 618–625 (August 2005); and David Phillips and others, "A composite metric for assessing data on mortality and causes of death: the vital statistics performance index", *Population Health Metrics*, vol. 12, No. 14 (2014).

300. The processes and procedures that should be implemented in applying this framework comprise a combination of quantitative and analytical (objective) methods and qualitative and observational (subjective) assessments that would provide contextual evidence of data quality, together with empirical evidence on the basis of which interventions can be mounted to improve data quality.

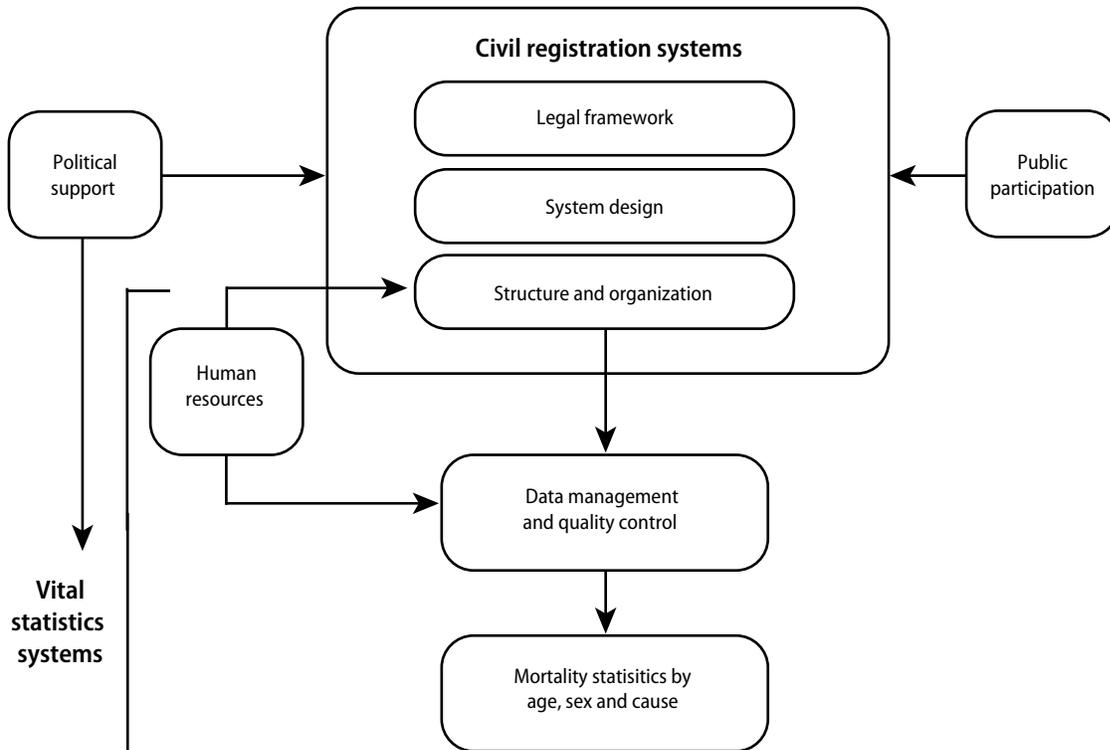
1. Civil registration and vital statistics quality assurance

301. As recommended in *Principles and Recommendations*, the civil registration and vital statistics system should be operated by governments in accordance with a nationally mandated legal, administrative and technical framework. The various elements of the civil registration and vital statistics framework in each country should conform to international operating standards. The framework should also meet local specifications with regard to structure and organization to ensure the efficient operation of the system. Both those aspects—conformity to international standards and compliance with local requirements—comprise the quality assurance benchmarks of the civil registration and vital statistics system, designed to ensure that the objectives and outputs of the system are fit for purpose. Hence, a detailed evaluation of quality assurance mechanisms is required to identify potential limitations arising from either aspect. Those limitations could then be addressed through appropriate interventions to ensure the quality of services and outputs from the civil registration and vital statistics system.

302. The civil registration component of the system encompasses the legal and administrative framework that organizes the registration of individual vital events, while the vital statistics component comprises activities involved in the compilation and management of data on registered events to generate vital statistics. There is some degree of overlap between the two broad components. For instance, the legal framework includes rules for the registration of an individual vital event, together with instructions for the compilation of data. Often, institutions and personnel responsible for registering vital events have additional roles in the processing and management of registration data and vital statistics. The quality assurance of the civil registration and vital statistics system therefore concerns the appropriateness of the system design, the availability of adequate resources, and the reliability of the maintenance processes to ensure system performance. In other words, quality assurance seeks to ensure the complete and accurate registration of vital events and the efficiency in the processing, compilation and analysis of vital statistics. Figure 8 provides a conceptual overview of the quality assurance elements of the civil registration and vital statistics system in Viet Nam.

303. Quality assurance in civil registration and vital statistics is assessed through a review of the processes in relation to international standards and an evaluation of the institutional and human capacities for assuring data quality, using a standard framework. The review is carried out by mapping the business processes of the civil registration and vital statistics system, identifying the responsibilities and roles of key institutions and personnel involved, and establishing the sequence of events—from occurrence of the vital event to issuance of the relevant documents—, together with the inclusion of data in relevant vital statistical outputs. Where relevant, the legal framework and administrative structure need to be reviewed to assess the potential for any data-quality issues, relating, for example, to protocols for registration by place of occurrence or by place of usual residence, expatriate populations, offshore registration and the registration of vital events in disaster situations.

Figure 8
Conceptual overview of quality assurance elements of the civil registration and vital statistics system in Viet Nam



Source: Chalapati Rao and others, "Compiling mortality statistics from civil registration systems in Viet Nam: the long road ahead", *Bulletin of the World Health Organization*, vol. 88, No. 1 (2010), pp. 58–65.

304. It is recommended that consideration be given to the following dimensions in the evaluation of quality assurance systems and processes within the civil registration and vital statistics system:⁷³

⁷³ See *Principles and Recommendations*, paras. 577 and 578.

- Overall assurance evaluation
- Civil registration structural design
- Business processes
- Infrastructure
- Management and operations
- Internal audits.

Each dimension is discussed in detail in the following subsections.

(a) Overall assurance

305. The quality-assurance evaluation should verify the presence of an interdepartmental coordination committee that involves all major stakeholders and verify the nomination of the Chair of the committee (which could rotate among the different agencies). The committee should have a specific charter of duties, with certain roles and responsibilities for different institutions: for example, the Ministry of Health could be assigned responsibility for coding and analysing causes of death; and there should be a specified timeline and regular schedule for committee meetings. Lastly,

the committee should require the preparation of annual overall reports on the performance of civil registration and vital statistics at the local and national levels.

306. An evaluation of political support and community participation in the quality of civil registration and vital statistics is also needed. The evaluation should verify the presence of activities to improve public awareness and participation in civil registration. Regular announcements on local radio and television about the need to participate in civil registration and the benefits of such participation are among the recommended actions.⁷⁴ Public participation could also be strengthened through the involvement of local community leaders, who could guide families in the procedures to be followed to complete the notification and registration processes.

⁷⁴ For more information, see *Handbook on Civil Registration, Vital Statistics and Identity Management Systems: Communication for Development* (United Nations, 2022).

307. Overall quality evaluation of the civil registration and vital statistics system, including, where possible, the quality assurance and the data-quality assessment components, should be undertaken on a periodic basis. That is particularly important in countries that are strengthening their systems through reforms and interventions to enhance overall performance. There are several approaches to conducting overall evaluations: a common approach is self-appraisal and reporting on various system aspects, using detailed questionnaires that are routinely sent to national civil registration authorities and statistical offices by the United Nations Statistics Division. Information and data from the completed questionnaires are compiled in detailed reviews that analyse and compare the structure and performance of the responding national systems.⁷⁵

⁷⁵ See *Handbook of Vital Statistics Systems and Methods, vol. II: Review of national practices*, (United Nations publication, Sales No. E.84.XVII.11). Available at https://unstats.un.org/unsd/publication/SeriesF/SeriesF_35v2E.pdf. See also <https://unstats.un.org/unsd/demographic-social/crvs/index.cshhtml#report> for technical reports on the status of civil registration and vital statistics in various regions of the world, published by the Statistics Division.

308. Another approach to the overall evaluation of civil registration and vital statistics is to undertake a series of national-level stakeholder consultations facilitated by technical experts.⁷⁶ For that purpose, WHO in collaboration with the University of Queensland, Australia, developed a standard questionnaire—described as a “rapid assessment tool”—⁷⁷ to rapidly evaluate the strengths and weaknesses of an existing system. See box 14 for more information on the rapid assessment tool. The stakeholders include representatives of the officially designated national organization legally mandated to operate the civil registration system, together with representatives from the health sector, statistical office, local administration, civil society and other national and international agencies with a role or interest in civil registration and vital statistics. The approach relies on self-reported information from public officials and the results serve as a potential basis for national strategic civil registration and vital statistics development plans. Findings from the exercises, known as rapid and comprehensive assessments (see box 14) can provide direct evidence on the administrative and technical constraints affecting system performance, and enhance awareness among national stakeholders about various aspects of civil registration and vital statistics operations.

⁷⁶ WHO, *Improving the quality and use of birth, death and cause-of-death information: Guidance for a standards-based review of country practices* (Geneva, 2010).

⁷⁷ WHO, “Rapid assessment of national civil registration and vital statistics systems” (WHO/IER/his/STM/2010.1).

309. An overall evaluation should provide specific and practical recommendations in line with the civil registration and vital statistics evaluation framework and international standards to strengthen administrative and technical aspects of the system. The evaluation should also consider social influences on the system’s performance, such as local and national political support and community participation.

310. In principle, a detailed overall civil registration and vital statistics evaluation is necessary when there is a clear national demand for a reliable and efficient system. That will ensure appropriate national commitment to the exercise and to the follow-up on the findings and recommendations. The evaluation will involve country-level exercises, including document review, consultations, field inspection visits and empirical local data-quality evaluation and vital statistics analysis. The evaluation methodology and the manner in which the findings are organized should generally follow the

Box 14

WHO: Rapid assessment tool

The rapid assessment tool was developed to accompany the comprehensive guide (published previously), and countries are advised to apply it before undertaking a full review of their systems. It is available both as text and as a spreadsheet, for ease of compilation of data. Both text and spreadsheet have been extensively peer-reviewed by technical experts.

The rapid assessment tool consists of 25 questions on how the civil registration and vital statistics systems function. The questions are grouped into 11 areas:

- Legal framework for civil registration and vital statistics
- Registration infrastructure and resources
- Organization and functioning of the vital statistics system
- Completeness of birth and death registration
- Data storage and transmission
- Practices compliant with the International Statistical Classification of Diseases and Related Health Problems (ICD) and certification within and outside hospitals
- Practices affecting the quality of cause-of-death data
- ICD coding practices
- Coder qualification and training, and quality of coding
- Data quality and plausibility checks
- Data access, dissemination and use

Each question allows the selection of one out of four scenarios describing a typical range of hypothetical situations. A numerical value (from 3 to 0) is assigned to each scenario, resulting in a total score. The score has no scientific value and should be taken only as a rough indication of the functionality and quality of the civil registration and vital statistics systems. Some countries may find the score useful in helping to decide whether there is need to carry out a comprehensive review. The rapid assessment tool provides a quick overview of how well or poorly a country's overall system is functioning.

Rather than the scores themselves, it is the process used to arrive at the scores that is important. The rapid assessment tool is not a questionnaire that one person/entity should use in an attempt to find suitable replies; rather, it is a group exercise to be undertaken by a group of individuals knowledgeable in civil registration and vital statistics in a country. The questions are designed to prompt a discussion among senior staff responsible for various aspects of civil registration and vital statistics systems.

framework presented in this chapter. The proposed reforms should address the administrative, technical and social constraints affecting the performance of the civil registration and vital statistics system. The recommendations should be tested through formative research interventions in small-scale pilot studies and subsequently built into a national-level research-based upscaling programme, with built-in monitoring and evaluation of the impact on both registration and vital statistics outcomes.

311. Once work has started on developing the civil registration and vital statistics system or on its strengthening programme, the overall evaluation could be undertaken after a suitable interval (e.g., three or four years) to enable the implementation of reforms and data-quality development activities across the country. Where applicable, appropriate monitoring and evaluation functions could be built into the routine field programme and internal audit activities of the system. As the system operations become standardized and system performance improves, the need for such overall assessments would be minimized and potentially restricted to instances in which there are major legal reforms, changes to administrative structures or revisions to key data standards.

(b) Civil registration structural design

312. The evaluation should cover the design of the civil registration system, which comprises several elements (see chap. I): the structural design of the model, the identity of institutions and their roles in the civil registration and vital statistics system, and the legal framework that mandates their operations.

313. At the outset, it is necessary to clearly define and study the structural design of the system in place in the country, according to the type of model—whether centralized or decentralized (see chap. I, sects. B and C)—and the specific variations of each model. The characteristics, advantages and limitations of each type of model and their variations should be clearly understood by the team conducting the civil registration and vital statistics quality-assurance evaluation exercise.

314. The structural design must be properly understood before further analysis of its elements, so that the potential strengths and weaknesses of the system can be fully evaluated. For decentralized models, it is essential to analyse the civil registration and vital statistics quality structural design, even at the subnational level, to understand the influence of the structural design on the efficiency and quality of the civil registration and vital statistics system. Based on that analysis, quality assurance mechanisms could be developed through system strengthening interventions which should address specific limitations in the structural design.

315. In evaluating the structural design, it is also essential to identify the key government agencies or institutions responsible for or involved in specific civil registration and vital statistics activities. Civil registration records serve multiple purposes, including individual-level identity management for national security and the delivery of various government services. In turn, vital statistics constitute an essential basis for population administration, planning and health policy. As a result, civil registration and vital statistics systems involve a range of government ministries or departments and personnel as stakeholders in the notification of vital events, the provision of registration services, and the processing, compilation and use of information from registration records and vital statistics. It is necessary therefore to clearly identify the institutions and their roles and responsibilities within the structural design of the civil registration and vital statistics system.

316. The analysis of institutions can provide important insights into potential limitations or bottlenecks in the system structure and guide changes aimed at improving system efficiency.⁷⁸ Those analyses may suggest modifications to the structural design, such as moving from a centralized to a decentralized model, or vice versa. However, such decisions would need to be taken in conjunction with the results from the data-quality evaluation.

317. In countries that are in the process of designing a national civil registration and vital statistics systems, the two structural models should be considered and discussed with a view to determining which model would be most appropriate to the administrative and social environment of the country. At the planning stage, it is essential to research available material on the structural models, and consult and seek advice from technical experts at the United Nations, WHO or other national registration authorities on the appropriate structural design. As a general principle, it is advisable to design and implement a model that is integrated with existing administrative processes and resources within the country, rather than to propose an entirely new stand-alone system.

318. As explained previously, a centralized system has the advantage that standard civil registration and vital statistics rules and procedures defined at the central level can be applied in a consistent manner across the country. They can be disseminated

⁷⁸ For example, in the state of Haryana, India, an institutional analysis of the civil registration and vital statistics system identified the need to transfer registration responsibilities from the Police Department to the Ministry of Health.

⁷⁹ See, for example, the centralized model in Viet Nam, where the civil registration system is operated by a single agency, the Ministry of Justice. At the central level, the General Statistics Office is involved in the tabulation and preparation of annual vital statistics from civil registration, while the Ministry of Health is responsible for collecting and analysing data on registered causes of death. For details, see the country's national action plan on civil registration and vital statistics for the period 2017–2024, available at http://vanban.chinhphu.vn/portal/page/portal/chinhphu/hethongvanban?class_id=2&page=1&mode=detail&document_id=188102.

⁸⁰ See, for example, the decentralized model in India, where by each state implements civil registration and vital statistics processes, which are largely determined by the availability of institutions and resources at state and local levels. See descriptions in annual reports available at www.censusindia.gov.in/2011-Common/Annual_Report.html. See also Mamta Gupta and others, "Estimating mortality using data from civil registration: a cross-sectional study in India", *Bulletin of the World Health Organization*, vol. 94, No. 1 (2016), pp. 10–21. Decentralized models are also implemented in Australia, Brazil and Canada, among other countries.

⁸¹ See *Handbook on Civil Registration and Vital Statistics Systems: Preparation of a Legal Framework* (United Nations publication, Sales No. 98.XVII.7) Updated version forthcoming.

⁸² See www.bloomberg.org/program/public-health/data-health/; also www.vital-strategies.org/wp-content/uploads/2018/01/CRVS-Legal-Toolkit_11_29_17.pdf.

through standardized training programmes, resulting in uniform implementation and expansion of the system. In addition, any modification to the system can be designed centrally and communicated simultaneously across the country.⁷⁹ On the other hand, countries with a large population and wide geographical dispersion or complex social structures at the subnational level may benefit from a decentralized civil registration and vital statistics model.⁸⁰

319. The legal framework is the key element that supports and operationalizes the structural design of the civil registration and vital statistics system.⁸¹ The legal framework essentially comprises the laws and regulations that mandate the procedures for civil registration and the compilation of vital statistics. The quality-assurance evaluation team would need to understand the principles of the civil registration and vital statistics legal framework, and be familiar with laws, rules and regulations from various different countries.

320. From a quality assurance standpoint, the legal framework at the national level (or subnational level in decentralized models) should be evaluated in terms of the availability of the following:

- (a) Definitions of vital events as set out in the *Principles and Recommendations for a Vital Statistics System, Rev. 3*;
- (b) Guidelines to ensure universal coverage of civil registration and vital statistics;
- (c) Designation of specific institutions and personnel to serve as registrars at local, regional and central levels;
- (d) Recognized notifiers of vital events, including for deaths in institutions such as hotels and jails, public transport vehicles and other public places;
- (e) Protocols for registration by place of occurrence and place of usual residence;
- (f) Timelines for registration and specific mention of penalties for delayed registration;
- (g) Protocols for the registration of vital events involving migrants, foreigners and expatriates;
- (h) Protocols for deaths in natural and human-caused disasters, occupational accidents and wars, and for deaths occurring in circumstances with possible forensic implications;
- (i) Protocols for instances of disappearance of individuals who may be presumed to be dead;
- (j) Specific mention of procedures for reporting causes of death, in the form of medical certification of cause of death, and, where applicable, verbal autopsy methods for deaths in the community;
- (k) Protocols for data coding, processing and tabulation, and for access to data, privacy and confidentiality.

321. Bloomberg Philanthropics' Data for Health Initiative developed a detailed matrix to facilitate evaluation of the national legal framework of the civil registration and vital statistics system.⁸²

322. The legal framework is developed according to the structural design of the model of the civil registration and vital statistics system. In the centralized model, there is a national law for registration with supporting regulations specifying the details concerning personnel, procedures and resources.⁸³ By contrast, in the decentralized model, the legal framework provides for the drafting of a model national law and regulations, with provisions

for each major civil division to promulgate its own laws and regulations according to local situations, in conformity with the recommended national law.⁸⁴ As mentioned previously, in decentralized models, the legal framework has to be evaluated separately for each state or province which has its own laws.

323. In most instances, the regulations cover the procedures and processes for the submission, compilation and analysis of vital statistics. However, given the growing demand for vital statistics and their inherent complexity, the quality-assurance evaluation of civil registration and vital statistics should carefully review the rules for vital statistics, so as to assess their compliance with the standard tabulations recommended by the United Nations.⁸⁵ In addition, WHO prescribes standard guidelines for reporting cause-of-death mortality statistics in accordance with the International Classification of Diseases and Health-Related Problems (ICD).⁸⁶

324. Standards for the notification and registration of vital events, and also for their statistical processing, can be evaluated through a review of the forms and statistical reports used in civil registration and vital statistics processes. That can then be used as the basis for appropriate modifications.

325. The legal framework for civil registration and vital statistics systems evolves over time as do developments in administration and technology. Concomitantly, registration procedures and statistical reporting requirements change; even the structural design of the model and the institutional arrangements could change. The civil registration and vital statistics quality-assurance evaluation should document those evolutionary changes, starting with the structural design of the original model and the legal framework, and ensure careful and systematic documentation of any modifications or additions over time. A review of the evolution would provide a baseline reference for understanding the factors that influence the current operational status of the system, and would explain patterns of vital statistics quality over time.

326. The quality assurance review should also check whether the legal framework includes provisions to formulate novel strategies for civil registration in exceptional circumstances, such as natural disasters, civil disturbances and war.⁸⁷

(c) Business processes

327. The second key step in the civil registration and vital statistics quality-assurance evaluation is to develop a map or flow chart showing the relationship between the roles of institutions and the roles of personnel involved in notification, registration and statistical compilation at different levels in the administrative hierarchy of the system. The optimal approach is to develop a diagram that outlines the reporting processes for vital events as they occur, and depicts the flow of data from their original submission through to their ultimate compilation in vital statistics.

328. The diagram should identify all the key nodes for the notification of events, registration and issuance of relevant certificates. In most instances, there are differences in the business processes for urban and rural areas, given the variations in their administration, institutional arrangements and the availability of infrastructure. In some countries, notification procedures can be completed at the village level, but the actual birth or death certificate is issued at a higher (subdistrict or district) level. In other instances, notification and registration are conducted at the local level for usual residents, but for other individuals (such as migrants or foreigners) the procedure has to be completed at a higher level. The mapping of the business process should adequately capture and describe all variants for all vital events and, if necessary, through separate charts for urban and rural areas.

329. As for other components of the quality-assurance evaluation, in decentralized models it would be necessary to map the business process separately for each state or province. It is also essential to evaluate registration data quality at different nodal

⁸³ For examples of centralized legal frameworks, see chap. I, sect. B.

⁸⁴ For examples of decentralized legal frameworks, see chap. I, sect. C.

⁸⁵ See *Principles and Recommendations*, annex II.

⁸⁶ See WHO, *International Statistical Classification of Diseases and Related Health Problems*, 10th revision, vol. 2, chap. 5: Statistical presentation.

⁸⁷ See the special regulation in the legal framework for civil registration adopted by Sri Lanka to manage the humanitarian crisis following the 2004 Indian Ocean tsunami. That regulation provided for the registration of deaths of missing persons for the purposes of securing legal closure, financial support and other social services.

points in the business process to identify potential bottlenecks in data flow or limitations in data collection procedures. That could also identify the possible risk of events being missed or duplicated, either of which could affect data quality.

330. The mapping of business processes should also review the existing procedures for notification, registration, issuance of certificates, and compilation and submission of statistics, in respect of their potential influence in ensuring the goals of the civil registration and vital statistics system. In principle, the health sector is a major source of vital event notification and for the coding and analysis of causes of death. It is of critical importance to recognize the importance of the health sector in the process and to involve it in strengthening the procedures, management and operations of the system at both the local and national levels.⁸⁸ The quality-assurance evaluation should investigate the existing roles and responsibilities of the health sector and make recommendations as necessary.

331. The business process should include the procedures for medico-legal cases relating to deaths resulting from injuries or other events requiring police and forensic investigation. Where necessary, the process for updating the vital statistics to reflect the results of a medico-legal investigation into the cause of death should be specified and ensured so as to enhance the accuracy of cause-specific mortality statistics. Since those investigations tend to take time, the business process and related regulations could specify a time frame (e.g., one year), after which the national statistics agency would be required to produce an updated version of vital statistics for the country.⁸⁹

(d) Infrastructure

332. The availability of adequate infrastructure is a critical element of the quality assurance of the civil registration and vital statistics system. There are several dimensions of infrastructure that need to be assessed. Key among these is the specific budgetary allocation for operations at the national and local levels. While the exact budget allocation may be difficult to gauge because of the sharing of resources between different government programmes, the evaluation of available infrastructure according to the dimensions outlined below might provide sufficient insight on this aspect.

333. First, the location and distribution of registration points should be assessed to evaluate the accessibility of registration services for the population. Poor access to registration services, either in terms of geographical distance or limited working hours (e.g., open only on certain days of the week) acts as a limitation in the overall performance of the registration system. The evaluation of accessibility may require some form of qualitative inquiry among key stakeholders in the community to understand their specific needs, with a view to developing expansion and outreach measures to improve access and availability of registration services. For a detailed discussion, see chapter II, section C.

334. The availability of adequate office space, basic equipment, such as furniture, electricity and means of communication, as well as the required official stationery are components of infrastructure. Evaluation of those components could form part of the field programme component for management and operations and would entail field visits to some registration units as well as periodic inspections, and feedback from registration staff during review meetings. The availability of information and communication technology resources, including computers, printers, telephone and Internet services, has vastly improved worldwide over the past two decades, and those resources should be properly harnessed to improve vital event notification, registration and issuance of certificates and the processing of vital statistics. Thus, the implementation of those technologies at all levels and for all functions of the civil registration and vital statistics

⁸⁸ See WHO, "Strengthening civil registration and vital statistics through innovative approaches in the health sector: Guiding principles and good practices", report of a technical meeting, Geneva, 17–18 December 2013. Available at www.who.int/healthinfo/civil_registration/crvs_meeting_dec2013_report.pdf.

⁸⁹ This is the practice followed in Australia.

system should be evaluated, and recommendations should be formulated to enhance the quality assurance of the system.

335. The availability of trained human resources for implementing the civil registration and vital statistics programme should also be evaluated at all levels of the system. Institutional and human capacity can be assessed through a review of the staffing patterns. That has important implications for the completeness of vital event registration, but also—and more importantly—for the accuracy of data variables recorded at registration. In addition, during the processing and compilation of vital statistics, coding and classifying specific variables, including age groups, ethnicity, educational and occupational characteristics, and causes of death may be done in a number of ways. Training programmes for registration staff should be evaluated to ensure the inclusion of adequate time and materials that emphasize the importance of ensuring the completeness of event registration and the accuracy of data recording. Training programmes for health sector staff should also be assessed in terms of the time allocated to training, the materials provided and the teaching methods employed to ensure the medical certificate of cause of death and verbal autopsy questionnaires, if these are used in the country, are correctly completed. Local physicians should also receive training in the medical certification of cause of death. Lastly, training programmes for statistical staff should be evaluated in terms of their coverage of the current standards for the coding, classification, aggregation and tabulation of data.

336. The budget allocation for infrastructure, including human resources, civil registration and vital statistics operations and local travel for data verification purposes or to attend training programmes and review meetings, is the third component of infrastructure that needs to be evaluated. In some countries, civil registration operations share infrastructure and resources with other local administration programmes (e.g., on matters such as revenue, land records and security establishments). Thus, the quality-assurance evaluation should weigh whether adequate attention is being given to the operation of the civil registration system, when such resource-sharing mechanisms are in place.

337. At the central level, the infrastructure should also be evaluated for the availability of resources to conduct a detailed analysis of vital statistics. That would require a team or specified unit within the national statistics office, along with research staff from government departments who specialize in the demographic and epidemiological analysis of vital statistics. The technical staff should be proficient in the evaluation of data quality using the standard framework described below in the present chapter, and also in the computing of adjusted estimates of key vital statistics indicators for population administration, health policy and evaluation.

(e) Management and operations

338. The materials and procedures used in civil registration and vital statistics operations should be appropriate for the quality assurance of the system. The quality-assurance evaluation should include a detailed review of the design of forms in relation to international standards and the fields that should be included on forms for the registration of live births, deaths, fetal deaths, marriages, divorces and other vital events.⁹⁰ It is necessary for the attending physician to complete the International Medical Certificate of Cause of Death, which allows for the indication of the direct, antecedent, underlying and contributory causes of death, depending on the information available.⁹¹

339. In addition to the forms for all types of vital events, the procedures for notification, registration, issuance of certificates, maintenance of records, submission of statistical returns, compilation and submission of statistics should be evaluated for their

⁹⁰ See *Principles and Recommendations*, table III.1, for a set of essential topics and themes.

⁹¹ See *Principles and Recommendations*, chap. IV, for definitions and details.

potential efficiency in attaining the goals of the civil registration and vital statistics system. In that context, and as mentioned in chapter II, section C, civil registration and vital statistics systems must routinely implement standard operating procedures for all their functions. Those standard operating procedures include specifications relevant to operations at various levels (local, district and central) of the system. The quality-assurance evaluation should carefully review all existing standard operating procedures and their alignment with the business processes for civil registration and vital statistics operations, and modifications or updates should be suggested to enhance operational efficiency. That element of the quality-assurance evaluation should be performed in conjunction with the review of business processes (see subsect. (c) Business processes, above).

⁹² See WHO, "Strengthening civil registration and vital statistics through innovative approaches in the health sector" (Geneva, 2014).

340. The importance and value of involving the health sector in efforts to strengthen the procedures, management and operations of civil registration and vital statistics systems at both local and national levels cannot be overemphasized.⁹² In principle, the health sector is a major source for both vital event notification and the coding and analysis of vital statistics, in particular on causes of death. The quality-assurance evaluation should investigate the existing roles and responsibilities of the health sector and make recommendations as necessary.

⁹³ This was done in Brazil, for example, following a 1975 review of the mortality registration system, which identified 43 different death registration and cause-of-death reporting forms across different municipalities. See Brazil, Ministry of Health, National Health Foundation, *Manual de procedimento do sistema de informações sobre mortalidade* (Mortality information system handbook), (Brasília, 2001). Available at http://bvsm.s.saude.gov.br/bvs/publicacoes/sis_mortalidade.pdf.

341. In decentralized models, there is a need to check the uniformity of forms and registration procedures across the country, to meet the essential requirements of both civil registration and vital statistics. In some countries, in particular those with a history of some form of colonial-based systems, the historical evolution of civil registration and vital statistics could have taken different trajectories in different territorial entities, resulting in variations across the country.⁹³ If that is the case, and the civil registration and vital statistics operations are fragmented, a national standard set of forms and procedures should be developed and implemented across the country.

342. In countries which are currently establishing or strengthening their civil registration and vital statistics systems, there is a considerable backlog of vital events from preceding years (even decades). While the legal framework may stipulate a specific time frame within which currently occurring events should be registered, it is often not observed, thereby complicating the process of including delayed registrations in summary vital statistics reports, which ideally should be presented according to date of occurrence, rather than by date of registration. The quality-assurance evaluation should review the procedures for delayed registration and the subsequent process for their inclusion in vital statistics reports and other dissemination vehicles, with the appropriate separation of delayed registration for events registered outside the reference period of the report.

343. In parallel with the evaluation of civil registration operations, there is a need to review vital statistics operations in terms of the formats used and the instructions provided for statistical tabulations and summary statistical reports. For the purpose of quality assurance of vital statistics operations, it would be ideal if individual vital records were computerized at the initial point of registration. That would permit ready access to individual records for ensuring data accuracy, and also for data validation, management, display and dissemination. The quality assurance review should assess the computerization status of individual records and the availability of specific computer programmes for data verification, data amendment and the management of delayed registration.

344. The review of computerized operations should also assess the public availability of database functions and data management programs in terms of the display of statistical data for specific variables, in response to user needs. Those might include the

possibility for users to be able to access annual data sets freely via the Internet, to customize their data requests in accordance with specific variables and aggregations, and to download the output. Countries which offer public access to vital statistics databases maintained by a government agency include Brazil⁹⁴ and Sri Lanka.⁹⁵

345. The review of statistical operations should also evaluate the availability of instructions for a minimum set of standard statistical tables to be included in an annual vital statistics report (see *Principles and Recommendations* table III.1). For example, the vital statistics regulations should specify the reporting of the frequency (absolute counts) of live births by age of the mother, a metric necessary for measuring age-specific and total fertility rates. The civil registration and vital statistics quality-assurance evaluation should review the existing formats for statistical tables in respect of their compliance with international standards and formulate any necessary recommendations to ensure compliance.

(f) Internal audits

346. Routine maintenance of the civil registration and vital statistics system and its operations is best achieved through a regular internal audit programme, which should be overseen by an interdepartmental coordination committee. As already noted, the quality-assurance evaluation should verify that an interdepartmental coordination committee has been established and includes representatives from all major stakeholders, namely, those agencies or institutions that have a direct role in the notification and registration of vital events and in the compilation of vital statistics

347. Civil registration and vital statistics systems should have a routine plan for internal audits to assess system performance, in particular at the level of the registration units. The quality-assurance evaluation should check for any available guidelines on the inspection of individual registration units to review operations, performance and maintenance, and the frequency of such inspections. Those guidelines should form part of the field programme (see chap. II, sect. C.2) and should specify the topics to be covered in the internal audits, which should essentially include all the items listed for review under infrastructure, and management and operations.

348. In particular, the instructions for the audit should include monitoring of the submission of statistical returns, together with certain basic elements of the data-quality assessment process described below, such as regular monitoring (e.g., on a monthly basis) of the registration coverage of different villages, urban wards and other territorial divisions, and of the accuracy of data recording for specific variables. The quality-assurance evaluation should make specific mention of the need for the internal audit team to pay special attention to the frequency and accuracy of registration of fetal, neonatal and infant deaths, events which are sometimes overlooked in civil registration and vital statistics systems. A detailed exploration of the internal audit process can be found in chapter III, section B.

349. The quality-assurance evaluation should also include instructions for the internal audit to check if the data standards and coding procedures prescribed in the legal framework are being implemented at the local level. The audit guidelines should also specify the preparation and submission of internal audit reports for review by the local and national civil registration and vital statistics coordination committees. Where applicable, information from the audit reports should be used in making adjustments designed to strengthen the system, such as alterations to the business processes, or in the implementation of capacity-building programmes.

350. The internal audit component of the field programme should also identify the existence of mechanisms for feedback from registration units about workload, specific

⁹⁴ Brazil, Ministry of Health, Departamento de Informática do Sistema Único de Saúde, DATASUS database. Available at <http://datasus.saude.gov.br/informacoes-de-saude/tabnet/estatisticas-vitais>.

⁹⁵ Sri Lanka, National Data Archive, vital statistics records. Available at http://nada.statistics.gov.lk/index.php/catalog/Demography#_r=&collection=&country=&dtype=&from=1970&page=1&ps=100&sk=&sort_by=title&sort_order=&to=2013&topic=&view=s&vk=.

infrastructure needs or for troubleshooting in relation to the registration of difficult cases, such as those involving migrants, medical and legal issues and others. That could be obtained through qualitative approaches, such as discussions and key informant interviews during field inspection visits. The evaluation should also gauge the interest and motivation of registration staff in the performance of their tasks and the support and guidance provided by their departmental supervisors, from both administrative and technical standpoints.

2. Data-quality assessment

351. The evaluation of data quality is the second component of the overall civil registration and vital statistics quality framework. The present subsection provides a definition of specific statistical indicators of data quality and discusses a range of methods and techniques to evaluate data quality. The techniques described are largely focused on the evaluation of data on live births, deaths and fetal deaths, but additional aspects of vital statistics, such as the accuracy of data on causes of death, are also considered. Where necessary, the relevant principles of the interpretation of data-quality measures are described.

352. Data quality needs to be evaluated across the following broad dimensions: completeness and coverage, accuracy, relevance, timeliness, and availability and accessibility.

353. The completeness and coverage of the civil registration system and the resulting vital statistics reflect the ability to make generalizations and indicate the extent to which a set of vital statistics indicators is actually representative of the population to which it refers. In addition, it is essential to establish the accuracy and validity of the data, that is, the extent to which they capture details of vital events as they actually occur in the population. The importance of data timeliness and their relevance for policy development and evaluation cannot be overemphasized. Lastly, the potential usefulness of data is directly contingent on their availability and accessibility. Each of these dimensions is discussed in detail below.

(a) Completeness and coverage of vital statistics

354. The ability to generalize vital statistics is assessed across two dimensions: coverage and completeness. Establishing the completeness and coverage of data is critically important to ensuring that relevant priorities, policies and decisions are correctly targeted. For example, using only data from urban areas, or data with a low registration of events in certain age groups, would lead to the adoption of decisions that do not take into account the needs of excluded populations. It is essential to distinguish clearly between coverage and completeness, in line with the definitions provided below. In various literature, the terms have been used interchangeably, giving rise to potential misinterpretation of the actual performance of the vital statistics system.

355. *Coverage* refers to the population to which the civil registration laws and procedures are applicable; it can also refer to the actual populations whose vital statistics are being compiled and processed. The term could also be used in several dimensions, including administrative coverage and reporting coverage. For all those definitions, the essential statistical figure is computed as a simple proportion, namely, the population which is covered relative to the total national population. Those various definitions of coverage are likely to be of particular relevance for countries that are in the process of developing and scaling up their civil registration and vital statistics systems

in a phased and incremental approach. It is essential that, at each stage of revision, the corresponding definition and extent of coverage are indicated in the technical report.

356. *Administrative coverage* refers to defined geographical or administrative areas or population groups that may be included or excluded from the registration system by law, or may be included from a legal perspective, but are dealt with separately for the compilation of vital statistics. In principle, all countries should mandate total coverage of their national population for the purposes of vital event registration, but there are some exceptions to this principle, in particular where certain events are concerned, or for the compilation of vital statistics. For example, in some countries, deaths among expatriates are legally registered, but not included in vital statistics reports. The application of registration laws may also vary in accordance with the nature of the events. In some countries, for example, registration laws do not cover fetal deaths.⁹⁶

357. *Reporting coverage* designates the performance of the registration system in terms of the proportion of primary registration units that submit returns of vital events registered each year, with the number of reporting units as the numerator and the total reporting units in the civil registration system as the denominator. The monitoring of reporting coverage is an integral part of the routine evaluation of the functional status of the registration system and vital statistics system or, where applicable, of sample registration and vital statistics systems. The monitoring of reporting coverage should be linked with local procedures to ensure that missing statistical reports are rigorously followed up, to ensure that such reports are eventually collected from all primary registration units. Suitable norms should be established to ensure that a nil return is filed for periods during which no vital events occurred within a specific registration unit area, so that the statistical reporting coverage can be correctly estimated (for details, see chap. II, sect. C).

358. *Completeness* is defined as the vital events registered by the civil registration and vital statistics system as a proportion of the total estimated number of vital events that would have occurred within the population to be covered by the system. When calculating completeness, reporting coverage should be taken into account, and non-reporting units should be excluded from the computational process, to get an understanding of actual system performance in the reporting units. In addition to an assessment of system performance, measures of completeness are also required to derive adjusted vital rates for demographic studies and for policy and planning purposes.

359. Measurement of the completeness of civil registration has been the subject of demographic research for over a century, starting with such evaluations in the United States of America and Canada in the early twentieth century. The key element of that measurement consists in the estimation of the total vital events (mainly births or deaths) that would have occurred in the population. That value then serves as the denominator in deriving the proportion of registered events. A range of methods has been designed and tested to measure completeness; they can be broadly divided into two groups, depending on the approach used to derive the denominator.

360. First, record matching or record linkage mechanisms which are based on the matching of individual events from two different sources, followed by data reconciliation or the estimation of events missed by both data sources, leading to a total number of events which could serve as the denominator in estimating completeness; and second, analytical techniques based on known empirical regularities or on mathematical relationships between age distributions of vital events and population, which are used to derive the expected number of total vital events that would serve as the denominator.⁹⁷ Those two approaches—record linkage or matching, on the one hand, and analytical techniques on the other—are also referred to as direct and indirect methods,

⁹⁶ For instance, in India, the legal provisions for medical certification of cause of death were initially applied selectively to health institutions in certain areas only. Over time, the coverage is being gradually widened.

⁹⁷ Kenneth Hill, "Analytical methods to evaluate the completeness and quality of death registration: current state of knowledge", Technical Paper No. 2017/2 (New York, United Nations, Department of Economic and Social Affairs, Population Division, 2017). Available at www.un.org/en/development/desa/population/publications/pdf/technical/TP2017-2.pdf.

respectively. The data requirements for the two approaches differ. In the first case, information at the individual record level is required from at least two sources, while, in the second, descriptive statistics and basic tabulations for the key variables of interest will suffice. The two methods are also subject to different sets of assumptions and conditions that should be fulfilled for their correct application and for the interpretation of their results. Those factors should be considered carefully prior to the selection of one or other approach.

361. Record linkage is generally considered to produce an accurate estimate of registration completeness if the requirements of both independence and quality of the two sources are met. That approach may also indicate the roots of underregistration or overregistration. The choice of an independent source of records can affect the accuracy of the results, however. The requirement that the two data sources must be independent may never be achieved in practice. In practice, if not automated, the matching process can be slow and laborious, and the selection of appropriate matching criteria is not always straightforward. If automated, the detailed rules for computer matching need to be specified with even greater precision than is needed for a manual process. Other important limitations of record linkage exercises include their cost and the amount of time needed to carry them out.

362. In turn, one important advantage of the analytical approach is that the level of completeness of vital statistics can be readily assessed as soon as data become available. Ease of application makes some of those methods suitable for several purposes, such as the regular monitoring of completeness levels and the provision of estimates of completeness for campaigns designed to promote improvements in civil registration. On the other hand, the applicability of analytical methods is limited by a variety of necessary assumptions and other requirements. For example, some of the methods require a stable population, that is, constant fertility and mortality over a period of time; others require data from two censuses, assumptions of a closed population or an absence of any variation in completeness across population subgroups.

(i) Record matching

363. Apart from their methodological differences, the two approaches also differ in terms of their purpose and the potential outcomes of their use. The analytical techniques provide only an estimated measure of completeness. In contrast, record-matching exercises can be used to evaluate completeness, and to enable data reconciliation that will augment the empirical total number of observed events in the study population. The linkage also provides additional variables from each of the sources of matched records, which enables more detailed analyses beyond the measurement of data completeness. The additional variables from either of the two sources could be used for broader demographic and epidemiological analyses of vital rates, for policy and planning purposes. In addition, linked records could be analysed to identify factors associated with event recording in either source, which could then be used in designing interventions to strengthen the civil registration and vital statistics system.

364. Record-matching mechanisms are based on a number of concepts which take into account the following:

- (a) Nature of the data sources used in the linkage exercise;
- (b) Data collection procedures used in each source;
- (c) Accuracy of variables recorded for each event in each source;
- (d) Processes and rules used for matching;
- (e) Statistical method for deriving the completeness measure.

When planning an exercise in record linkage to evaluate data completeness, each of those aspects needs to be carefully considered and accounted for in order to establish a valid statistical measure of completeness.

365. Where data sources are concerned, civil registration is the standard primary data source for which completeness needs to be measured. Alternative secondary sources which may be used to link civil registration records include data on vital events from other administrative and social records (health service records, immunization registers, social insurance registers, school enrolments, burial or crematorium records and others) and population censuses and surveys. Each of those alternative sources is often characterized by specific definitions of coverage, except for censuses, which are universal from a legal and administrative perspective. The coverage of the alternative source has implications for the overall generalizability of the completeness measure. Sources with partial population coverage are best used for record linkage and data reconciliation. Sources which are representative of the population can be used to evaluate the overall completeness of the civil registration system, but if they are based on representative samples, then an appropriate statistical assessment of the precision of the completeness estimate should also be conducted.

366. In a record-matching exercise, the design and characteristics of both civil registration and the alternative sources should be carefully reviewed and documented. In addition to ensuring the compatibility of population coverage, particular effort should also be made to ensure compatibility of the reference time period for the data in each source. That will minimize the potential for the introduction of bias in the matching process by out-of-scope events.

367. The data collection process is also relevant, whether it is a continuous recording process as in civil registration and other administrative records, or based on recall as in censuses and surveys. Continuous recording systems result in more reliable data quality. It must also be noted whether the civil registration system registers events according to place of usual residence, or place of occurrence, or both. Other administrative records also include events in accordance with their place of occurrence. On the other hand, censuses and surveys usually record events by their place of usual residence. The source of address variables in the respective data sets should be clearly identified as such in both data sources to ensure their compatibility for matching.

368. Prior to linkage, an inventory of the variables available in each source should be prepared and, if a unique identifier number is not available, a defined set of variables should be selected for testing and subsequently establishing the match. Subsequently, the data set should be assessed for missing data for each of the matching variables, in particular those such as date of birth or death, age and address. Data quality in the recording of complete names (first, middle and last, or surname), and also spelling variations of common names should be noted, as they could affect the matching process, and may have to be dealt with in an iterative manner in the linkage exercise.

369. A set of deterministic criteria should be established to define matched (or linked) records. The criteria usually involve matching using a unique PIN or, if that is not available, across multiple variables including address variables, vital event dates, names and, in the case of deaths, the age at death. For births, the names of parents could be used in the linkage process, when matching birth records with administrative health records or school enrolment records. Another important consideration in setting the linkage criteria is the geographical or administrative level at which the linkage exercise would be conducted. That is because of the likelihood that individuals and villages in different subnational areas may have the same names, creating the potential for erroneous matches or non-matches. As mentioned above, care should be

taken to match address variables according to the same definition of place of occurrence or residence.

370. The linkage criteria can be set to accommodate a fully matched, a partially matched, or a fully non-matched event. Certain relaxations or ranges can be applied to different criteria, with a view to resolving partially matched cases in order to improve the accuracy in matching. Such modifications to the criteria are often necessary where data are missing, necessitating some form of judgment in the adjudication of matched events. For instance, while event dates in continuous recording systems such as civil registration or other administrative records are likely to be accurate, those based on recall, as in censuses or surveys, are subject to recall bias, in relation to the date or even month of birth or death. Hence some form of range in the recorded date or month of the event is required in one or both data sources. In addition, the age at death is sometimes subject to misreporting, in particular of the kind known as “age-heaping”, where intervals of 5 or 10 years are used, in societies in which knowledge of actual age is limited. Case studies of record linkage implemented to evaluate completeness of death records in Oman and Viet Nam (see boxes 15 and 16) illustrate the practical aspects of applying ranges to specific variables for the linkage process. When linkage is conducted at the local administrative or geographical level, there is greater veracity in the relaxation of criteria for age at death or date of event, given that it is rare for two individuals within the same narrow interval of dates or from the same age bracket to have the same name and address variables.

371. The method used in conducting the matching exercise is also an important factor. Manual processes of matching are routinely used in the sample registration and vital statistics systems of Bangladesh, China and India at the registration unit level. In such instances, minor variations in the spellings of names along with small differences in event dates or ages are readily accounted for. Besides, additional field visits may also be conducted to verify partially matched events and to complete the adjudication of matched and unmatched events. On the other hand, the routine availability of electronic data sets from civil registration systems and of other administrative records can facilitate speedy and efficient linkage operations. Where feasible, as in the case study in Oman (see box 15), it is recommended that the electronic data sets be divided according to registration subunits and then that the linkage is conducted, to improve the accuracy of matching in line with geographical location. That will be possible if there is compatibility in the registration of place of event, either by usual residence or occurrence, and the linkage is processed with the same criteria for both sources.

372. Linkage is often an iterative process, undertaken in an effort to improve the matching of records. As already noted, it may be necessary to consider testing several ranges for different variables, to enable more accurate matching. For each set of criteria, it is necessary to evaluate the results in terms of matched and unmatched records, and also to evaluate a sample of each, to verify the accuracy and plausibility of the matching. That evaluation should identify true matches and true non-matches, besides doubtful or potentially erroneous matches or erroneous non-matches. The difference between erroneous matches and non-matches is termed the net matching error, and can be used in estimating the overall error in the completeness estimate, as discussed below. The various iterations of linkage criteria should be tested to improve the matching rates and to minimize the potential net matching error.

373. Following the final or best iteration, the record matching process would yield results as labelled in table 1.

Table 1
Conceptual model for results from record linkage or matching across two data sources

Source 2	Source 1		Total
	Reported	Not reported	
Reported	M	U ₂	N ₂
Not reported	U ₁	Z	
Total	N ₁		N

M = events that are matched across the two sources, i.e., recorded in both sources

N₁ = total events reported in source 1 = M + U₁ where U₁ = records in source 1 not matched in source 2

N₂ = total events reported in source 2 = M + U₂ where U₂ = records in source 2 not matched in source 1

374. If the primary purpose of the record linkage was for the reconciliation of data only, then the sum of records from the three cells M, U₁ and U₂ provide the total number of events that are estimated to have occurred in the population.⁹⁸

375. In some instances, an additional step could be taken to estimate the completeness of either source, using the total number of events from the data reconciliation as the denominator. The number of events recorded in either source (N₁ or N₂) would serve as the numerator in estimating the completeness of its vital event recording.⁹⁹

376. Statistical methods are also available to account for the likelihood of events having been missed by both data sources, in the measurement of completeness. Those methods are applicable under certain specific conditions, including the assured statistical independence of the two sources, accuracy of data in each source, and zero-matching error. More details of those conditions and the overall methodology of the computation are available in the literature.¹⁰⁰ Given that those conditions are fulfilled, the estimate of events missed by both sources (represented by Z in table 1) is calculated as:

Z = number of events estimated to be missed by both sources; computed as

$$Z = \frac{U_1 U_2}{M}$$

and, as a result, the total estimated events in the population (represented by N in table 1) is:

$$N = \text{estimate of total events} = M + U_1 + U_2 + Z$$

and

$$\text{completeness of source 1} = C_1 = N_1 / N$$

$$\text{completeness of source 2} = C_2 = N_2 / N$$

377. The computation of completeness measures described above can be conducted separately for different subgroups within the population, for example, by sex, age group, geographical division or any other characteristic for which a separate completeness estimate is required. That could help in identifying specific subgroups that are particularly affected by low registration, which could be followed up through targeted interventions to strengthen the registration of events in those subgroups. In addition, separate measures of completeness make possible a more detailed weighted adjustment of vital rates for the overall population. Examples of such subgroup analysis of

⁹⁸ The sample registration system in India adopts this approach to derive its estimates of vital events and vital rates. In some other countries (e.g., Islamic Republic of Iran and Turkey), data-record matching and reconciliation are routinely carried out across different sources (usually the civil registration system and health records) in order to compile the overall data set of vital events for their national population

⁹⁹ Such an approach has been adopted in a record linkage analysis conducted for Kiribati, although the resulting completeness estimate was used only to assess the performance of the civil registration and vital statistics system, and not to adjust the vital rates, which were computed only from the reconciled data. For further details see Karen Carter and others, "Mortality and life expectancy in Kiribati based on analysis of reported deaths", *Population Health Metrics*, vol. 14, No. 3 (2016).

¹⁰⁰ Chalapati Rao and Matthew Kelly, "Overview of the principles and international experiences in implementing record linkage mechanisms to assess completeness of death registration", Technical Paper No. 2017/5 (New York, United Nations, Department of Economic and Social Affairs, Population Division, 2017). Available at www.un.org/en/development/desa/population/publications/pdf/technical/TP2017-5.pdf.

completeness may be seen in the record linkage studies in Oman and Viet Nam (see-boxes 15 and 16).

378. Important elements of the estimation of completeness are the measurement of standard error and the confidence interval of the completeness estimate. Based on all the conditions being met for the computation of events missed by both sources, the standard error (SE) could be computed as follows:¹⁰¹

$$SE = \sqrt{\frac{Nq_1q_2}{p_1p_2}}$$

where:

N = total number of events estimated by the method (see table 1)

p_1 = the probability that an event is recorded in data source 1 ($p_1 = N_1/N$)

p_2 = the probability that an event is recorded in data source 2 ($p_2 = N_2/N$)

q_1 = the probability that an event is missed in data source 1 ($q_1 = U_1/N$)

q_2 = the probability that an event is missed in data source 2 ($q_2 = U_2/N$)

The 95 per cent confidence interval (CI) for the completeness estimate denoted $C = C \pm 2SE$

379. In most instances, however, all the conditions for applying the method for estimating the events missed by both sources are not met. In such situations, the computation is still processed under the assumption that those conditions have been met, giving rise to the potential for the completeness estimate to be affected by bias. In addition, in many instances, the record linkage evaluation of completeness is conducted in only a sample of the population, as a result of which, the completeness estimate is also likely to be affected by sampling variance. Accordingly, it has been proposed that the error in the completeness estimate could be expressed as a “root mean square error” (RMSE) according to the following formula:

$$RMSE(C) = \sqrt{\text{variance} + \text{bias}^2}$$

380. A range of statistical methods have been proposed for the measurement of bias, which could arise from three potential sources: lack of statistical independence between the two sources; presence of events in either source which are not in the same reference space or time period; and matching error. In summary, those three sources of bias tend to cancel out one another, so the net bias is less than the sum of that from all three sources. Verification of a sample of fully matched, partially matched, and unmatched events is recommended as a basis for evaluating the overall accuracy of the matching process and for estimating bias from matching error. Under current circumstances, those methods for evaluating bias need to be tested and adapted for routine application.

381. At this point, it is recommended that, in applying record-matching mechanisms to evaluate the completeness of vital statistics, attention should be paid to minimizing the potential for bias from the three identified sources. When there are data from multiple clusters or subgroups within the population, statistical methods applying the bootstrap or jackknife principles could be used to measure the standard error of the completeness estimate. In summary, it is essential for every measure of completeness to be supplemented with an estimate of its error, to enable appropriate interpretation and subsequent use of the estimate for adjusting vital rates, or to evaluate the performance of the civil registration and vital statistics system.

¹⁰¹ Chidambara Chandrasekaran and William Edwards Deming, “On a method of estimating birth and death rates and the extent of registration”, *Journal of the American Statistical Association*, vol. 44, No. 245 (March 1949), pp. 101–115.

Box 15

Oman: Evaluation of completeness of mortality data

A comprehensive national-level evaluation of the completeness of mortality data was conducted in Oman for the year 2010. Data from the national birth and death notification database maintained by the Ministry of Health were linked with census reports of deaths that occurred during the same reference period. The study employed a combination of electronic and manual processes, and included the following methodological characteristics:

- Use of deterministic criteria with ranges for age and date variables
- Use of field verification to verify missing variables
- Field verification of matched and unmatched events using manual query and clarification with local authorities and key informants
- Detailed subgroup analysis of completeness by sex, age and geographical registration area
- Calculation of standard errors for completeness measures and their application in adjusting sex and age-specific mortality rates

The record linkage exercise involved three iterations of matching, with intervening field verification and modifications to matching criteria to improve final linkage outcomes. The analysis included deaths among Omani citizens residing abroad and excluded deaths among foreign citizens who were residing in Oman during the reference period.

Where data quality is concerned, the census mortality responses had larger proportions of missing data for key variables such as age, event dates and addresses. In the case of some deaths with missing ages, the age was inferred from the strong association of the registered cause with the neonatal period (such as prematurity, birth asphyxia or very low birth weight).

One limitation of the census data set was that it did not include the personal names of reported deceased individuals; instead, however, the names of the heads of the household along with their tribal names were used as proxies in the matching exercise. Similarly, the names of missing geographical subdivisions were inferred from the name of the hospital notifying the death event. Those inferences were facilitated by conducting the linkage process at the subnational level of the governorates of Oman. The accurate recording of complete names of deceased individuals, including the tribal name, greatly enhanced the matching process, particularly in the case of notification of deaths in major urban health facilities.

The results indicated that underreporting was more prevalent for deaths at early ages, followed by deaths of the elderly. Underreporting was observed to be higher in Muscat, the capital city, and in Al Buraymi and Musandam—two areas with low population density.

In summary, the availability of a robust routine electronic national data set of death notifications from the Ministry of Health enabled an efficient linkage process and analysis. The results made possible the detailed adjustment of mortality rates and the identification of subgroups which required greater attention with relation to death notification procedures and practices.

382. The two recent case studies from Oman (box 15) and Viet Nam (box 16) illustrate key aspects of the use of record linkage mechanisms to evaluate the completeness of civil registration. The Oman study provides an example of a national-level exercise and illustrates the value of using routinely available data sets. The Viet Nam study illustrates the principles of using multiple locally available data sources for compiling

Box 16

Viet Nam: Record-matching mechanisms to improve data compilation from multiple sources

In a situation where the national civil registration system is yet to develop into a routine source of vital statistics, the case study in Viet Nam represents an example of record linkage mechanisms used to improve data compilation from multiple sources through reconciliation, and also an example of the application of methods to evaluate completeness of the reconciled data. Data compilation of deaths was conducted in 192 communes across the country in 2009, covering a population of approximately 2.6 million. Death records were sourced from the local civil register maintained by the justice clerk, the mortality register from the commune health station, records from the commune population office, and several other local citizen welfare groups which maintained records for specific population subgroups such as women, farmers and the elderly.

Owing to close interaction between the commune health and population offices, records from those sources were merged into a single list and linked with the record lists from the justice register in a standard two-source analysis of completeness.

Subsequently, the completeness of the list was computed in the following way: the number of death records in the combined list, created by reconciling the data across the two sources, was expressed as a proportion of the total number of estimated deaths derived by use of the standard two-source analysis, following the method described in paragraphs 373–376.

Since those data were derived from separate record linkage analyses across 192 population clusters (communes), and there was a likelihood that the assumed statistical independence between the data sources had been infringed, the bootstrapping technique was used to derive the variance and standard error, and to compute the 95 per cent confidence intervals for the completeness estimate.

The results showed similar levels of completeness across three age groups (15–59, 60–74 and 75+) for both males and females. Record matching was not attempted for the age group 0–14 years, owing to the uniformly very low level of reporting in all sources. Hence, the analysis was also instrumental in highlighting the need to strengthen infant mortality registration in Viet Nam.

¹⁰² India, Ministry of Home Affairs, Office of the Registrar General and Census Commissioner, Vital Statistics Division, *Sample Registration System* (New Delhi, 2007). Available at www.censusindia.gov.in/Vital_Statistics/SRS/Sample_Registration_System.aspx.

¹⁰³ Gonghuan Yang and others, "Mortality registration and surveillance in China: History, current situation and challenges". *Population Health Metrics*, vol. 3(1), No. 3 (April 2005).

mortality data through linkage reconciliation across the sources, and also analysis of the completeness of data in order to derive adjusted mortality rates.

383. Record-matching mechanisms are also routinely used when a sample civil registration and vital statistics system has been established. The sample-based vital statistics systems in India¹⁰² and in China¹⁰³ are two examples (see box 17).

384. Box 18 shows three case studies in which the health sector has a principal role in the record linkage procedures by taking advantage of the key role of the health sector as a natural source both of vital events occurring within its institutions, and of events occurring within the community, which, for a variety of reasons, are commonly brought to the attention of local health sector personnel. In addition, the health sector is a key stakeholder, given its interest in routine and timely high-quality vital statistics for policy, monitoring and evaluation, accordingly, enhancing the role of health sector institutions and personnel in strengthening civil registration and vital statistics systems is essential. As noted above, the measurement of completeness should be followed up with additional analysis to measure the error in completeness estimates that arise from data biases and sampling variance, where applicable.

Box 17

India and China: Sample civil registration and vital statistics systems

In the sample registration system in India, a dual record system approach is used, comprising the continuous records of vital events from local registrars, and records from an independent half-yearly survey that covers the entire sample registration system population. Records are matched followed by data reconciliation, with the reconciled list used to measure vital rates. That system has been in regular practice for four decades.

In the disease surveillance point system for measuring mortality indicators, in operation in China since 1980, the secondary source of vital records for linkage is provided by an independent sample retrospective survey conducted once every three to five years.

While using record matching, the sample registration system in India does not apply any methods for estimating registration completeness, and therefore there is no adjustment of sample registration system vital rates. The disease surveillance point system in China applies the linkage method to estimate completeness and standard errors, according to the assumptions of statistical independence and absence of bias from other sources. The standard error estimation does not, however, account for sampling variance from the independent survey. The disease surveillance point vital rates in China are adjusted for incompleteness. It is recommended that record matching be followed up with estimation of completeness of the registration data source and also measurement of error, accounting both for bias and for sampling variance, as applicable.

(ii) Probabilistic record matching

385. The record linkage methods applied above follow the deterministic approach, as outlined in paragraph 369 above. An alternative method is the probabilistic matching approach, which takes into account the likelihood of two records being matched based on agreement characteristics across a number of variables. That approach is best applied when dealing with large electronic files of records from routine sources, including civil registration systems, censuses and health information systems, which can be readily analysed using electronic record linkage software. In addition, probabilistic linkage methods can be used where only a limited set of matching variables is available, or where there could be variations in data quality.¹⁰⁴

386. The method assigns agreement and disagreement weights for each variable from a sample of matched records derived from a deterministic review of the data. The method compares the probability that true matches agree on a specific variable with the probability that unmatched cases randomly agree on the same variable. In instances for which information on some key variables for the deterministic approach is missing, the probabilistic method offers some advantages, by using the information provided by other less important variables, along with their agreement and disagreement weights. The method also takes into account the potential for agreement or disagreement to be affected by chance. The ratio of those two probabilities is termed as the weight for each variable. It is also possible for partial agreement weights to be applied for some variables.

387. The match probabilities and weights from the sample of matched cases from deterministic review are then applied to evaluate the variable values in linked pairs from the larger universe of records being analysed. Subsequently, the weights are summed across all the potential variables to derive a total weighted agreement score for a case pair. The total weighted score is then evaluated against a threshold score above which record pairs can be adjudicated as matched pairs, and below which record

¹⁰⁴ See Stacie B. Dusetzina and others, *Linking Data for Health Services Research: A Framework and Instructional Guide* (Rockland, Maryland, Agency for Healthcare Research and Quality, 2014).

Box 18

Brazil, Islamic Republic of Iran and Turkey: Role of the health sector in quality evaluation

In some countries, multiple systems operate at the local level for recording vital events. Such systems provide readily available sources for linking records and data reconciliation to improve the completeness and accuracy of vital statistics. Three case studies exemplify such mechanisms.

- **Brazil:** The Ministry of Health routinely collates and merges deaths recorded in hospitals with records of deaths outside hospitals from civil registers maintained in each municipality, to generate the national mortality database maintained by the Ministry of Health mortality information system. That is supplemented by routine active data searches and the compilation of data on infant deaths from sources such as primary health care units, midwife groups, ambulance services, burial sites and institutes of forensic medicine. Those activities have strengthened the measurement of local infant mortality rates. Routine implementation of those linkage mechanisms has improved the completeness of mortality data in Brazil to over 90 per cent, with some subnational variations.
- **Islamic Republic of Iran:** On a routine basis, the District Health Centre collates and merges death records from all local health sector institutions (hospitals, rural health centres, and forensic medicine bureaus) with records from the district office of the National Organization for Civil Registration. The reconciled data are entered into a customized computer programme and submitted to the Ministry of Health and the Medical Education Institute for subsequent data compilation, quality evaluation and analysis. That process was initiated in three provinces in 1997, and the coverage was gradually expanded across the country to cover all 30 provinces by 2007.
- **Turkey:** Since 2009, death records from the central population register (MERNIS) maintained by the Ministry of Internal Affairs are regularly reconciled with data from the death reporting system operated by the Statistical Institute of Turkey. That has resulted in a marked improvement in completeness of data from the Statistical Institute since 2009. The record matching and data reconciliation process is conducted by the provincial health directorates, and this activity is also associated with the implementation of procedures for quality evaluation and the coding and classification of causes of death..

pairs are declared as non-matched pairs. Different thresholds could be tested to assess their impact on the overall validity of the linkage and matching exercise. Validity can be evaluated in terms of sensitivity and positive predictive value, using the sample of pairs from the deterministic review as the reference standards for validation. A conservative threshold restricts the total number of matches from the probabilistic linkage, while a liberal threshold maximizes the total number of matches.

388. The probabilistic approach has several significant advantages in terms of its potential for application in settings with limited or unknown data quality, the statistical precision of its results and the cost-effectiveness of its implementation. That method has been used successfully in several studies using health system databases till date as documented in a systematic review.¹⁰⁵ There is, however, no available documentation on the application of this approach in linking civil registration data with other electronic data sets on vital events. There is a need for standard practical instructions and a guide for its use in record matching to assess completeness of civil registration data, particularly in regard to the procedures for deriving agreement and disagreement probabilities and the overall weighted score for matched pairs. The civil registration and vital statistics quality evaluation should explore the potential for testing

¹⁰⁵ Daniele Pinto da Silveira and Elizabeth Artmann, "Accuracy of probabilistic record linkage applied to health databases: systematic review", *Revista de Saúde Pública*, vol. 43, No. 5 (2009).

probabilistic methods to assess completeness, in terms of the availability of requisite electronic data sources, as well as the availability of statistical institutions with skilled human resources to undertake such research.

(iii) Analytical (indirect) techniques and alternate methods to evaluate completeness

389. A range of alternatives can be used to estimate completeness, where secondary data sources for record linkage are not available. The estimated parameter is the expected number of events in the population, which is used as the denominator to compute the proportion of observed events as the measure of completeness. One approach commonly used to estimate the expected events is to apply a crude vital rate (birth or death rate) from an alternative source, such as a population census or survey, a demographic surveillance site or a research project, to the population.

390. In all such instances, the source of the alternate vital rate is itself potentially subject to incompleteness, or may not be actually representative of the population. For that reason, the estimated completeness from that approach could at best only be an approximation, indicative of the likely performance of the system. Where such alternative empirical vital rates that could be potentially representative of the population are not available, a modelled estimate could be used to compute the denominator of expected events. The United Nations World Population Prospects time series of estimated fertility and mortality rates for all countries may be used for that purpose.¹⁰⁶

391. In addition to record linkage mechanisms, a range of analytical methods are available to evaluate the completeness of child and adult death registration. Those methods essentially involve two approaches. The first comprises comparisons of specific aspects of the data under evaluation (for example the ratio of neonatal deaths to post-neonatal deaths, or the ratio of deaths below the age of 1 to deaths between the ages of 1 and 5) with such ratios from another population with high-quality data and proven accuracy. Such comparison of ratios can identify potentially missed events in specific age groups in the civil registration data under evaluation.

392. The second approach involves methods based on mathematical relationships between age distributions of populations and age distributions of deaths.¹⁰⁷ The methods based on mathematical relationships require information on population distributions by age from one or two censuses, along with information on distributions of deaths by age from death registration. In this family of methods, statistical models comprising mathematical relationships based on specific demographic assumptions are used to estimate an expected number of deaths by age-sex distribution in the population. This estimate of expected deaths serves as the denominator in computing the fraction of deaths that were actually recorded in the population,¹⁰⁸ and in turn that fraction represents the completeness of death registration in the population.

393. In general, analytical methods are far less resource-intensive, in particular since they are applied to available data from existing systems only, without any need to mount additional data collection schemes. At the same time, however, the relevance of some of the demographic assumptions for individual populations (such as constant fertility and mortality for some methods, and absence of migration), together with uncertainty in accuracy of data from death registration systems (such as misreporting of age and reference period for registration data) and in enumerated population from censuses may limit the overall usefulness of such analytical methods based on population and death distributions by age.

394. In developing countries institutional capacity for the implementation of such processes at the national or subnational level is limited. Most important, the outputs of

¹⁰⁶ See <https://esa.un.org/unpd/wpp/>.

¹⁰⁷ See Hill, "Analytical methods to evaluate the completeness and quality of death registration".

¹⁰⁸ Rao and Kelly, "Overview of the principles and international experiences in implementing record linkage mechanisms to assess completeness of death registration".

¹⁰⁹ Christopher Murray and others, "What can we conclude from death registration? Improved methods for evaluating completeness", *PLOS Medicine*, vol. 7, No. 4 (April 2010).

such analysis are inconsistent across populations and over time. Added to which, there is considerable uncertainty in the resulting measures of completeness, estimated to be in a range of plus or minus 25 per cent.¹⁰⁹ In summary, the civil registration and vital statistics quality assessment could consider the application of such analytical methods as an exercise designed to give a rough estimate of the potential completeness more as an indicator of data quality than as a means of deriving adjustment factors to estimate vital rates.

395. As outlined in *Principles and Recommendations for a Vital Statistics System*, Rev.3, the following techniques are available for use if a record linkage exercise is not possible: comparison of trends, comparison of rates, comparison with census results and inclusion of questions regarding registration in surveys and censuses. Overall and disaggregated trends and rates can be compared over time for a broad assessment of the levels of registration and statistical reports from the registration authority to the statistical office. A significant variation over time or across population subgroups may indicate problems of underregistration. While such comparisons provide only a general measure, if large unexpected differences are found, that technique may be useful as a warning that further examination of the data is warranted.

396. Comparing the results of a single census with registered births provides another means of evaluating the completeness of birth registration. In that approach, the number of children under 1 year of age enumerated in the census is compared with the number of live births registered in the 12 months preceding the census, making allowance in the process for the number of deaths of children in that age group during those months. The same approach can be extended to children other than those under 1 year of age. By the process known as "reverse surviving" the number of children under 15 enumerated in a census, the number of live births for the years preceding the census can be derived through the use of a set of mortality estimates. That method makes it possible to derive an estimate of the completeness of the birth registration for a larger number of years. It is also affected, however, by the factors listed. The technique provides only a rough measure of underregistration, since the difference between the data from the census and those from civil registration may be due to a number of factors, including incomplete registration of births and infant deaths, errors in the statement of age of enumerated infants, or census underenumeration of infants. Problems of infant underenumeration and age misstatement, which are particularly widespread in developing countries, may limit the usefulness of this method.

397. A similar analysis can be performed by comparing the number of deaths (and the corresponding age and sex of the deceased) declared in a census with deaths registered in the 12 months preceding the census. That approach is commonly followed when an active search is made of maternal deaths.

398. Lastly, censuses and sample surveys implemented in some countries have included such questions as whether children who are under 5 years of age have birth certificates, and whether they were registered with the civil registration authority; sometimes a birth certificate is requested. Based on the answers, an estimate of birth registration completeness may be derived. Those questions have been included in the multiple indicator cluster surveys supported by the United Nations Children's Fund (UNICEF), the Demographic and Health Surveys programme, and the population census questionnaires used by a number of countries.

399. In addition to factors such as recall bias and the lack of a clear understanding by the respondent of the nature of a birth certificate, it should be noted that registration does not always translate into statistics. There are situations in which vital events are registered but not all the data are compiled into statistics. Accordingly, the measure of

completeness obtained from questions on sample surveys and censuses relates only to registration and not to statistics. That practice is generally not recommended because it is unlikely that reliable estimates will be obtained.

(b) Accuracy of vital statistics (data content)

400. A variety of methods and techniques to assess data content errors will be discussed in this subsection. The techniques will largely be focused on the evaluation of data on live births, deaths and fetal deaths, but additional aspects of vital statistics, such as accuracy of data on causes of death, are also considered.

401. First, data accuracy should be evaluated in terms of the recorded variables for each registered event and the extent of missing variables. The accuracy (or correctness) of the registered spelling of names, age, sex, address and other location variables, dates, and other variables for core topics, as specified in *Principles and Recommendations for a Vital Statistics System, Rev. 3*, such as causes of death, are essential both for the verification of events and for the production of good-quality vital statistics. Data accuracy is best ensured at the point of registration, by the local registrar, paying careful attention to the task of entering complete and correct information. Data accuracy can also be enhanced, however, through secondary data evaluation and verification using alternate data sources for the same individual.

402. At the point of registration, it is possible to ensure data accuracy for several variables by asking the informant to provide any available identification documents for the verification of relevant details, in keeping with the national legal framework. Registration officials should be made aware of the critical importance of the accurate entry of details of all variables. That aspect should be emphasized during training and should also be documented in registration guidelines and reference operation manuals. The guidelines should include clear definitions of specific variables and the range of permissible options, as applicable. Where manual registration processes are in place, the need for legible writing and correct and consistent spelling of names and address variables should be noted. For electronic data capture, data entry should follow similar norms of accuracy and consistency.

403. Several countries routinely apply mechanisms to ensure data accuracy through customized database functions and software programs. Those include functions for the completion of missing variables and for the verification and updating of specific variables. For example, Canada (see box 19) has a routine mechanism for the weekly and annual monitoring of the accuracy of variables to be verified and updated for record duplication, and also for missing, improbable and clearly erroneous data. The accuracy and validation procedures include automated corrections, such as calculating missing age from available information on dates, and the review of microfilm images of physical registration records. The findings from these corrections and updates of missing variables are used to revise vital statistics indicators and estimates. Similar reviews of the data accuracy of specific variables with corrective follow-up are essential to the maintenance of a high level of data quality from civil registration and vital statistics systems.

404. Second, the validity of reported variables needs to be assessed in order to determine data accuracy. The notion of “validity” here refers to the propensity for a recorded data variable to actually be the true or correct value for that variable. Establishment of validity would require the presence of a reference standard for the specific variable in question. Data validity is statistically evaluated using a sample of vital records. The indicators used to measure validity are sensitivity, specificity, and positive or negative predictive values.

Box 19

Canada: Internal review mechanisms for vital statistics

Coverage: Although vital event registration data are received by Statistics Canada on a daily basis, and volumes are monitored on a weekly basis, data are processed on a yearly basis. Once all the microdata for a reference year are extracted, a reconciliation of data holdings takes place. During that step, different sources of data are gathered: the electronic National Routing System messages, digitized images of event registrations, cause-of-death data automatically extracted by cause-of-death coding software, and the highest registration number reported by the jurisdiction. Those are compared in order to determine whether all records have been received. If, for example, there are more records on the cause-of-death coded data than there are electronic death messages for a particular jurisdiction, the jurisdiction is contacted and asked to submit the missing data.

The next step is the elimination of possible duplicates within a jurisdiction, among jurisdictions and over two years of data. Most of the possible duplicates identified through this process, which is based on a set of key fields, can be resolved at the central office, which then cancels the duplicate record. For those that cannot be dealt with in this way, the jurisdictions for which there are duplicate records are contacted and requested to resolve them.

Missing, improbable, and erroneous data: The microdata are then run through a series of validation edits. In the past, erroneous vital statistics records were corrected or verified by manually consulting the digitized image (or microfilm) of the registration to confirm or correct the information in the field which failed the edit. That process is lengthy and labour-intensive.

Where possible, computer programmes are installed to make automated corrections or data conversions for systematic errors, based on information available from other areas of the data. For example, if the age-of-mother field is blank but the date-of-birth field contains data, the age is derived using the date of birth and date of event. In this way such attributes as the parity of the mother can be more accurately verified during the editing stage. Another example is where the province of residence is missing and the postal code is available, the province can be derived from the first letter of the postal code. Certain edits correct errors of logic (for example, to verify that marital status is given as "single" for deaths of children under the age of 15).

The final stage of the evaluation is to assess the value of the corrections on the basis of the precision of the estimates.

Cause-of-death editing is a separate process and a shared responsibility. The three larger jurisdictions maintain their own trained cause-of-death coding staff and code their own data. Statistics Canada provides cause-of-death coding for the remaining jurisdictions. Statistics Canada provides the training for all cause-of-death coders and also conducts a cause-of-death review where invalid cause, rare codes, first time used codes, age and cause correlations, and maternal deaths are reviewed. The review also ensures consistent application of the classification and addresses problems arising with the automated mortality classification system. Validity checks such as age and cause or sex and cause are conducted during the editing process.

405. In addition, data validity is studied by triangulating the civil registration records with other data sources for the same event or variable, taking one source as a reference standard, which can lead through a descriptive analysis of misclassification patterns. For instance, certain variables captured in deaths from civil registration records are compared with information available from deaths in health records. Research studies

can measure the validity of causes of death recorded in the process of death registration, comparing them to causes for the same death that are derived from a detailed review of available medical records for the deceased. The result of such a comparison exercise would be a table showing observed discrepancies and misclassification patterns, and would shed light on the types of variations that arise between certified causes recorded in the process of death registration and actual causes noted in clinical records.¹¹⁰

406. The findings from such research studies carried out to validate causes of death can serve several purposes. The statistical measures of validity and misclassification patterns can be used to derive adjusted estimates of cause-specific mortality rates, which serve as more plausible and relevant data for health policy evaluation and planning. Moreover, the review of death certification practices and of the implementation of coding processes provides useful insight into the nature and design of interventions to strengthen those processes in the routine civil registration and vital statistics system. Lastly, implementation of those studies is of help in the development of standard training materials and protocols and in creating a critical mass of trained human resources, with a view to scaling up best practices for those functions.

407. In its efforts to assess the quality of cause of death statistics, the Bloomberg Data for Health initiative has developed a tool known as ANACONDA, for the analysis of causes of death, and has supported its implementation in the 20 countries participating in the initiative. Further details on the ANACONDA tool are set out in box 20.

408. Third, reliability of the recorded information is yet another dimension of data accuracy. Reliability is assessed through the collection and matching of data variables from an independent data source, and by measuring the agreement scores between the two data sources for specific variables of interest. Assessments of reliability are applied when neither of the two data sources could be considered as a true value or reference standard for the measurement of validity. In some instances, a separate data collection exercise could be undertaken to establish the independent data source. The statistical measures for reliability are measures of concordance, and also Cohen's kappa coefficient, which estimates the chance-corrected agreement between the two data sources. Measures of reliability help to establish the consistency of data collection and com-

¹¹⁰ As an example, see the following study looking at the discrepancies and misclassification patterns observed from a review of registered causes in a sample of deaths in China: Chalapati Rao and others, "Validation of cause-of-death statistics in urban China", *International Journal of Epidemiology*, vol. 36, No. 3 (2007), pp. 642–651.

Box 20

ANACONDA tool: "Analysis of causes of (national) death for action"

With support from the Bloomberg Data for Health initiative, ANACONDA is a tool that performs the calculations needed for a comprehensive quality assessment of cause-of-death data. It automatically generates the figures and tables from which a data-quality assessment report can be written. Countries that integrate ANACONDA into their vital statistics production system can conduct annual assessments of their data at marginal cost. The tool identifies weaknesses in cause-of-death reporting, such as the misuse of certain causes of death, thus enabling a focus on the necessary remedial action. ANACONDA also generates a summary indicator, the Vital Statistics Performance Index (VSPI(Q)), that enables progress monitoring and cross-country comparisons.

Detailed information on ANACONDA can be found at <https://crvsgateway.info/learning-centre/deaths-cause-of-death-statistics/tools-specifically-to-assess-mortality-data-quality-1>.

See also Carla AbouZahr and others, "Mortality statistics: a tool to improve understanding and quality", Working Paper No. 13, University of Queensland School of Population Health, Health Information Systems Knowledge Hub (Brisbane, 2010).

pilation procedures and should be used to evaluate data quality during exercises to triangulate records from different sources for data reconciliation.

409. Data reliability can also be indirectly assessed in terms of the plausibility or consistency of observed patterns of age–sex distributions of vital events when compared with those from populations with similar demographic, socioeconomic or epidemiological profiles.¹¹¹ For instance, plausibility can be assessed by comparing the proportional distributions of components of under-5 mortality, such as neonatal mortality as a proportion of total infant mortality, with similar proportions in historical data from high-quality civil registration and vital statistics systems. Distortions in observed proportions in local data could potentially be due to problems with data completeness or accuracy, and their detection could trigger more detailed investigation and data verification exercises. Similarly, age patterns of distributions of deaths by cause could also be reviewed for their consistency with epidemiological expectations.

¹¹¹ Jané Joubert and others, "Evaluating the quality of national mortality statistics from civil registration in South Africa, 1997–2007", PLOS One, vol. 8, No. 5 (2013).

(i) Relevance of vital statistics

410. In today's world, data on population characteristics and vital events are increasingly being used for government policy and planning at the local level. Small area statistics are best available from civil registration and vital statistics systems with total national coverage, high levels of data completeness and adequate data quality. Such civil registration and vital statistics yield local-level estimates of key statistical indicators with a high degree of precision, as compared with statistics derived from sample surveys whose precision is affected by limited sample size, or indicators derived from routine health sector and other administrative data sources, which are usually biased in their coverage.

411. The limitations of civil registration and vital statistics systems in several countries have resulted in the routine conduct of programmes by international agencies and academic institutions to generate modelled estimates of key vital rates and indicators, including life expectancy at birth, fertility and mortality rates. In general, those statistical models are based on mathematical relationships and time trends observed in historical data from developed countries, with only minimal local data from developing countries. As a result, those indicators have limited validity and political relevance, because they are so weakly anchored in local data.

412. National civil registration and vital statistics systems should strive for the accurate and complete compilation and availability of local data in order to increase the policy relevance of their outputs. That would decrease the need for modelled estimates, or at least would provide better inputs for such statistical models for small-area statistics, much more strongly anchored in local data of good quality. Ultimately, the continued improvement over time in the availability and quality of the data underpinning locally produced empirical vital statistics enables their direct use in development policy, monitoring and evaluation and, in consequence, enhances their relevance.

(ii) Timeliness of vital statistics

413. The importance of data timeliness for policy development and evaluation cannot be overemphasized. The timeliness of data also has an impact on their relevance.

414. Given the extensive administrative and geographical scale of most national civil registration and vital statistics systems, a time lag in the overall compilation and publication of annual vital statistics is inevitable. A margin up to two years for the publication of vital statistics is generally acceptable. Added to which, the observance of regular production intervals in order to attain a time series of vital statistics is also a prerequisite to achieve timeliness.

415. National statistical agencies need time to implement specific data-quality verification and update activities, in accordance with their respective internal audit and field programmes. Allowance must also be made for delayed registrations and for the incorporation of findings from additional procedures, such as the forensic investigation of causes of death. Such time margins vary across different registration units, and statistical offices and must be effectively monitored by the statistical agency, to minimize their impact on data compilation at the national level.

416. Regular monitoring of the interval between the date of occurrence and the date of registration of events can provide useful information on the timeliness of civil registration and statistical reporting. The proportion of total registrations that are delayed—or late— provides a rough but easily obtainable estimate of underregistration in previous time periods. Depending on the length of the delay and the cut-off date for the inclusion of vital statistical reports in statistical tabulations, delayed and late registrations can have a substantial impact on the completeness of vital statistics. Through continuous measurement of the delay between occurrence and registration, it is possible to infer whether the operation of the system is improving or deteriorating.

417. Similarly, delays in the transmission of vital statistical reports to the compiling agency may affect the completeness of annual statistics. Regardless of the size of the country and any difficulties in communications, delays in the transmission of statistical reports should occur rarely, and every effort should be made to ensure that the process is as efficient as possible.

418. Information on late and delayed registrations or on the delayed transmission of information can provide insights into other aspects of the vital statistics system as well. For example, for systems relying on health personnel for the notification of events or for the actual registration of events, a table showing registration or transmission delays by type of place of birth or death (for example, whether a health facility or not a health facility) may provide some information on the degree of cooperation of health personnel in the registration and reporting process.

419. In developing countries, where a considerable proportion of deaths occur without medical attention, arrangements could be set in place for the performance of verbal autopsies and related investigations, including follow-back procedures to trace and link medical records from health facilities attended by the deceased. In such situations, there may be a longer time lag for the incorporation of cause-of-death findings into statistics.

420. As noted above, the computerization of individual records at the point of registration will be conducive to rapid electronic compilation and data management and analysis to meet specific statistical requirements. Generally speaking, time lags of longer than three years decrease the relevance of the data, since revisions may be made to the civil registration and vital statistics system, or, for example, sudden changes may occur in the epidemiological profile of disease prevalence or risk factors in local communities.

(iii) Availability and accessibility of vital statistics

421. The final element in the quality evaluation of civil registration and vital statistics systems is an assessment of the availability of and accessibility to data, both from individual civil registration records and from statistical compilations and aggregated data analyses. In principle, the available data should meet the needs of various sectors, including identity and population management, government planning for housing and education, population health assessment and health services policy, among others. As noted above, *Principles and Recommendations for a Vital Statistics System*, Rev. 3, prescribes a comprehensive and detailed list of vital statistics tabulations that should

be made available on at least an annual basis at the national and subnational levels, as determined in each country. The assessment exercise should verify the availability of those statistical tables in published annual vital statistics reports or on regularly maintained and publicly accessible websites. The availability evaluation should also look at the formats of publicly available data and assess whether they are suitable and friendly for a wide range of users, with needs ranging from the most basic to the most sophisticated. An important criterion for the evaluation of vital statistics is the availability of a time series, in other words, data points available for successive points in time over a considerable period of time.

422. The assessment should also review policies for data accessibility and sharing between the civil registration authority, the statistics office and other government agencies. In some instances, there could be a need to provide access to individual records, including identity and demographic details. Such access is often required for the purposes of verification of identity, to enable the accurate provision of relevant public services, including passports, employment services and other financial and social support services. In addition, there should be clear and public instructions as to how to gain access to anonymized microdata for academic research. Institutional data-sharing policies and agreements should include clauses about data confidentiality and privacy, to prevent data leakage, identity theft and other forms of misuse. Further discussion of this issue can be found in chapter VI.

423. The assessment of availability and accessibility should also consider processes to facilitate efforts by citizens to gain access to their relevant registration documents or certificates from the civil registration authorities. Issues relating to application forms, the submission of supporting documentation and the payment of fees or penalties for obtaining original or additional copies of vital-event certificates, such as those for birth, death, marriage and adoption, should be reviewed as part of the evaluation. Where possible and necessary, the field programmes could also include a set of random interviews with citizens at civil registration offices to ascertain their perceptions and feedback on the quality of civil registration services and their general opinions regarding the ease of obtaining relevant documents and advice.

424. The quality evaluation assessment should also review the availability and accessibility of anonymized microdata from civil registration and vital statistics systems, both for academic research and for policy purposes (for further discussion of this topic, see chapter VI, section C.). These microdata are necessary for a wide range of research topics in the fields of demography, sociology, epidemiology and economics, among others. In several countries, such data are available only on specific request to the national statistics offices, with the request being accompanied by details of the purpose, methodology, expected outputs and potential benefit of the research. The quality assessment should check for the availability of regulations and specifications for such requests and make recommendations to improve the dissemination and availability of microdata, as required.

425. Certain countries routinely release anonymized microdata on births and also on deaths, including coded multiple causes of death, which are of considerable value in public health research. In general, for each individual record in the data set, the availability of geographical location (indicating at least state or province level and whether urban or rural area), along with sex, age, date of birth or death, occupation, and multiple causes of death can facilitate detailed demographic and epidemiological analysis.

¹¹² The quality assessment should review the availability of such services, with the application of appropriate safeguards regarding privacy and data confidentiality.

¹¹² Such data sets, with varying levels of detail with regard to the number and type of variables, have been available in the United States of America since 1959. See United States of America, National Bureau of Economic Research, *Mortality Data—Vital Statistics NCHS' Multiple Cause of Death Data, 1959–2017*. Available at www.nber.org/data/vital-statistics-mortality-data-multiple-cause-of-death.html. Australia provides a service known as the National Death Index, which, in response to research requirements, establishes links between civil registration data and other sources of individual records (for example clinical trial registers) and returns the linked records with desired variables to the applicant. See Australian Institute of Health and Welfare, *National Death Index*. Available at www.aihw.gov.au/about-our-data/our-data-collections/national-death-index.

Chapter V

Integrating civil registration, vital statistics, population registers and identity management

A. Introduction

426. As mentioned in previous chapters, vital statistics and civil registration are separate entities, but it is crucial that they be established, maintained and employed as components of a coordinated and coherent system for registering and producing vital statistics. In addition, the emergence of interconnections between civil registration and identity management systems adds yet another dimension to the structure of the civil registration and vital statistics system. A graphic representation of those relationships and functioning is presented in chapter I, figure 1. Civil registration is defined as the continuous, permanent, compulsory, universal recording of the occurrence and characteristics of vital events pertaining to the population, as provided through decree or regulation in accordance with the legal requirements in each country.¹¹³

It is important to highlight the quality of universality in relation to people's rights regarding the registration of vital facts. Everyone has the right to be recognized as a person before the law, as enshrined in article 6 of the Universal Declaration of Human Rights and reaffirmed in several other global accords and international human rights instruments.¹¹⁴ As civil registration establishes the existence of a person under law, it has traditionally been the fundamental means of granting legal identity. In that regard, laws, policies, rules and regulations must not be a hindrance to the realization of that right. In particular, the registration of events must be performed even if the time frame given by law has elapsed, and regardless of migratory status, citizenship and any other request that may act as an obstacle to registering the vital facts which occurred in the territory. Civil registration is carried out primarily for the purpose of registering vital events and establishing the documents provided for by law. The usefulness of those records as the best source for the production of vital statistics is well established. The procedures for recording vital events are equally important for civil registration as a legal exercise and for vital statistics as a source of statistics; hence the tasks performed by civil registrars and those of statisticians are interdependent.¹¹⁵

427. In a significant number of countries the full interoperability of civil registration, on one hand, and vital statistics, on the other, is not completely assured, yet both components are able to perform their intended tasks in an efficient manner. That model is undergoing significant shifts with the emergence of population registers that require a much more coherent and automated structure. At the current time, in view of the heightened importance of assigning to each individual a unique identity document that would ensure the effectual delivery of services and, at the same time, enhance the identification of individuals for security purposes, and in response to the need to link civil registration, as the entry point for assigning identity documents (birth and death certificates), vital statistics and identity management, yet another model has come into existence,

¹¹³ *Principles and Recommendations for a Vital Statistics System, Rev. 3*, para. 279.

¹¹⁴ 1948 Universal Declaration of Human Rights, arts. 6 and 15; 1951 Convention relating to the Status of Refugees, arts. 25 and 27; 1954 Convention relating to the Status of Stateless Persons, arts. 25 and 27; 1961 Convention on the Reduction of Statelessness, arts. 1–4; 1965; 1969 International Convention on the Elimination of All Forms of Racial Discrimination, art. 5 (d) (iii); 1966 International Covenant on Civil and Political Rights, art. 24; 1979 Convention on the Elimination of All Forms of Discrimination against Women, art. 15; 1989 Convention on the Rights of the Child, arts. 7–8; 1990 International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families, art. 29; 2006 Convention on the Rights of Persons with Disabilities, art. 18.

¹¹⁵ *Principles and Recommendations for a Vital Statistics System, Rev. 3*, para. 274.

¹¹⁶ The three models are presented in chapter I above.

and this makes extensive use of information technology. The present chapter considers the flow of information and accompanying arrangements for each of these three models:¹¹⁶ civil registration and vital statistics as separate components without population registers; civil registration and vital statistics with the use of population registers; and, lastly, the holistic combination of the functions of civil registration, vital statistics and identity management.

B. Civil registration and vital statistics as separate agencies

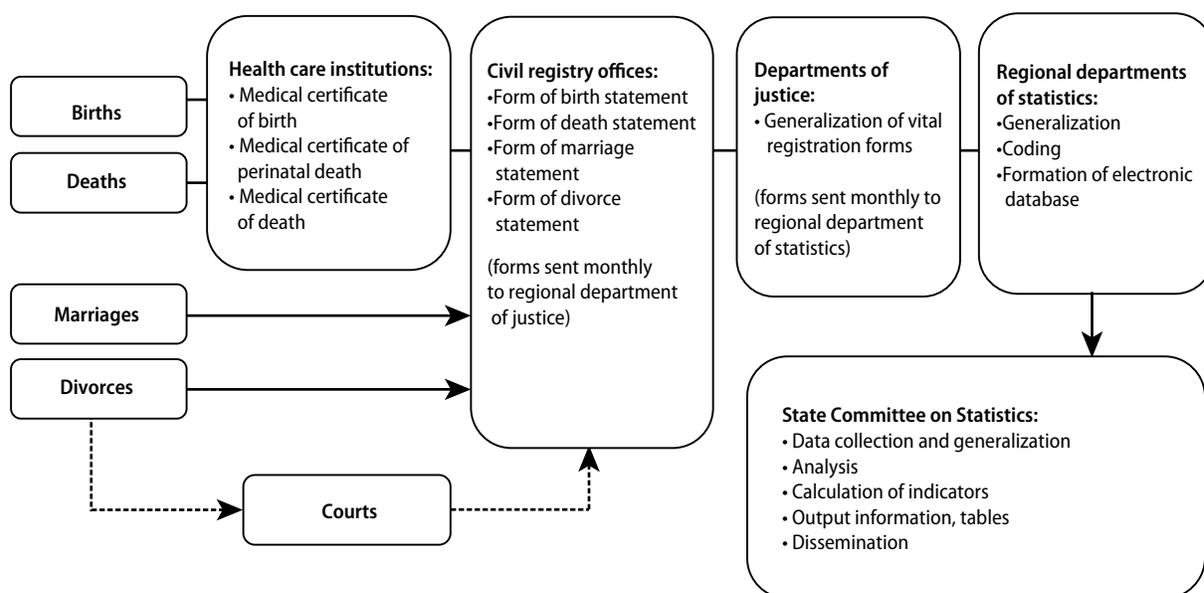
428. In this model, the functions of civil registration, on one hand, and vital statistics, on the other, are delivered by separate agencies, which requires a careful and effective division of labour, along with coordination to ensure the efficient transmission of relevant and accurate information. A graphical example of the division of labour is provided in figure 9. The flow chart or business map is part of the output of a series of regional workshops on the application of *Principles and Recommendations for a Vital Statistics System, Rev. 3*, held by the United Nations Statistics Division in partnership with relevant regional stakeholders.

429. In the case of birth, *Principles and Recommendations for a Vital Statistics System, Rev. 3*, recommends, in paragraph 66, that the following information be collected:

1. Date of occurrence of birth
2. Date of registration
3. Place of occurrence
4. Place of registration
5. Type of birth (single, twin or other)
6. Attendant at birth
7. Name of newborn
8. Sex of newborn
9. Weight of newborn
10. Name of mother
11. Date of birth of mother
12. Marital status of mother
13. Educational attainment of mother
14. Place of usual residence (address) of mother
15. Duration of residence at current address of mother
16. Place or country of birth of mother
17. Children born alive to mother during her entire lifetime
18. Fetal deaths to mother during her lifetime
19. Date of last previous birth by mother
20. Date of marriage of mother
21. Name of father
22. Date of birth of father
23. Marital status of father
24. Education attainment of father
25. Place of usual residence (address) of father

430. In addition to those characteristics—in all, 25 pieces of information, as presented—recommended as core topics in accordance with international statistical

Figure 9
Civil registration and vital statistics systems in Uzbekistan



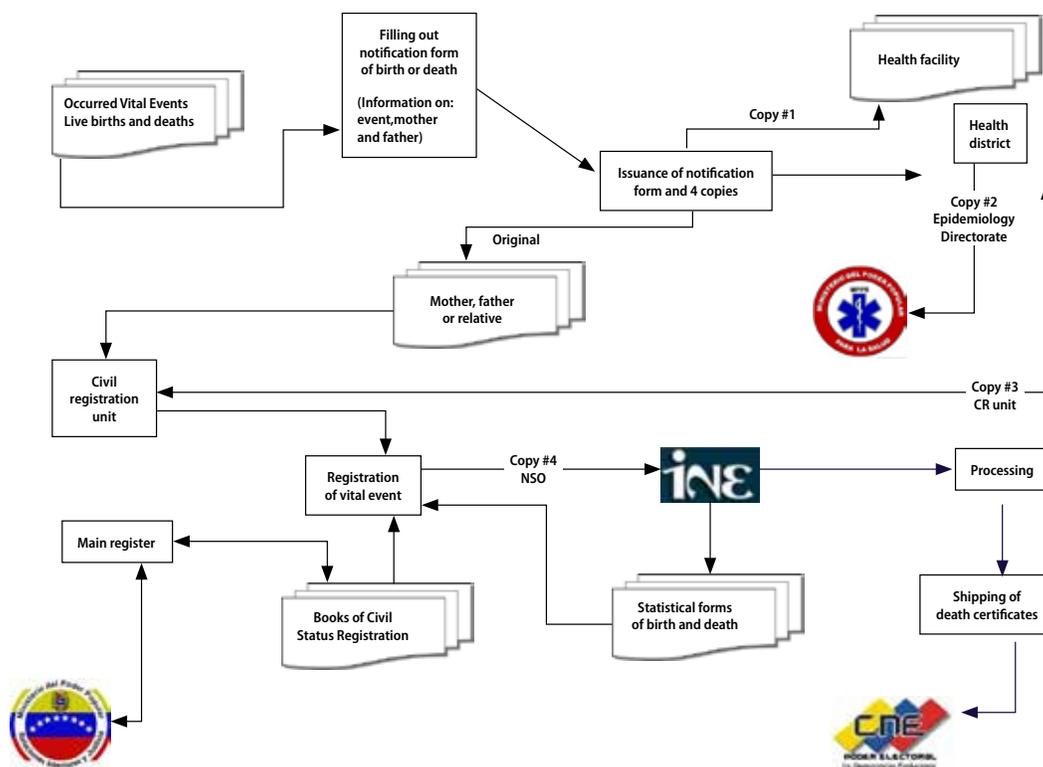
Source: United Nations subregional workshop on applying *Principles and Recommendations for a Vital Statistics System* for implementing the regional action framework for CRVS in Asia, held in Istanbul, 15–18 September 2015. (All documentation is available at https://unstats.un.org/unsd/demographic/meetings/wshops/Turkey/2015/list_of_docs.htm).

standards, other essential pieces of information would have to be collected or assigned, such as the unique identifying number of the event, which usually consists of the civil division code for the locality where the birth occurred, the code for the registration office where it was registered and a set of random numbers. In addition, in a number of countries, supplementary personal characteristics of the mother and the father may be of particular interest, such as literacy, ethnicity, employment and occupation. Public health concerns may also influence additional sets of information that have to be collected, for example, related to gestational age, number of prenatal visits by mother and the exact month of pregnancy when prenatal care began. Thus, the list of information items is comprehensive and necessitates the development of procedures and routines that would ensure the complete and accurate collection of information.

431. Informants (notifiers) play a critical role in collecting the bulk of information. Consequently, a number of countries specifically designate, through the civil registration law, the health institution or its head as responsible for acting as an informant of births, fetal deaths and deaths occurring in the institution. In practice, it is the staff of the health institution that actually collects the information and fills out the form. The form, in turn, may be in a paper or electronic format. If a paper form, once filled, it is submitted to the registrar's office, where verification of the information in the form takes place. The registrar, as an official of the State, has the authority to request identification documents from the parents, and will check whether name, date of birth and address correspond to those provided in the form. In addition, the registrar supplies any missing information in the form by acquiring it directly from the parents, thus ensuring completeness of the collected data.

432. The registrar then makes an official entry in the civil register, including all the information required by law, which usually comprises the names of parents, name of the newborn, addresses, age, marital status and, depending on the country, additional information regarding ethnicity, religion and so forth. Once the official record is

Figure 10
Civil registration and vital statistics systems in the Bolivarian Republic of Venezuela

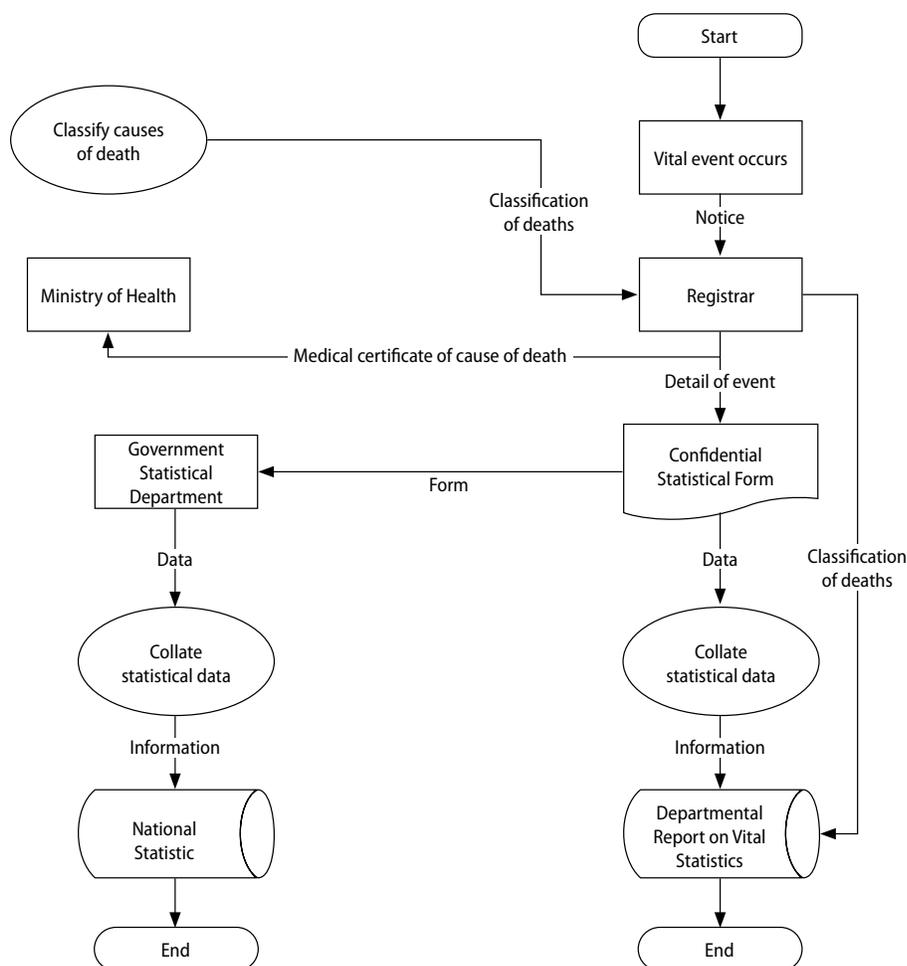


Source: Workshop on the *Principles and Recommendations for a Vital Statistics System, Rev. 3*, for South American countries, held in Santiago, 9–12 November 2015. (All documentation is available at https://unstats.un.org/unsd/demographic/meetings/wshops/Chile/2015/list_of_docs.htm).

entered, the registrar issues a birth certificate to the parents, which represents the seed document for the newborn's identity and ensures that individual access to various services, such as immunization, health care, education and so forth. Country examples of the birth and death registration process are presented in the form of business process maps in figures 10 and 11.

433. As for the form (whether paper or electronic), the registrar is responsible for transmitting it to the statistical authorities. In practice, the registrar's office compiles all forms for a certain period of time, usually one week, and then forwards them as a batch to the regional outpost of the national statistical system. The national statistical system, in most cases, has regional offices that are fully equipped to collect and process data from administrative records, surveys and censuses. In the case of forms in paper, the staff of the regional statistical office then keys the information into a computer file, proceeds with the data processing and coding, runs editing procedures and notifies to the registrar's office any discrepancy identified in the process. In the case of electronic forms, data entry is performed by the registrar; all the other procedures, however, such as coding, editing and others, are administered by the statistical office. Ultimately, digital records for all events are compiled by the central statistical office, where national totals and tabulations are produced. That does not prevent the regional statistical offices from producing the same tabulations for their regional levels.

Figure 11
Civil registration and vital statistics systems in Barbados



Source: Workshop on the *Principles and Recommendations for a Vital Statistics System, Rev. 3*, for Caribbean countries, held in Port of Spain, 1–4 December 2015. All documentation is available at (https://unstats.un.org/unsd/demographic/meetings/wshops/trinidad/2015/list_of_docs.htm)

434. Such an arrangement requires an appropriate administrative set-up for the coordination of activities and the establishment of procedures and protocols to ensure the flow of information and performance by each of the two components of their assigned tasks: that set-up is an inter-agency coordination committee. As the two key preconditions for the reliability of records are completeness and timeliness, achieving those is the committee's primary focus and its membership should include participants from all levels of both the civil registration and vital statistics systems, and also from the health sector. That will ensure an essential insight into the broad and comprehensive use of the information that the registration system provides. The perspective that the committee provides to the system can help focus and direct the agencies involved in obtaining complete, timely and quality data for the registration office. At the committee's sessions, the registration and statistical staff should present and discuss the potential use of the data. The committee should consider the use of data at the local

level for immunization programmes, disease categories and associated illnesses, related health-care needs and services, and available resources. That type of cooperative involvement and information exchange among the various agencies and local registration offices improves data integration. For further information on coordination mechanisms, see chapter II, section C.

435. The inter-agency coordination committee would need to develop and maintain instructions covering such matters as definitions of vital events, coding schemes, generation of the unique identifier, content of the form, statistical definitions of characteristics of the event and the persons involved, training curricula for informants, registrars and statisticians, quality-control mechanisms, field visits, procedures for reporting and recording events, content and format of certificates, transmission protocols, content and periodicity of statistical reporting and all other standardized activities as necessary. That committee is the coordinating body for data items and definitions, for the collection, monitoring, access and use of data and for the legal and administrative functions needed to manage the programmes effectively (see chapter II, box 12 for a few case examples on how this type of committee works).

436. In addition, the creation of working committees for specialized functions should be considered, with a view to maintaining the operational aspects of registration and vital statistics. Such working committees can revise the legal framework, conduct education and communication programmes and enhance the accuracy, completeness and timeliness of civil registration and vital statistics. Subcommittees may be set up to focus on operational aspects of the two programmes, looking in particular at the interaction of staff in the processing of records. Each programme requires access to the vital records in order to complete its respective functions. Delays in reporting, errors and staffing shortages within a particular unit involved in the process could influence each programme's activities. To address such issues, the working committee could establish options for conducting specific processing functions, depending on the issue under review.

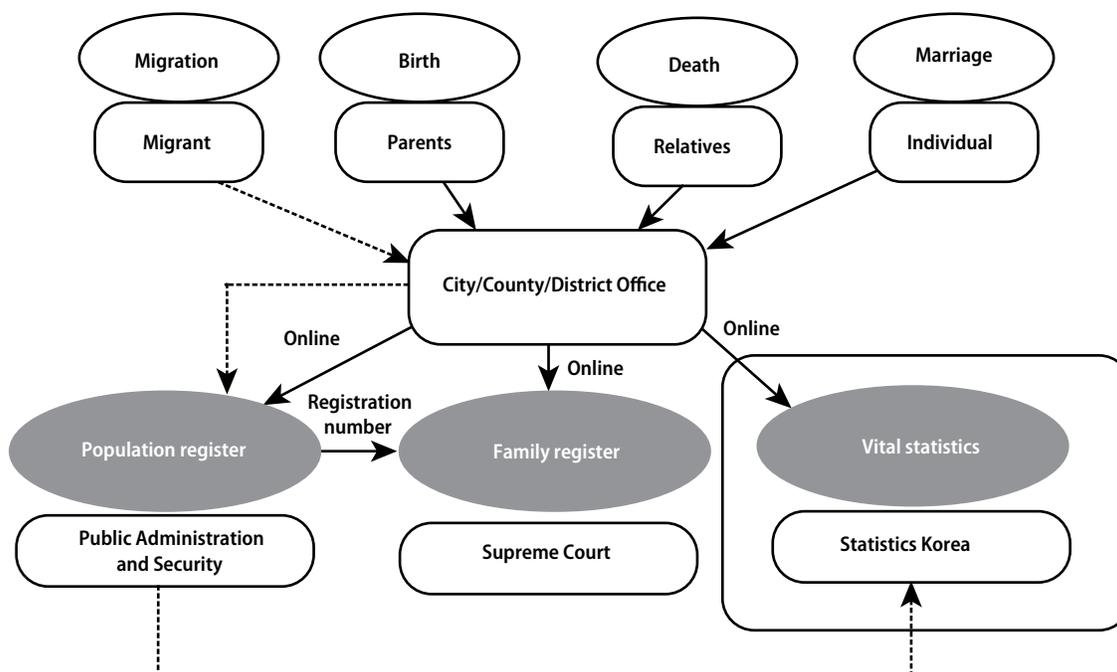
C. Civil registration, vital statistics and population registers

437. With the introduction of population registers as standard government mechanisms, the functional, but not the administrative or institutional, integration of civil registration and vital statistics has been further strengthened and standardized where operational activities are concerned. Nowadays, population registers essentially take the form of computerized databases with a separate record for each individual in the country. The population register can be a centralized database or it can consist of interlinked regional or provincial databases. The agencies in charge of operating and maintaining population registers differ from one country to another. Often that function is assigned to the home affairs authorities and the police. In other countries it is under the responsibility of the tax authorities. There are cases in which the function was initially performed by the national statistical office, then moved to an agency that has more direct access to the population. Figure 12 illustrates how the division of labour works in the Republic of Korea.

438. The primary function of the population register is to provide reliable information for the administrative purposes of government, in particular for programme planning, budgeting and taxation. The registers are also useful in other administrative areas, such as establishing personal identification, voting, education and military service, social insurance and welfare, and for police and court reference.¹¹⁷

¹¹⁷ *Principles and Recommendations for a Vital Statistics System, Rev. 3*, para. 455.

Figure 12
Civil registration and vital statistics systems in the Republic of Korea



Source: Expert group meeting on the management and evaluation of civil registration and vital statistics systems, United Nations Headquarters, New York, 20–24 February 2017. All documentation is available at <https://unstats.un.org/unsd/demographic-social/meetings/2017/new-york-egm-on-management-and-evaluation-of-crvs-systems/>

439. In practice, population registers nowadays rely on a robust computer structure designed to meet the essential uses presented above. They are not specifically designed either for civil registration purposes, or for the production of vital statistics; hence they must be specially adapted for these functions, so that they are compatible with all the mechanisms involved.

440. Where the population register is concerned, the first step is to ensure that all the definitions used are identical to those used in both the civil registration and statistical components. That requirement will necessitate harmonization measures that might not always be straightforward. For example, the population register definition of a resident may require that a certain period of time—three months, for example—is spent in the country for a person to be entered in the register. In the case of a newborn infant who died after a few weeks, the requirement would not be met and would, in turn, necessitate the development of particular protocols to deal with such occurrences.

441. In this model, the process is very similar to that outlined in the previous subsection. The informant fills out the form, in either electronic or paper format, which includes all the required characteristics (see para. 431) and submits it to the registrar. The registrar verifies the information, assigns the PIN that will follow the newborn throughout her or his life, issues the birth certificate and makes an entry in the population register. Entries may be made online or uploaded in batches, depending on the computer infrastructure designed to hold and maintain the population register.

442. The content of a specific population register varies from country to country. It always includes the names of the individuals and of their parents, their date and place of birth, their address, their PIN and the unique civil registration record identifier.

443. It is important that the population register be organized as a set of databases linked by a unique identifier, ideally the PIN. Thus, there would be a master database containing all the PINs. Then another database would contain names, addresses, places and dates of birth. Another would contain the characteristics of the event, in this case birth, including the unique civil registration record identifier, and this database would double as a civil register, which could be used for amendments such as adoption and recognition. Yet another should contain other characteristics, including those relevant for the production of vital statistics. Another would contain the causes of deaths. Each database would be indexed with the use of PINs, with provision for the extraction of short-form or longer certificates, as needed.

444. In that set-up, the national statistics office would be authorized to have access to the population register for the purpose of extracting records and variables necessary for the production of regular and accurate vital statistics.¹¹⁸ The frequency of such access and the material to be extracted should ideally be spelled out either in the law governing population registration or in the law on statistics or related regulations. In principle, the statistical component does not need access to all the information in the population register, such as names, for example. A unique identifier must, however, be made available to statisticians, so that errors and inconsistencies in the processing, editing and aggregating of records can be identified and then reported back to the institution responsible for maintaining population registers. For further details on how the population register functions in Norway box 2 in chapter I, box 2, and box 21, which follows.

445. Integrating the processes of civil registration, the maintenance of population registers and the production of vital statistics results in a dynamic mechanism that is updated on a daily basis, with routine operations encompassing all three components, from the issuance of birth, death and marriage certificates to the processing of individual information for administrative purposes, and generating regular and timely vital statistics. The successful outcome of such integration also significantly reduces the costs of all three functions in the long run, and savings are reflected in the short term as well. From the point of view of service delivery, such a mechanism will afford individuals much faster and more comprehensive access to various documents necessary for daily tasks in present-day life.

446. As noted in chapter I, the linkage of the population register with the civil registration system makes it possible to reconstruct the history of an individual's life events. Provided that the date of the events is properly recorded, that high level of detail can be used also for estimation both of the duration of a demographic state (such as the state of "married" or "parity one", and so forth) and of the related probabilities of transition, and also for longitudinal studies. In addition, it may enable the definition of specific geographical aggregates of interest, such as population living in coastal areas, or in certain disadvantaged localities, whose boundaries do not necessarily conform to the administrative boundaries.¹¹⁹

447. The confidentiality of individual information is of paramount concern and one of the basic principles underlying all three components: civil registration, the population register and vital statistics. Thus, strict and unambiguous procedures and rules designed to ensure the confidentiality and protect the privacy of the information contained in the population register have to be part and parcel of the law regulating the use and maintenance of population registers. The law should also stipulate the punishments incurred by government officials who fail to protect confidentiality or unduly disclose private information.

448. In conclusion, making the civil registration system a vital component of a computerized population register would offer the most appropriate and advanced means of gen-

¹¹⁸ See "Register-based statistics in the Nordic countries" (United Nations publication, Sales No. E.07.II.E.11). Available at <https://unstats.un.org/unsd/dnss/docViewer.aspx?docID=2764>.

¹¹⁹ Other significant advantages of this model include the wealth of longitudinal information critical for researching and understanding population dynamics and structure, migration and a number of other demographic and social phenomena; these are not discussed here as the focus of the present chapter is on the operational structure. See *Principles and Recommendations for a Vital Statistics System*, Rev. 3, para. 479.

erating relevant, accurate, timely and comprehensive vital statistics. While building such a system would initially be resource-intensive, it would pay dividends over a prolonged period of time.¹²⁰

¹²⁰ *Ibid.*, para. 484.

D. Civil registration, vital statistics and identity management

449. In principle, identity is an individual's self-awareness. As such, identity can have numerous dimensions, or layers, including cultural, ethnic and religious, and they can evolve and change over time. In modern societies, however, and the manner in which they function, it is the individual's legal identity that counts, as it is the one that provides access to services, the exercise of rights and entry into the legal framework. Thus, in this context, "identity" refers to that dimension of the term established by issuing a birth certificate, with the newborn's name, date and place of birth and parents' names, in other words, official certification of the occurrence of the event and the persons involved, and the identity is withdrawn upon the issuance of the death certificate of that person (by flagging it or changing its status from "living" to "deceased").

450. As presented in the documentation collected for the purpose of monitoring the state of the art of civil registration and vital statistics worldwide,¹²¹ the number of individuals without a basic birth certificate is considerable because of the lack of civil registration services or the incomplete coverage of such services in their respective countries. As noted above, it is important to highlight the quality of universality in relation to people's rights regarding the registration of vital facts. As established in the 1948 Universal Declaration of Human Rights and reaffirmed in other global accords, every person has the right to be recognized as a person before the law and, as civil registration establishes the existence of a person under law, it has traditionally been the fundamental means of granting legal identity. In that regard, laws, policies, rules and regulations must not be a hindrance to the realization of this right. In particular, the registration of events must be performed even if the time frame prescribed by law has elapsed, and regardless of migratory status and any other request that may act as an obstacle to registering the vital facts that have occurred in the territory.

¹²¹ Further information on this matter may be found on the website of the United Nations Statistics Division, available at http://unstats.un.org/unsd/demographic/CRVS/CR_coverage.htm.

451. The problems experienced in attempting to govern without a comprehensive understanding of the size and structure of their populations and without assurance that services are being delivered to the people for whom they were intended forced many countries to give much more careful attention to the task of issuing identity documents to everyone in the population. In addition, the sharing of resident information makes possible the provision of joint services from multiple government agencies and reduces the time spent reviewing and verifying identity and resident information. Information-sharing systems help governments to enhance their capacity to meet citizens' needs with targeted solutions.¹²² Awareness of that benefit has prompted governments to establish a special agency entrusted with issuing identity documents to every individual in the country, with unique identifiers, such as photographs, fingerprints and other biometric characteristics.

¹²² See Proceedings of the International Identity Management Conference, Seoul, 23–25 September 2014, available at https://publications.iadb.org/bitstream/handle/11319/7125/International_Identity_Management_Conference_Proceedings.pdf?sequence=4.

452. Civil registration—in other words, the recording of vital events of individuals and ascertaining their occurrence through the issuance of certificates—forms the basis for the legal or civil identification of individuals. Thus, the most pressing first steps that those identity-management agencies have to take is to integrate the civil registration function into their work. In that process, the civil registration operations are not significantly changed in any substantive manner: the submission from the informant to the registrar remains as before, as do the processes of official certification and

Box 21

Norway: Administrative and statistical databases and registers

The Norwegian Tax Administration has been hosting and running the country’s central population register since 1991, when it was transferred from Statistics Norway (Statistics Norway established the original register in 1964, see Box 2).

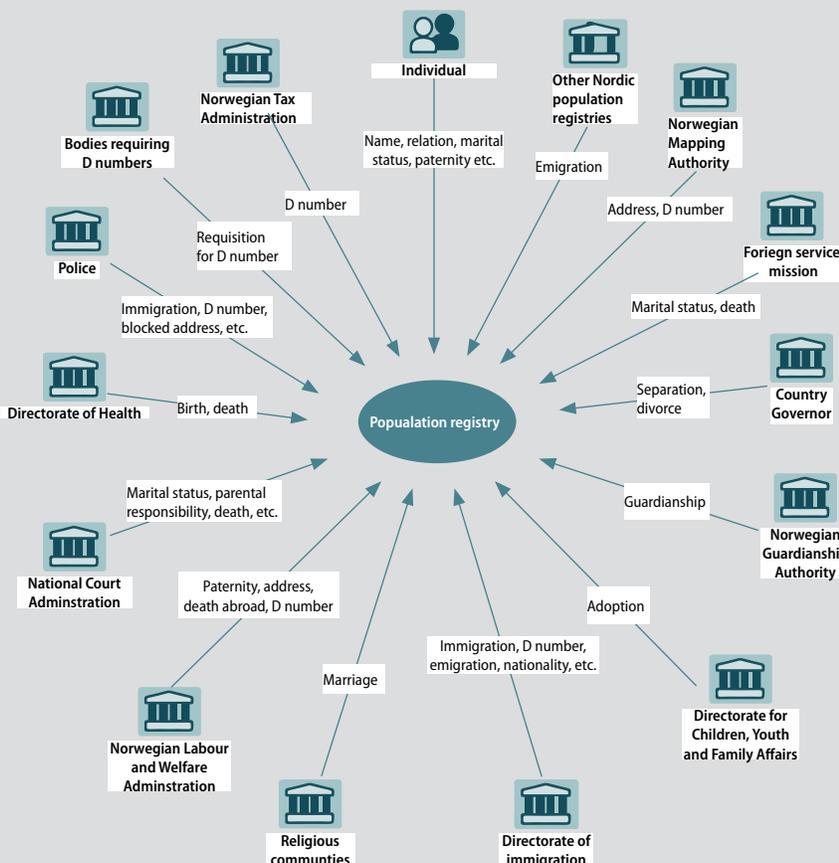
The two figures below show the flows of data on individuals to and from the Central Population Register of Norway. The entity at the middle of both figures, “Population register”, functions both as the central register of civil events in Norway and as the country’s population register. Thus, civil registration and national identity management are fully integrated. Births to residents of Norway and new immigrants are assigned PINs. Residents who die or emigrate are not physically removed from the register, but their codes are changed from “Resident” to “Dead” or “Emigrated”.

The first figure shows that the population register receives microdata from many public institutions on births, deaths, internal and external migrations, marriages and divorces, adoptions, address changes, name changes and other events. It should be noted that the population register does not receive any microdata from Statistics Norway, in keeping with one of the fundamental principles of statistics, that the statistical agency shall not distribute data that can be used to identify individuals.

The second figure shows the public and private institutions to which the Norwegian Tax Administration distributes microdata. Statistics Norway is one of the most important recipients and users of these microdata, together with health and educational institutions, police, army, electoral register, banks and other bodies.

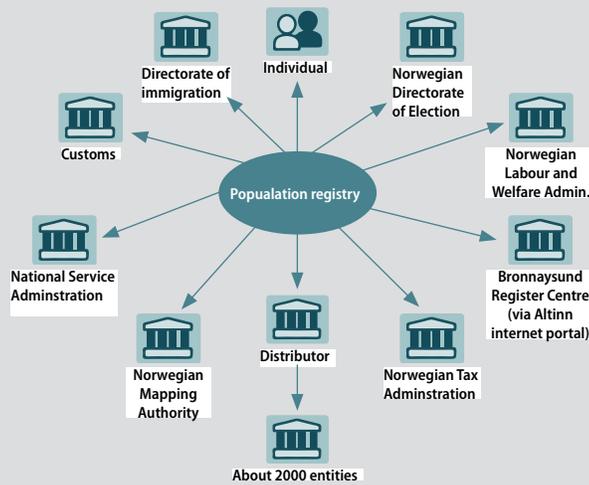
The task of sharing the microdata is not performed by Statistics Norway but rather by the owner of the administrative register, the Norwegian Tax Administration. Statistics Norway may, however, share anonymized data on individuals if it is approved by the data inspector.

Figure A
Data flows to the Central Population Register



Notes: A national identity number is assigned to everybody born in Norway or who settles in Norway for more than six months. It consists of 11 digits, of which the first six digits indicate the date of birth. D numbers are temporary identification numbers assigned to persons who do not live in Norway but are working in the country for less than six months or who have other economic relations with the country, such as owning property or paying taxes.

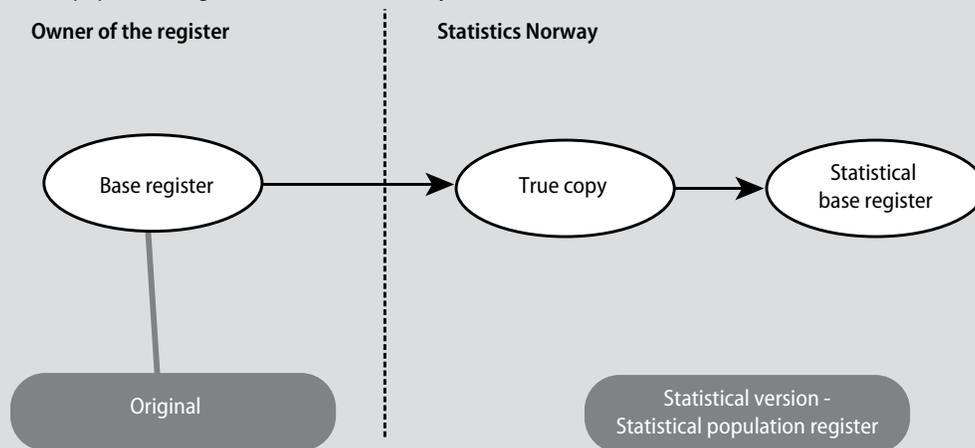
Figure B
Data flows from the Central Population Register



Statistics Norway receives updates on vital events and other changes in the register every night, five days a week, following the same routine as many other users of the population register that need daily updates for administrative purposes. Every morning, Statistics Norway staff verify the updates received.

The diagram below shows the relationship between the administrative and statistical population registers. Statistics Norway maintains two versions of the population register:

- True copy of the administrative register
- Separate statistical population register, in which internal adjustments and amendments are made and saved



The key reason for that approach is that the administrative register is incomplete and may include errors and other shortcomings, such as missing data. Statistics Norway has access to many other administrative data sources and can link them to the copy of the central population register to check for possible errors. The information cannot be shared with the Tax Administration without permission from the owners of other sources for confidentiality reasons, but it still has an impact on the quality of the statistics produced. Statistics Norway may report faulty microdata (including the PIN) back to the Tax Administration or any other register owner, as this may be considered a complaint regarding the quality of the data. The most important aspect of the statistical population register is that it has been supplemented with other relevant data from internal sources, which makes it a prime source for statistics production.

issuance of a certificate. In that model, the identity management agency becomes the custodian of the population register, described in section C.

453. While the integration of civil registration and identity management functions was fairly straightforward and uncomplicated, incorporation of the vital statistics component represents a rather more difficult process. That is partly because the national statistical system, of which vital statistics forms part, is administered by the national statistical office, an institution of long standing with a specific role in the government structure. For a variety of reasons, primarily the incomplete coverage of civil registration, the national statistical office traditionally relied on other sources of data to generate vital statistics indicators. Where the identity management agency is concerned, the generation of vital statistics was not a priority. Rather, every effort was made to use contemporary technology to issue biometric identity cards to every individual, with a focus on national security and law enforcement.

454. Integrating the vital statistics function in that model, in a holistic and routine manner, is an essential prerequisite for making the system efficient and comprehensive. As described above, the informants and notifiers should be trained and equipped to collect all the characteristics prescribed by international standards; the registrar must verify and certify the content of registration forms and ensure their entry in the population register databases. The central statistics office must adjust and develop routine procedures for extracting data from the identity-management system and the civil registration database in order to generate complete, accurate, reliable and routine small-area vital statistics. As that model is now implemented and functioning in an increasing number of countries, the benefits to the population that it serves and the easy availability of identification documents that afford access to various services and enable the government to develop with precision the types of social services needed for their respective jurisdictions clearly and unambiguously indicate the appropriateness and efficiency of this paradigm.

455. Care must be taken to maintain the equal standing of the various components of the system: in other words, civil registration is the building block that must continuously feed information on vital events on the one hand to the identity management system for it to maintain its relevance and, on the other hand, to the statistics office in order to produce tabulations, rates, ratios and other figures that guide policy formulation. Those components should provide feedback to one another in a virtuous circle of improvement. Figure 13 depicts an example of the division of labour following this paradigm. This process map is one of the outcomes of a series of regional workshops on the application of *Principles and Recommendations for a Vital Statistics System, Rev. 3*, held by the United Nations Statistics Division in partnership with relevant regional stakeholders.

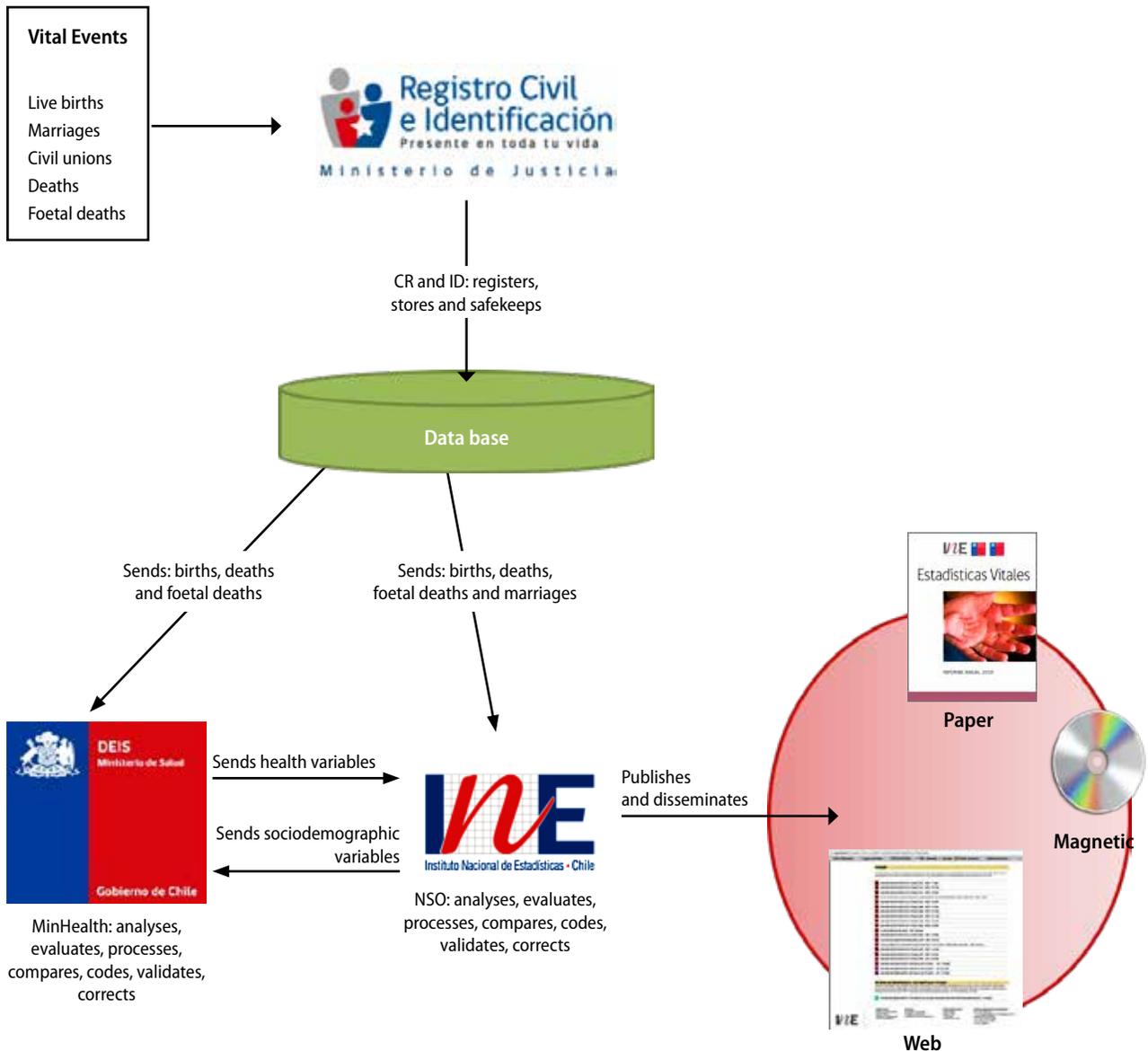
456. The unified system also has the advantages of being conducive to smoother registration procedures, making the system more cost-efficient and being more accessible to the public. When looking at ways of streamlining processes, cutting red tape and improving services, countries must seek opportunities for collaboration among agencies and with all levels of government. That is the case of service bundling, often with civil registration at its core. Box 22 presents an example of that practice in Canada, which takes advantage of a seamless integration of identity management, civil registration and vital statistics. Another example of that integration effort is presented in box 23, with the case of Uzbekistan.

457. Many countries¹²³ have integrated their civil registration, vital statistics and identity management systems. An important advantage of this model is that it makes it easier to assign a PIN at birth, rather than requiring people to attain a certain age

¹²³ Examples include Bhutan, Botswana, Mongolia and the Nordic countries, among others.

in order to obtain an ID card (usually set the ages of 15, 16 or 18). Late assignment of PINs makes it harder to capture children who die before the threshold age and to link their deaths to other data sources, such as the population register. Introduction of a PIN at birth increases the registration coverage of infant deaths and improve estimates of infant mortality.

Figure 13
Civil registration and vital statistics systems in Chile



Source: Workshop on the *Principles and Recommendations for a Vital Statistics System, Rev. 3*, for South American countries, held in Santiago, 9–12 November 2015. All documentation is available at https://unstats.un.org/unsd/demographic/meetings/wshops/Chile/2015/list_of_docs.htm.

Box 22**Canada: Service bundling and integration**

Service bundling enables various federal and provincial departments to improve services to clients by delivering programmes without developing completely separate systems for each programme. For example, when parents fill out birth registration forms, they can indicate whether or not they would like to apply for a social insurance number for the newborn and for federal benefit programmes to which they may be entitled. That information is captured by the provincial register as part of the registration process and is then automatically distributed to the appropriate federal government department through the National Routing System. That integrated service motivates early birth registration and has proved popular with parents as they have to provide the information only once in order to register their child's birth and to gain access to key federal services.

Service Canada also uses the National Routing System to validate birth certificate information submitted in support of a social insurance number application. That reduces the potential for fraud, as the information that is on the birth certificate must match the information in the provincial civil registers. Federal departments enjoy cost savings and are assured of the integrity of the information as it is provided directly by the provincial issuing authority.

The Canada Revenue Agency and Service Canada also receive timely death notifications through the National Routing System. Both organizations rely on these data for the integrity of their programmes. Where the Canada Revenue Agency is concerned, these data help to reduce overpayment of benefits. Similarly, for Service Canada, the integrity of the data that are maintained in the Social Insurance Register is enhanced to reduce overpayment by programmes that rely upon that information, such as the Canada Pension Plan. Receipt of death data also serves to trigger survivor benefits.

Box 23**Uzbekistan: Electronic archive of the Registry Office**

Since January 2014, Uzbekistan has operated a consolidated electronic archive for its registry office system. The registry office bodies at subnational level furnish information on civil status (for example, birth, marriage, divorce, death) to the State Personalization Centre, under the central Government, which subsequently assigns a personal (ID) code.

Passports and other documents of citizens of Uzbekistan should include that ID number, in compliance with the national legal framework and conformity with the standards of the International Civil Aviation Organization (ICAO) for machine-readable documents.

In order to ensure accuracy of the entered data, the State Personalization Centre provides access to the database of biometric passports. With the use of that mechanism, the registry office bodies can instantly verify information and fill out forms with the necessary data about individuals.

In parallel, birth and death registration information is also provided to statistics bodies at the subnational level.

Lastly, death registration information is relayed to the Pension Fund under the Ministry of Finance for the purpose of removing the deceased persons from the list of pension beneficiaries

Chapter VI

Application and use of civil registration and vital statistics information

A. Introduction

458. The present chapter covers such topics as the use and application of civil registration information and records, and of vital statistics and data, including total counts, tabulations, rates, ratios and microdata. In particular, a distinction is made between use within each system (registration and statistics, respectively), and use for applications outside the system. External applications of civil registration information and vital statistics include data sharing with both public and private entities. Thus, heightened importance must be placed on confidentiality issues.

459. As noted earlier in this handbook, vital statistics and civil registration are separate entities, but it is crucial that they be established, maintained and exploited as components of a coordinated and coherent system for registering and producing vital statistics. In addition, the emergence of interconnections between civil registration and contemporary identity-management systems adds yet one more dimension to the structure of the civil registration and vital statistics system. A graphic representation of these relationships and functioning is presented in chapter I, figure 1. Civil registration is defined as the continuous, permanent, compulsory, universal recording of the occurrence and characteristics of vital events pertaining to the population, as provided through decree or regulation in accordance with the legal requirements in each country.¹²⁴ It is important to highlight the quality of universality in relation to people's rights regarding the registration of vital facts. In this regard, laws, policies, rules and regulations must not be a hindrance to the realization of this right. In particular, the registration of events must be performed even if the time frame given by law has expired, and regardless of migratory status, citizenship and any other request that may act as an obstacle to registering the vital facts occurred in the territory. Civil registration is carried out primarily for the purpose of establishing the documents provided for by law. The usefulness of those records as the best source of vital statistics is well established. The procedures for recording vital events are equally important for civil registration as a legal exercise and for vital statistics as a source of statistical information; hence the tasks performed by civil registrars and those of statisticians are interdependent.¹²⁵

¹²⁴ *Principles and Recommendations for a Vital Statistics System, Rev. 3*, para. 279.

¹²⁵ *Ibid.*, para. 274.

B. Application of civil registration information

460. The information collected through the civil registration system can be used to assess performance, support managerial decision-making and management structure development and organize the operational workflow between different programme functions. In both centralized and decentralized systems, each of those activities will yield relevant information from the programme.

1. Applications within the registration system

461. The uses of registration information in the three different areas described in the present subsection are all intra-agency applications, either within the registration programme or outside the programme, but within the agency. The information may be descriptive or qualitative, or may consist of frequency counts of vital events reported and registered. Such properties as its completeness, quality and reliability are critical to the usefulness of the information. Where any of these aspects raise concerns, steps should be taken to resolve them.

(a) Assessment of civil registration performance

462. A number of activities are carried out in the registration programme to establish performance standards. These relate primarily to services provided to the public but may also include internal programmatic activities. Where public services are concerned, the availability of the information for issuing certified copies of records, the process for amending records, the time period required to provide those services, the waiting time in the civil registration office, and the number of times that a user has to go back to the registration office in order to have a request fulfilled are all essential measures of performance.

463. Other public services that reflect performance include making changes to records, maintaining the proper documentation for changes that are made and following legal standards in making the modifications. The ability to complete, document and record the legal basis for making changes to records is a measure of performance. As described in earlier chapters of the present handbook, changes necessitated by adoptions, legitimation and paternity issues and those involving such items as name, date of birth and residence all require documentation, court orders or other administrative approvals. Such documentation should be retained in case questions arise at a future date. The record itself should contain proper citations of the legal basis for the changes to the record. The civil registration programme is considered to be at a satisfactory performance level when each of those elements is in place as an integral and routine part of the registration services provided to the public, both centrally and at the local registration offices.

464. Some internal registration activities also benefit from the information contained in registration files. The completeness, accuracy and reliability of the information reflect on the performance of the programme units responsible for those components. Deficiencies in these areas can jeopardize the results for other registration activities. In the case of an adoption, the original birth record must be registered and the information regarding the biological parents must be accurate and complete. Performance here affects not only the adoptee and adopting parents but also the adoption unit in the registration programme. The performance of the unit would be rated harshly in the case of misplaced, inaccurate or incomplete information.

465. The number of double registrations must be kept to a minimum. A central database containing all registrations of vital events in the country, or the creation of a number of linked databases are effective means of preventing double registrations (both intentional and inadvertent). One of the most common uses of civil registration records for assessing performance is the matching of the death of an infant to the infant's corresponding birth registration. This has a twofold objective: first, to evaluate completeness of the birth registration and, second, to flag the birth record in order to prevent its subsequent fraudulent use.¹²⁶ Other internal activities on which civil registration performance are rated include the vital event index registers, which affect the capability to search for and retrieve records; record matching for purposes of incorpo-

¹²⁶ *Ibid.*, paras. 580–582.

rating amendments and corrections to the original records; and the verification of registered events for legal or administrative purposes. The last of those relates to services provided to other programmes or agencies that may receive requests for health, social or economic benefits. The ability to provide such services is a measure of the quality of the performance of units within the registration programme.

466. Public service functions are primary objectives. The extent to which these objectives are accomplished yields performance indicators of the registration programme. Periodic user satisfaction surveys represent a key tool for assessing registration performance and an excellent source of information on user needs and expectations.

(b) Management decision-making and structure

467. The information derived from registered vital events can support administrative decisionmaking and policy and planning activities within the agency responsible for the registration programme, at national, subnational and local levels. Registration data provide insights into the sources of reporting and the possible need for training or other resources. Significant increases in vital events may require a redistribution of staff resources, funding support or the establishment of additional local registration sites. Proposals for legal or procedural changes in registration functions can be initiated through the administrative process. Those proposals are based on information received on changes in vital events reporting, changes to the reporting period between the occurrence of a specific vital event and the date of registration, or changes in definitions of events or supporting documentation for modifications of records.

468. Outside the registration programme, registration information from local offices can be used for administrative policy and planning at the local level. It can be used to plan in respect of health care needs and resources for specific health facilities, geographical areas or population groups. Administrative decisions in the conduct of programmes such as those relating to maternal and child health, family planning, adolescent health and acute and chronic diseases draw on the registration information to assess the current impact of existing programmes. This information can also signal the need for the development of new programmes.

469. The requirements for managing an effective registration programme are based in part on the information from the programme itself. Administrative decisions determine priority service areas and functions. Those priorities, in turn, require a management structure for performing the programme activities necessary to accomplish them. The internal programme structure is heavily dependent on management approaches to the performance of specific functions and activities. Each of those functions and activities is identified, along with staff, equipment, resources and relationships with other programmes. When legal changes cause delayed registration or large increases in requests for registration services, or new programmes for public service benefits are implemented that require additional registration documentation, the organizational and management structure are seriously affected. Advance information from the registration units responsible for those activities can guide the management in its work to arrange and structure necessary resources to meet these needs.

470. Relationships with other programmes within the agency, but outside the registration programme, also have significant implications for the management. In order to provide information to those programmes, the types of data and the information network required to support them are the management's responsibility. Drawing on the information from the registration programme relevant to the specific programmes and activities being addressed provides the proper structure for managing data and information requests. Such programmes would benefit from information on vital

events registered by type of event, location, volume, reporting source and health-care providers. Access to that information from programmes outside the registration system requires a well-managed and well-organized internal structure that can direct the proper resources to meet these needs.

(c) Operational workflow

471. Daily registration operational activities rely on information related to record volumes, number of requests for registration services, coding, data entry, validation, record changes and updates. To assign appropriate resources for the conduct of those activities in an effective and timely manner, information from the various organizational units is essential. The number of records received by type and the processing needed before the records can be shared with other registration units set the framework for all other activities. The initial review, logging, recording and entering of the records is followed by their distribution to other units for their use. The type of record, birth, death, fetal death, marriage or divorce determines the time period required for each unit to complete its function, since the volume and number of data elements included in the records differs, and this affects the workflow. Fewer data items require less time for coding or data entry and validation. Birth records, for example, require a greater amount of processing and services than fetal death records. Each characteristic helps determine the workflow between the various units.

472. When a well-organized record-management system among units is in place, the information from the system defines which type of records is to be processed by which units for a specific time period. The workflow and the processing methods for birth records, for example, determine how soon records are available for adoption, legitimation and paternity modifications. The priority level for those areas determines the resources allocated to the initial birth record-processing activities. A high priority would require more resources to ensure that birth records were available on a timely basis. A low priority would suggest that other records, such as deaths, would receive more processing resources. The major factor determining the operational structure to meet established priority needs is the information coming from the registration programme. Without the use of this information, the capability to establish an efficient and productive programme is minimized. The impact is not limited to the registration programme: it also affects the other programmes in the agency that rely on those records for their activities and functions.

2. Inter-agency applications of civil registration information

473. The extent to which information collected through the civil registration system can serve other government agencies, professional organizations and voluntary health or social groups depends on the data items that vital record and statistical forms contain. Prior determination of the anticipated use of registration information establishes the baseline; major areas that rely on registration information include identity management and population registers, health and social services, selected health-oriented registers, electoral rolls, passport, visa and citizenship services, and certain legal functions. Figures 1 and 2 in chapter I provide a graphic illustration of inter-agency interaction. The objective of the national coordination committee is to study particular challenges, make decisions and take actions to facilitate the use of civil registration information among agencies.

(a) Identity management and population registers

474. The process of building a holistic system that encompasses civil registration, population registers, identity management and vital statistics was elaborated and pre-

sented in detail in chapter V. The main focus of the present subsection is to consider how the civil registration systems support the building, maintenance and operation of identity-management systems and population registers. The key attributes of a holistic system are described in the following paragraphs.

475. *Interoperability*: Interoperability is critical to the civil registration, population registers, identity management and vital statistics system, and it must be incorporated from the very beginning. Interoperability refers to the system's capacity to develop interfaces that fully communicate among themselves in the process of its operation. Civil registration is the building block that must continuously feed information on vital events, on the one hand, to the identity-management system for it to maintain its relevance and, on the other, to the statistics office for it to be able to produce vital statistics that guide policy formulation. Within the identity-management system, a major use of civil registration information is the issuance of passports; an example of this interaction is described in box 24.

476. Where civil registration and identity management are concerned, interoperability refers to the ability of different registers and databases to communicate with one another, on the basis of a unique identifier, definitions and classifications, subject to restrictions in terms of security and legal protection of confidentiality and privacy of information. Restrictions must be balanced with international agreements about data sharing, in particular where data sharing between agencies may be required to monitor disease outbreaks, in particular those which, pursuant to the International Health Regulations, are to be communicated to WHO. For example, death notification data received by civil registration or a health agency may be critical to the detection, monitoring and containment of a disease outbreak. The inter-agency coordination com-

Box 24

Canada: Civil registration and passport issuance

Passports are issued by the federal Government through the passport office, called Passport Canada. In 2011, Passport Canada attended the annual general meeting of the Vital Statistics Council for Canada in order to consult the Council on proposed changes under consideration for passport issuance. To enhance the security and integrity of Canadian travel documents, Passport Canada suggested limiting what constitutes acceptable proof of citizenship for a general passport application to a copy of the birth certificate issued by a provincial or territorial registrar or a certificate of citizenship. The proposed changes would have a significant impact on civil registrars since a substantial number of citizens would now require a copy of their birth certificate in order to apply for a passport.

The Passport Canada presentation highlighted the changes under consideration and registrars were able to provide feedback during the meeting. Passport Canada was then able to incorporate the feedback and forward a discussion paper to the registrars for more formal input. Additional discussions were held with individual jurisdictions to accommodate differences in provincial and territorial legislation. One of the main findings was that outreach materials were needed to enable vital event registrars to explain the changes to Canadians.

Negotiations between Passport Canada and registrars ensued on the appropriate timing for implementation of the proposed changes. A communications strategy and accompanying outreach materials (press release, posters, etc.) were developed collaboratively. Ultimately, the initiative was successful, and there were no significant issues with these substantial changes across 13 individual jurisdictions.

mittee is well placed to study particular challenges and make decisions to facilitate interoperability among agencies.

¹²⁷ Ibid., para. 296.

477. *Universality*: The universality of the coverage of civil registration is one of the essential principles defined in the international standards,¹²⁷ and is directly related to the ability to make use of the civil registration information. In this context, “universality” means universal coverage of the occurrence of vital events in the country, irrespective of the characteristics of the event and the persons involved, such as sex, age, nationality, ethnicity, physical ability, income, legal or migratory status and so forth. The registration and issuance of certificates must be free from any kind of discrimination and truly universal throughout the country, in line with the universality of the right of all persons to be part of the system. Consequently, the same principles must guide the establishment and development of population registers and identity management, so that identity documents are available for the lifetime of each individual in the country, thus enabling access to services in the contemporary societies.

¹²⁸ Ibid., para. 294.

478. *Compulsory nature*: Hand in hand with universality is the necessity to make the registration of vital events and the persons involved a compulsory requirement.¹²⁸ Civil registration is not just a right, but also a duty, regardless of migration status, nationality and any other characteristic. A country’s civil registration system must be compulsory in order to ensure its smooth operation and effectiveness. While it is necessary for every country to establish and maintain a law on registration, the existence of such a law is not a sufficient condition for ensuring that the general public reports the occurrence of vital events. To facilitate compliance with that requirement, issuance of the first certificate should be free of charge and, as a compulsory requirement, registration must be linked to the imposition of some form of penalty on those who fail to comply with registration law—in other words, those who fail to register the occurrence of a vital event should be punishable by law. Since penalties for failure to comply with registration laws may not always be invoked and penalties may also be a deterrent to registration, it is imperative that there be a legal basis for prosecution to ensure general compliance with the registration law. Thus, a legal framework for civil registration is fundamental to its sound operation as a coherent, coordinated and technically sound system.

479. In spite of the existing provisions in a number of countries for penalties in cases of non-compliance, the level of completeness of registration remains low. This non-compliance is primarily attributable to the lack of incentives for registration. Incentives must be established not only to stimulate but also to encourage compliance with the compulsory registration law. Civil registration authorities must highlight the function that registration performs in giving people access to a range of services. Besides the privileges and rights that are to be enjoyed upon proof of registration (such as facilitated access to health, education, employment, banking, electoral participation, driving permits and so forth), national registration systems, within their own respective social and cultural environments, should offer other incentives which are of practical use, in particular at the individual level. Examples of incentives include in-kind goods for newborn care, household goods and cash stipends for health care or burial expenses, among other measures. Some countries owe the high level of completeness of their registration records to the existence of a unique identifier for individuals, or PIN, which is key to the provision of a range of services, both public and private, and also helps to ensure interoperability.

480. There are no standards for the type of PIN to be used; most European countries use individual information for the first part of the PIN, together with a second part comprising random digits; other countries assign random, sequential or consecutive

Box 25

Chile: Personal identification number

Since 1942, the functions of civil registration and identity management are integrated in a single government agency. Every individual is assigned a unique identifier (PIN) at the moment of birth registration, or at the moment of immigration registration. That identifier comprises a consecutive number allocated in sequential order, plus a verifier digit (zero to nine, or the letter K) generated by an algorithm. Individuals carry the number for a lifetime in order to identify themselves in all interactions both with the State and with private entities. Consequently, birth registration plays a fundamental role because it is the gateway to inclusion in the network of subsidies, benefits and health care, in both public and private spheres. In turn, people are highly motivated to comply with birth registration requirements as soon as possible and no penalties are necessary for late and delayed birth registration. It is estimated that only 0.5 per cent of all births in the country are not registered, and that only 0.5 per cent of the population have no PIN.

Chile is a centralized State, which means that all its public agencies have nationwide authority. The civil registration system and the identity management system are integrated into a single agency; individuals' records in the corresponding databases are linked through their PIN. The implementation of the PIN system has made possible the efficient targeting and control of resources linked to social security, health, education and other social services.

Addresses and change of residence are not registered, but every time that individuals renew their identity cards or passports, they are given the opportunity to provide an address for electoral purposes. Thus, interoperability is established between the electoral authority and the civil registration and identification authority, which serves as the main data supplier when an election takes place.

numbers; others use a combination of letters and digits. There are two important factors to bear in mind regarding the type of PIN to be used. The first is security and protection of data. PINs should be difficult to crack; and designed so as to enable the perennial generation of new PINs for new members of the population—in other words, to ensure that the pool of available numbers is not exhausted. See box 25 for details on how PINs are managed in Chile.

481. The compulsory nature of registration must be maintained throughout the system of civil registration, population registers and identity management. In practice, that means that changes in the civil status or physical location of individuals have to be reported and recorded in the population register and this obligation needs to be stipulated in the relevant legislation. Changes of address, in particular, have a substantial importance for a number of reasons, for example, voting lists, and must therefore be reported to the agency that maintains the population register.

482. In the case of identity management, the compulsory requirement is manifested by making the acquisition and carrying of an identity document mandatory for all individuals in the country. Provided that the requirement is spelled out in the appropriate legislation, it can easily be enforced by denying services to individuals without the proper identity document, creating a strong and unambiguous incentive for all to comply with the requirement. It should be noted that that approach engages ethical implications that need to be carefully considered.

483. Continuity and permanence: These attributes of the registration method, which are among the basic principles identified in the international standards, require the

existence of an agency of sufficient administrative stability whose operation is not limited by the factor of time. Permanence is contingent upon the authority given to the civil registration administration through enactment of a civil registration law. Permanence of the system is a requirement for the continuity of registration and vital statistics data, which is necessary for a meaningful understanding of both current figures and also of trends in vital statistics measures.¹²⁹ That is true for the functioning both of population registers and of identity management.

¹²⁹ Ibid., para. 297.

484. *Confidentiality*: Confidentiality is yet another major principle spelled out in the international standards.¹³⁰ Operation of a civil registration system means that a variety of information is collected about individuals within the population. While all the information collected may be significant, some data, when identified and linked to a specific individual, could be highly personal and sensitive. In order to promote the provision of full and honest data to the system, which directly conditions the extent to which civil registration information can be used, confidentiality must be protected. In other words, those who provide information must rest assured that it will be used only for the purposes prescribed by law or only in aggregated form so that individuals are not publicly identifiable.

¹³⁰ Ibid., paras. 298–299.

485. If an agency other than the civil registration authority, such as the national statistical office, is responsible for producing vital statistics, this agency should be given access to microdata, namely, individual-level information from the civil registration system. That will greatly improve the possibility of assessing the data quality, including detection of errors, and of producing good-quality vital statistics. In every case, the national statistics office must guarantee that the same or a higher level of security is maintained as at the civil registration authority and that confidentiality is strictly safeguarded. In addition, the formulation of a data protection law and the establishment of a data-protection government agency may be helpful in enforcing the confidentiality and security of individual data, and in preventing their misuse.¹³¹

¹³¹ Norway and Sweden have such data protection agencies, the Swedish Data Protection Authority (www.datainspektionen.se/in-english/) and the Norwegian Data Protection Authority (www.datatilsynet.no/English/).

486. In today's world, acts that compromise the confidentiality of individual data can occur through many different channels, such as breaking into online databases or selling them for profit to online retailers, for example. Those facts heighten the importance of assuring the population that the confidentiality of individual information provided to civil registration, population registers and identity management is of paramount concern and that access to such information is strictly underpinned by law and regulations. It also requires the development of safeguards that are as robust as possible, to prevent intrusion into the registers; in turn, that demands continuous follow-up on technological developments in the field of digital security systems.

487. In practice, a series of routines (physical and electronic) must be established in order to protect information. For example, employees must sign, together with their work contract, that no confidential data will be shared and that they will be subject to legal prosecution if this is violated. Designating and equipping a zone for secure data storage is of paramount importance, as is designating laboratories where there is access to confidential data but no Internet or email connection. If data are moved from laboratories to a work zone where there is email and Internet, this movement must be registered, as must the attachment of data files to email messages. That means that a log must be maintained of those persons who open, change and extract records, in order to be able to track their activity. Access to confidential data must be limited to those who need it for work purposes.

¹³² *Principles and Recommendations for a Vital Statistics System, Rev. 3*, para. 364.

488. *Costs*: Any costs involved with the registration of vital events and issuance of certificates and identity cards must be set in such a manner that the registration and subsequent issuance of documents are encouraged. International standards¹³² recom-

mend that, when registration of a birth, marriage, divorce, fetal death or death is made within the time period prescribed by registration law, no fee should be charged. In addition, issuance of the first certificate should be available to the public at no cost. The fees charged should be related to the purpose of issuance, for example, of certified copies of vital records and replacement of identity cards. Fees, reasonable and proportionate to the additional work necessary, may apply in cases of the delayed registration of vital events as provided in registration law. For individuals, fees may be related to the extent of the delay or to the nature of the information, such as name changes, legitimations, adoptions and the establishment of filiation. Minor corrections due to clerical errors discovered at the time of registration, burial or cremation should be permitted free of charge.

489. *Accountability*: Instruments for holding the system accountable must also be put in place. Accountability of the system and its operators boosts the confidence of the population that it serves its needs and augments the likelihood of, for example, the proper and prompt reporting of the occurrence of vital events and the characteristics of persons involved, the timely registration of changes of address in the population registers and the issuance of identity cards with biometric characteristics¹³³ The administrative arrangements for ensuring accountability of the system may include the creation, for example, of the institution of an independent general inspector of the agency, whose office would have the authority to review all the procedures and actual services delivery by the agency's staff, in particular in terms of gaining access to and manipulating individual information. In a number of countries, civil servants in such agencies are required to swear an oath that they will discharge their responsibilities according to the law and regulations and will be subject to penalties and criminal investigation in case of breach.

¹³³ In general, biometric identifiers are unique and measurable characteristics of each individual person, such as photographs, fingerprints, palm or footprint (used mainly for newborns), iris recognition, among others.

(b) Health and social services

490. Access to health and social benefits generally requires some sort of documentation, including registration information. For example, social service programmes that provide support for families with a large number of children require, prior to the allocation of resources, birth certificates for each child to verify family size. In the case of a single parent requesting support services as a result of the death of the other parent, the agency may require a certified copy of the death record to verify that the death occurred. Services relating to food, immunization, housing, clothing and other personal needs that are provided through either government or voluntary organizations require verification of the individuals involved, hence the importance of official identity cards issued by the identity agency and seed documents, such as birth or death certificates issued by the civil registration authority.

491. Services in the medical and health area are often made available to the public free of charge provided that other eligibility criteria, such as residence and income, are met. Problems associated with pregnancy or delivery complications can lead to necessary follow-up for medical and health benefits. The birth record, in addition to hospital and or clinic records, may include relevant information to verify stated medical and health conditions and may trigger cost-free care for the patient. Selected causes of death on the death record may be used by a family to obtain certain counselling and testing procedures related to possible hereditary communicable disease categories for the surviving spouse and children, depending on the condition. Thus, the content of the vital record forms becomes critical for their use in obtaining particular or targeted services.

(c) Disease registers

492. The use of notification and registration data for surveillance purposes and in the development and maintenance of disease registers has been on the rise. The International Health Regulations are a legal instrument which requires WHO member States to report diseases of global importance; the notification and registration of deaths may form an important part of the process in reporting such diseases. The long-established use of the cancer registers in many countries has drawn on death information to identify cases and to update existing cases. That has now resulted in other registers being implemented; those registers are enriched when drawing on civil registration information. Examples include registers for birth defects that obtain the initial information from the birth record. The information in those registers is also used for epidemiological investigations in which environmental or nutritional factors may have caused the defect. Other disease registers, such as those for tuberculosis, AIDS and Alzheimer's disease, use death records information to identify cases not previously reported and to update current cases. Such information is critical for establishing and maintaining effective disease registers that may be used to identify individuals and families in need of health or social support services. Other examples that may benefit from civil registration information are patient registers and registers of medical prescriptions.

¹³⁸ Matthias Bopp and others, "Cohort profile: the Swiss national cohort—a longitudinal study of 6.8 million people", *International Journal of Epidemiology*, vol. 38, No. 2 (April 2009), pp. 379–384; www.swissnationalcohort.ch.

493. To manage the critical functions linking the civil registration and vital statistics systems and the health systems, it is recommended that a national technical committee be entrusted with ensuring that data sharing and linkage arrangements are put in place. That will benefit disease notification and disease registers, and the continuous registration of vital events, such as death.

(d) Legal uses and activities

494. Throughout the present handbook, and also in the principles for civil registration and vital statistics, the importance of providing legal status and identity to each individual has been outlined as one of the most essential and crucial responsibilities of the government. That is especially related to the fact that, in many of the support service areas, there are specific requirements to be met prior to authorizing the release of the information. The identity documents based on civil registration form the legal basis for establishing some of the essential criteria and authorizations needed for access to services. Other areas, such as inheritance, insurance, citizenship, school and military enrolment, and family status, are all based on legal information from the registration and identity-management system. Age, date of birth, place of residence, place of occurrence, family name, citizenship and personal identification are significant legal factors that rely heavily on the registration system for verification. Those, in turn, affect a wide variety of rights to which an individual may be entitled. Normally, there is no other system that provides those basic elements.

495. The legal implications associated with registration information are a significant factor in the design, implementation, operation and management of a registration and identity-management programme. Those elements have been described in the chapters above, and the use of the information noted in the present subsection demonstrates the need to ensure a well-developed system. Legal issues often occur many years after the date of occurrence of a vital event. There is, accordingly, a need for record preservation and record accessibility. Events involving issues of adoption, legitimation, paternity and the dissolution of legal marriages have legal implications for inheritance, government services, insurance benefits and social and health outcomes. An adopted child's health might become an issue in later years, depending on medical facts of the biological parents. Such situations can lead to legal action to gain

access to the original records in order to obtain relevant information for assessing a current medical condition. Civil registration information clearly has a broad spectrum of uses for multiple purposes and under many different conditions for the population, and for administrative, government and legal actions and activities.

(e) Other inter-agency applications

496. Information from the civil registration records, population registers and identity-management systems has a valuable role in a number of other programmes at the national and subnational levels. Those include maternal and child health, family planning, population patterns, planning and development for health and medical care programmes, surveillance sites, evaluation, government resources allocation and electoral processes. In the case of the maternal and child health programme, it identifies families requiring services. Within this programme, a number of subprogrammes are funded to supply medical care, nutrition, public housing, prenatal and postnatal counselling, and infant and child health-care services. Reviews can be conducted using both the birth and death records associated with the maternal or infant death under review, combined with other data from the medical care provider and the facility where the event occurred. Based on the findings, the government may promulgate rules and regulations relating to medical practice, health-care delivery services at medical facilities or malpractice issues. The records-level information extracted from the civil registration and population registers is the primary source for initiating and implementing those types of programmes.

497. With the increasing availability of computerized records from both civil registration and censuses, several countries lacking population registers have created long-term representative samples (longitudinal panels, or virtual cohorts) of their national population by linking a systematic sample of birth records from selected years with other civil registration records in subsequent years (such as those for marriage and deaths), together with census individual records over the following decades. Unlike cross-sectional studies, those virtual cohorts make possible the study of many individual outcomes through the course of an individual's life (such as social and economic inequalities in health, geographical and occupational mobility), without being affected by numerator–denominator bias. France,¹³⁴ the United Kingdom¹³⁵ and the United States¹³⁶ are among those countries which started some of these largest national cohorts several decades ago, followed in more recent years by New Zealand¹³⁷ and Switzerland,¹³⁸ to name a few. Selected examples of this type of endeavour are set out in box 26 below.

498. The linkage of these various sources of information, including tracking individuals from one census to the next, supplemented by civil registration (and, where applicable, other administrative data sources such as health records), provides a wealth of information on geographical, occupational and demographic changes relating to its study population. Panel data of this nature are invaluable for the conduct of methodological studies and the exploration of health pathways and complex life trajectories, including those of education, social and professional mobility, evolution of family composition and others, which are difficult, if not impossible, or too costly to study from a single data source.

499. The ability of the civil registration authority to share information with other governmental agencies must be regulated by the legal framework, which spells out conditions and limits, specifies partner agencies and makes other provisions. The legal framework for the civil registration system establishes a continuous source of information to serve a broad range of activities and programmes. A detailed discussion of the legal framework may be found in chapter I, section D.

¹³⁴ Christine Couet, "L'échantillon démographique permanent de l'Insee", *Courrier des statistiques*, No. 117–119 (2006), pp. 5–14; Stéphane Jugnot, (2014). "La constitution de l'échantillon démographique permanent de 1968 à 2012", Institut National de la Statistique et des Etudes Economiques, Direction des Statistiques Démographiques et Sociales, Document de Travail No. F1406 (September 2014); www.insee.fr/fr/metadonnees/source/s1166.

¹³⁵ Paul Boyle and others, "Cohort profile: the Scottish Longitudinal Study (SLS)", *International Journal of Epidemiology*, vol. 38, No. 2 (2009), pp. 385–392; Dermot O'Reilly and others, (2012). "Cohort description: the Northern Ireland Longitudinal Study (NILS)", *International Journal of Epidemiology*, vol. 41, No. 3 (2012), pp. 634–641; www.ons.gov.uk/aboutus/whatwedo/paidservices/longitudinalstudies.

¹³⁶ National Longitudinal Mortality Study, available at www.census.gov/did/www/nlms/about/.

¹³⁷ Tony Blakely, Alistair Woodward and Clare Salmond, "Anonymous linkage of New Zealand mortality and census data", *Australian and New Zealand Journal of Public Health*, vol. 24, No. 1 (2000), pp. 92–95; Sarah Hill, June Atkinson and Tony Blakely, "Anonymous record linkage of census and mortality records: 1981, 1986, 1991, 1996 census cohorts", NZCMS Technical Report No. 3 (Wellington, Department of Public Health, Wellington School of Medicine and Health Sciences, University of Otago, 2002); www.otago.ac.nz/wellington/departments/publichealth/research/hirp/otago020541.html.

Box 26

Longitudinal panel studies created by linking civil registration records with census individual records

France launched its “échantillon démographique permanent” (“permanent demographic sample”) with 1 per cent of its 1967 birth cohort and 1968 census. By the end of 2013, the sample had grown to 2.7 million, with individuals enumerated in the censuses of 1968, 1975, 1982, 1990 and 1999, and annually since 2004. Each year, all vital events are tracked for all persons born on the first four days of October. The sample size has quadrupled since 2004 for civil registration and since 2008 for the census, as persons born on January 2, 3, 4 or 5 or the first four days of April or July have been added to be monitored in the panel.

The British equivalent is the Longitudinal Study, based on the censuses of 1971, 1981, 1991, 2001 and 2011. Census records are linked with life events data to create a 1 per cent sample of the population of England and Wales. More recently, sister studies have been established in Scotland and Northern Ireland. The Scottish Longitudinal Study started with 1991 census data and the Northern Ireland Longitudinal Study with 2001 census data.

In the United States of America, the National Longitudinal Mortality Study is based on a random sample of the non-institutionalized population and, since 1973, has been following 1 million respondents of the current population surveys, annual social and economic supplements and a subset of the 1980 census, combined with death certificate information to identify mortality status and cause of death. The study enables the investigation of social, economic, demographic and occupational differentials in mortality (total and by cause).

The New Zealand Census Mortality Study anonymously and probabilistically links all census data (1981, 1986, 1991, 1996, 2001 and 2006) with death registration records during the subsequent three years (for the cohorts of 1981, 1986, 1991 and 1996), or five years for the more recent cohorts (2001 and 2006). That linkage has made it possible to study socioeconomic and ethnic inequalities in mortality, and to address the issues of numerator–denominator bias for ethnicity reporting in censuses compared with mortality data from death registration.

In 2005, Switzerland created the Swiss National Cohort, which is a nationwide anonymized record linkage of census and death registration records that includes all residents enumerated in the national 1990 and 2000 censuses. Deterministic and probabilistic methods of record linkage were used to link anonymized census records to death or emigration records from 1991 up to 2008.

500. Continuous assessment of the impact and outcomes of national health programmes and identification of population health patterns require access to appropriate health and demographic information. The registration programme can provide that type of information for planning new programmes and for evaluation of the impact of existing programmes. Whether the issue is maternal and infant health, family planning activities or general health, fertility and mortality patterns of the population, birth and death information is available by health, demographic and geographical characteristics on an individual basis. That information can then be used to profile the impact of current programme activities, and can lead to planning and programme evaluation. The individual record information, supplemented with vital statistics summary data for relevant variables, is an effective mechanism for determining new directions for various programmes.

501. Another area in which registration information is used by different government agencies is for the allocation of funds, human resources, supplies and services. The conduct of such programmes as education, maternal and infant health care, family

planning, maintenance of health and disease registers, and population health patterns and status requires well-structured decisions and resource commitments. To do that effectively, a sound, accurate and reliable information base is needed. In some cases, a base can be provided by vital statistics summary data and, in others, by record-specific individual information. The latter situation draws on the civil registration system to provide data on an individual level. When funds are to be allocated to programmes based on individual events, the decision-making process needs information at that level, and that is available from the well-designed and -operated holistic system of civil registration, population registers and identity management.

C. Applications of vital statistics

502. The registration information described above is primarily for use at the individual level. In addition to those substantive applications, the registration system provides the database, containing microdata (individual level), for the preparation of vital statistics data files covering natality, fertility, mortality, marriage, divorce and selected population profiles. The statistical data have broader uses at the general descriptive or analytical levels. The database serves a multitude of purposes in quantitative terms, offering the capacity to extrapolate, estimate or project selected characteristics based on previous data. That provides for more applications, some of which may relate to conditions outside the registration programme. Several application areas within the statistical agency, in conjunction with other agencies and programmes and at the national level, are described below.

1. Intra-agency applications of vital statistics

503. Acquiring knowledge of the size and characteristics of a country's population on a timely basis is a prerequisite to social and economic planning and informed decision-making. Vital statistics and their subsequent analysis and interpretation are essential for setting targets and evaluating social and economic plans, including the monitoring of health and population intervention programmes, and the measurement of important demographic indicators of standards of living or quality of life, such as expectation of life at birth and infant mortality rate.¹³⁹ Vital statistics are obtained preferably through a complete civil registration system, as this is the ideal source from which to derive accurate, complete, timely and continuous information on vital events. In addition, vital statistics derived from the civil registration system and accompanying population registers can include annual flow statistics from the smallest civil divisions, which no other data-collection system can provide.

504. In the model in which civil registration, population registers and identity management components are interlocked in a holistic system, vital statistics activities are usually housed in the national statistical office, since centralizing all statistical work in the country enhances the quality and efficiency of the production of official statistics. That holistic model also enables the forging of linkages with other sources. Examples of specific indicators and measures computed within the national statistical office include infant mortality rates, crude birth, death, fetal death, marriage and divorce rates, total fertility rates, age-specific rates, fertility rates, mortality and marriage rates, life-tables, life expectancy at birth and cause-specific death rates. Those specific indicators and measures are available not only for the country as a whole and its main divisions but also for small geographical areas. The national statistical office would develop the raw statistics for other programmes and agencies involved in medical, health, housing, social services, education, economic planning, natural-disaster

¹³⁹ *Principles and Recommendations for a Vital Statistics System, Rev. 3*, para. 3.

risk mapping, among other issues. The demographic data would be directly used for national purposes within that agency.

505. Many of the applications described in the previous subsection related to registration information at the individual level have similar statistical applications in aggregate form. In the maternal and child health area, vital statistics are used to compute rates for maternal mortality, infant mortality, complications of pregnancy, labour and delivery, malformations and such health services as prenatal care and other related government services. Those quantitative measures are then used by programmes to assess the quality of care, medical problems associated with pregnancies or delivery procedures, the use of health services and health outcomes.

506. Within an agency with responsibility for the health of the population, such as the ministry of health, vital statistics serve multiple purposes. Mortality measures based on demographic information provided on the death record are used to identify specific causes of death for specific population groups. When death rates appear significantly higher for certain groups, studies to obtain more detailed information or epidemiological investigations may be initiated to determine the factors causing the increases. Geographical data for place of residence or place of occurrence, and also for year of occurrence, can provide additional information on health conditions in specific locations and points in time, and are key elements for the evaluation and monitoring of intervention programmes.

507. To assess disease conditions elevating mortality rates in a certain area, the mortality data must be analysed by both residence of the deceased and the site where the death occurred. Individuals may be infected in one area but travel to another for medical care. That can give a false impression of where the problem exists. The rates in the area of occurrence may have no bearing on the site where the actual disease problem exists. Place of residence and occurrence are two critical variables in the conduct of such analysis.

508. Extensive use is made of mortality data in evaluating health-service facilities and for studying environmental and social factors related to the health system. Death rates for events that occur in a particular hospital, clinic or other type of facility can be compared both with other similar facilities and with national or state averages. Those data can give some sense of the quality of services being provided, and may reflect both on the institution and on the person providing care. For example, when reported on the death record, differences in death rates following surgical procedures for heart disease or cancer can be used to assess the outcomes for quality of care, availability of resources or severity of illness. Results of those analyses are then brought back to the health facilities and providers for review and evaluation to improve conditions, when applicable.

509. The data can also be used by government survey teams in attempting to determine the allocation of resources and funds for improving health and medical services to the population. In countries where surveys of medical records are conducted for reviews of the use and the quality of care of health providers, mortality outcomes are essential data in the survey process.

510. Generally, there are more data items included on the birth record than on the death record. That creates the potential for more extensive use. In line with international standards, the birth record would contain items relating to the mother, such as demographic characteristics, previous pregnancy history and prenatal care; in some countries, birth records also include information on services or behavioural factors, such as smoking, alcohol or drug use. In addition, the record often contains conditions associated with pregnancy, methods of delivery and birth outcome. Those data form a

large pool of health data for review, evaluation and research activities. Data regarding the condition of the infant at time of delivery, Apgar score,¹⁴⁰ birthweight and birth defects provide a substantial database for planning and evaluation purposes, research and the health service needs of the family.

511. The broad and comprehensive nature of the vital statistics data for use in areas of research, analysis and evaluation may be observed in most public health and medical publications of governments, professional organizations and other public and private agencies. Examples of vital statistics and research, in particular if a PIN is available to link different databases, include distribution of women by parity (number of live births), including research into childlessness; analysis of fertility by social strata (educational attainment, labour force activity), social inequalities in life expectancy (by occupation and educational attainment); and integration of immigrants by duration of residence in the receiving country.

2. Inter-agency use and applications of vital statistics

512. Vital statistics are a critical mechanism for supporting good governance, through data-driven planning and accountability. They have a significant value and financial function as they are key inputs for planning and resource allocation at the national and subnational levels. Access to the vital statistics database by other agencies is important to such bodies as public social services organizations, specialized units for independent research and medical facilities, and for the preparation of population profiles and for educational purposes.

513. Those programmes draw on natality, fertility and mortality statistics to address current issues, identify trends and project new directions of the events being considered. Social service programmes use natality data to identify geographical or demographic profiles of high fertility that affect benefits and services directed at women and infants. In particular, natality and fertility data are used to inform plans for building or opening new schools. In a similar manner, urban planning, in general, is highly connected to vital statistics.

514. Social and health programmes use mortality data to provide support to families in areas having major difficulties involving epidemics or other health problems where support services are needed. Through the linkage of social service records and vital statistics data, family profiles may be developed for use in the allocation of resources. Allocations can be based on such attributes as number of children, single parenthood, health problems and availability of medical care in specific geographical locations.

515. Agencies that maintain data on selected health characteristics, such as specific disease categories and health or medical conditions, or are responsible for planning and evaluation activities require access to data and information from the vital statistics system. The number of individuals dying from a particular disease or illness is valuable information for agencies or programmes targeting these conditions. The most complete and timely data come from the vital statistics database. An agency with the responsibility to build health facilities or relocate clinics or care providers based on health conditions, or to propose new resources to meet current or projected healthcare needs, must have access to vital statistics.

516. Quantitative information is fundamental to the conduct of such programmes. Rates of specific health conditions, the proportion of events occurring in particular locations or at specific facilities and the relative rates of change and trends over time offer valuable indicators for the agency to make decisions and align resources to their best use.

¹⁴⁰ The Apgar score, named after Dr. Virginia Apgar, the anaesthesiologist who developed it in 1952, was introduced in the 1950s as a simple and quick method of assessing and summarizing the health of a newborn. It evaluates the newborn on five criteria (skin colour, pulse rate, reflex irritability, grimace, activity and respiratory effort) on a scale from zero to two and the resulting Apgar score ranges from zero to 10.

517. High rates of low-birthweight newborns, birth defects and infant mortality from the vital statistics database may help to define where the next infant health programmes should be located. That information can indicate the conditions on which the programmes should be focused. High fertility rates for specific age groups may provide the information needed to redirect a family planning programme. High rates of mortality in specific geographical areas, for particular population groups or in health facilities provide data necessary for the health agency to conduct surveys and record reviews to determine causes.

518. Agencies often require quantitative data to sustain support for the programme or agency function. Depending on the area of responsibility of the agency or programme, vital statistics represent a vital source of information for preparing descriptive summaries and profiles of particular categories of vital events. Those events can be further detailed by geographical areas, demographic profiles, health-care provider types and particular population groups, and can be linked with other data. The data provide integrated information for the programme or function under review.

519. For instance, the demographic dynamics of displaced, stateless persons and refugees may be different from that of the ordinary population. If the vital statistics on those population groups are sufficiently comprehensive, it can be useful for governments and humanitarian workers to analyse their statistical patterns, also in comparison with the overall population in the country. The Expert Group on Refugee and Internally Displaced Persons Statistics was established by the United Nations Statistical Commission in 2016 to develop guidelines on refugee statistics and produce a technical report on the statistics of internally displaced persons.¹⁴¹

520. Measures and indicators for selected vital events can be constructed for use in programme operation, evaluation and impact analysis. The data items to be used depend on the programme objective. Rates, proportions, frequencies and volume of events are common indicators and measures that may be used for agency programmes and functions. For infant immunization programmes, the number of infants in a particular area can be obtained from the vital statistics files, and this measure will help to define the level of service needed.

521. Programmes for the delivery of health-care services, programme initiatives, impact analysis, evaluation and programme direction, planning and development, and research activities have significant links with the vital statistics system. Responsibilities for those activities vary among agencies, programmes and private and voluntary organizations. Vital statistics systems should be positioned to meet those needs. For their part, external users need to have that information available. Participation of those groups in the structure of the civil registration programme is essential to the attainment of this objective.

522. The use of data can be of a general nature, with a focus on the overall characteristics of vital events. Birth rates and death rates, the frequency of vital events categorized by selected demographic and geographical variables, the distribution of vital events by type of service provider, and the place of occurrence of the event and residence of the individual give a general statistical overview. Those data offer a profile for health outcomes of the population, for geopolitical subdivisions down to the smallest geographical areas, and for facilities used for health care. Further detailed uses can be made of the vital statistics data, using selected outcome variables, such as malformations at birth, the amount of prenatal care by age or socioeconomic group, cause-specific information for maternal and infant deaths, complications associated with pregnancies and specific cause of death for various demographic characteristics.

523. Those detailed data may be used to monitor particular programme or agency objectives or to define areas for medical and health research activities. In either case,

¹⁴¹ See, for example, the report on the forty-seventh session of the Statistical Commission (E/2016/24-E/CN.3/2016/34).

the data elements for those applications come through the vital statistics system and reach out in a wide pattern of use and application in the health field.

524. At the international level, vital statistics are essential for reporting against development frameworks such as the Sustainable Development Goals. Of the 230 indicators, 19 use vital statistics as direct inputs, be it in the numerator or the denominator. Of these, 11 form part of Goal 3, on good health and well-being, in pursuit of which strong emphasis is placed on cause-of-death information. In addition, information on registration completeness of births and deaths is directly needed for two more indicators. Many more indicators use vital statistics as an indirect input for computing population estimates, rates, ratios and other figures. Examples of indicators of the Sustainable Development Goals which necessitate vital statistics indirectly include indicators on access to certain services, land ownership, malnutrition, school attendance, literacy and gender violence, among other variables.

(a) Vital statistics dissemination

525. The regular dissemination of vital statistics is one of the principles of the vital statistics system in accordance with the international standards.¹⁴² The compilation of vital statistics should have as its minimum goal two attainments. First, the provision of total monthly or quarterly summary counts of vital events on a time schedule prompt enough to provide information for health intervention and population estimation programmes, administrative uses or other needs. Second, the production of detailed annual tabulations of each type of vital event cross-classified by its demographic and socioeconomic characteristics. Such tabulations must be accompanied by metadata, graphs, maps and descriptions that are conducive to their analysis and comprehension.

526. In planning the detailed tabulation programme, it is important to ensure that resources are available for completing it on a regularly established basis and in accordance with a publicly available time schedule. It is common for countries to set a cut-off date for incoming data from the previous year in producing their annual vital statistics tabulations. Depending on the country, this date ranges around 1 February and 1 March every year. An established time schedule contributes to the effective use of the analysis of the interrelationship among demographic, economic and social factors in the planning, operation and evaluation of public programmes and policies, and for the purpose of formulating and evaluating economic and social plans.

527. There are tools that support the design and implementation of the annual dissemination programme of vital statistics compiled from civil registration data. Principal among these are Principles and Recommendations for a Vital Statistics System, Rev. 3, which presents recommended tabulations in detail in its annex II,¹⁴³ and the guidelines and template for developing a vital statistics report, developed by Statistics Norway.¹⁴⁴ As far as possible, statistics should be comparable within the country, across demographic data sources and across different countries, so as to permit international analysis. Where particular circumstances within a country require departures from international standards, publication of the data should be accompanied by an explanation of those departures and an indication of how the national presentation can be converted so as to meet or approximate international standards.

528. For national and subnational purposes, an annual programme for the tabulation of vital statistics should provide data classified in accordance with the need to study the incidence, patterns, time trends and geographical differentials of the most important characteristics and determinants of fertility, mortality, fetal mortality, nuptiality and divorce, together with the exploration of their interrelationships. Tabulations for small geographical areas need to be included in the dissemination plan, together with

¹⁴² *Principles and Recommendations for a Vital Statistics System, Rev. 3*, para. 38.

¹⁴³ *Ibid.*, annex II.

¹⁴⁴ Economic Commission for Africa, Helge Brunborg, [Economic Commission for Africa, Helge Brunborg, Vibeke Oestreich Nielsen] Vibeke Oestreich Nielsen, "Guidelines and template for developing a vital statistics report" (Addis Ababa, 2018). Draft available at www.getinthepicture.org/resource/guidelines-and-template-developing-vital-statistics.

disaggregations by relevant variables. In addition, the programme should include tabulations needed for administrative purposes to evaluate the quality of vital statistics, including the completeness and timeliness of registration and the accuracy of the content of the registration records (or the reporting forms for statistical purposes, as the case may be). The tabulation programme should also seek to meet the requirements of international organizations and, wherever possible, conform to recommendations for achieving international comparability.

529. As far as basic concepts of tabulations are concerned, they refer to the following attributes:

- (a) *Universality*: The legal framework stipulates that each vital event occurring within the geographical area concerned must be registered once and only once within the time period. Accordingly, statistical tabulations should encompass the entire geographical area and include events for all population groups within the area occurring during the specified time period. The tabulation of data for a country should generally include only events occurring within its boundaries. Events occurring outside the boundaries need to be included only when they relate to persons included in the population denominator for potential national rates, such as deaths to nationals on holiday or members of the armed forces occurring outside the country. For countries that wish to implement that approach, provision should be made for the international or bilateral exchange of records so that events occurring to residents of other countries can be excluded from occurrence data;
- (b) *Tabulation by date of occurrence*: Although preliminary tabulations may be presented by date of registration so that they can be prepared as quickly as possible, final tabulations for the calendar period should be based on events that actually occurred during the period, regardless of their date of registration;
- (c) *Tabulations by place of occurrence and place of residence*: Final annual tabulations should be prepared by place of residence. Generally speaking, for tabulations of events for the country as a whole, there is relatively little difference between place of occurrence and place of residence. Final tabulations for geographical areas smaller than the total national territory, major civil divisions, minor civil divisions and cities should, for analytical purposes, be prepared according to place of usual residence. As discussed in paragraphs 465–469 above, however, place-of-occurrence tabulations required for administrative purposes or evaluation of registration coverage need to be prepared.

530. A detailed list and specifications for an annual vital statistics tabulation programme are presented in appendix II to *Principles and Recommendations for a Vital Statistics System*, Rev. 3. In addition, countries are encouraged to publish the level of completeness of registration for each of the vital events, at the national and subnational levels.

531. The term “vital statistics microdata dissemination” refers to the development of mechanisms to grant users access to individual record files maintained for the production of vital statistics. In the model of civil registration, population registers and identity management, an indispensable feature of such an arrangement is reliance on individual records stored in different databases that can be linked with a unique identifier, preferably the PIN. For the purpose of vital statistics, the extraction from the

population register normally omits data items not relevant for aggregation purposes, such as the name and address, but retains the unique identifier and location.

532. Guidelines for the dissemination of microdata by the national statistical service are presented and elaborated in *Principles and Recommendations for Population and Housing Censuses, Rev. 3*.¹⁴⁵ The same principles and confidentiality protection protocols apply also to vital statistics microdata, taking into consideration the substantial value that such dissemination provides for in-depth research of demographic, health and social-related phenomena. See box 27 for details on how the dissemination of vital statistics microdata is handled in Norway.

¹⁴⁵ *Principles and Recommendations for Population and Housing Censuses, Rev. 3*, paras. 3.373–3.388.

Box 27

Norway: Vital statistics microdata for research

Requests for access to the data of the Central Population Register in Norway are handled by the owner agency, the National Tax Administration. The Tax Administration distributes data directly and daily to a few large users, including Statistics Norway, the Norwegian Labour and Welfare Administration, the Directorate of Immigration and the Norwegian Mapping Authority. Other users (more than 2,200) receive the information through a private company according to an agreement with the Tax Administration. Users may receive data only after submitting an application that explains their reasons for needing the data. The users receive the data only in the Central Population Register to which they are entitled by law.

For its part, Statistics Norway handles requests for microdata for research projects, relating to persons, establishments and enterprises (www.ssb.no/en/omssb/tjenester-og-verktoy/data-til-forskning). Researchers from approved research institutions in Norway have to apply to the Data Protection Authority or one of the regional ethics committees for permission to use microdata while paying for the costs of producing the data files. Under the Statistics Act, the transfer of personal data outside the country's borders is not allowed. There have not been any very serious cases of misuse of data from the Central Population Register, but it has been revealed that in a handful of cases conditions for receiving microdata were violated, such as sharing the data with other researchers or exporting data to other countries.

The microdata are anonymized before being released, which means that variables that can be used to directly identify an individual, such as name and PIN, are removed from the file. Since it may still be possible to use other variables, such as address, full date of birth, and so on to identify individuals, users need to sign a non-disclosure declaration. Furthermore, microdata are released for a specific project and must be eradicated when such a research project is finished. Microdata that may be released for research include data from administrative registers, population censuses and sample surveys, and cover such areas as the labour market, population, social security, income, wealth, educational activity and attainment, health and establishments and enterprises.

According to the new Population Register Act, which is expected to enter into force in 2017, public authorities and enterprises will be able to obtain non-confidential information from the Central Population Register through lists based on PINs. Private businesses and individuals will be able to obtain non-confidential information from the Register about named identifiable individuals. The principle of confidentiality will not apply for information elements such as name, date and place of birth, gender, PIN, citizenship, marital status and date of death. The confidential items will include address, parents, spouse, children and adoption.

¹⁴⁶ General Assembly resolution 68/261. Text available at <http://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx>.

533. The Fundamental Principles of Official Statistics¹⁴⁶ provide unambiguous guidance in the administration of official statistics at the national and international levels. Particular emphasis is placed by those principles on confidentiality of information collected for statistical purposes. Thus Principle 6, governing international statistical activities, states: “Individual data collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons, are to be strictly confidential and used exclusively for statistical purposes.” In addition to the Fundamental Principles of Official Statistics, the following four principles should be considered when ensuring the confidentiality of microdata:

- (a) *Appropriate use of microdata:* It is appropriate for microdata collected for official statistical purposes to be used for statistical analysis to support research, as long as confidentiality is protected;
- (b) *Microdata should be made available only for statistical purposes.* A distinction must be made between statistical or analytical uses and administrative uses. In the case of statistical or analytical use, the aim is to derive statistics that refer to a group (whether this be of persons or legal entities). In the case of administrative use, the aim is to derive information about a particular person or legal entity to make a decision that may bring benefit or harm to the individual. If the use of the microdata is incompatible with statistical or analytical purposes, then microdata access should not be provided;
- (c) *Provision of microdata should be consistent with legal and other necessary arrangements that ensure that confidentiality of the released microdata is protected.* Legal arrangements to protect confidentiality should be in place before any microdata are released. The legal arrangements must, however, be complemented with administrative and technical measures to regulate the access to microdata and to ensure that individual data cannot be disclosed;
- (d) *The procedures for researcher access to microdata should be transparent and publicly available, as should information about the uses and users of microdata:* That principle is important to shore up public confidence that microdata are being used appropriately and to show that decisions about microdata release are taken on an objective basis.

(b) Demographic applications

534. The use of vital statistics in the area of demographic analysis depends heavily on the quality and completeness of the data. The accuracy and timeliness of data are significant factors for demographic use in mortality, natality, fertility, nuptiality and population analysis.

535. Demographic analysis related to natality and fertility also requires specific variables, many of which are included in the vital statistics files. Characteristics that are important in the measurement and analysis of fertility for population purposes include the age and marital status of the mother, parity, birth order and residence. Other factors that may affect the levels of fertility are also essential data elements, such as race and ethnicity, age of parents, marital status, social and economic status and educational level. Those data provide basic information on factors that can affect the fertility of population groups and population growth.

536. Measures for demographic analysis include age-specific fertility rates, fertility rates within marriage cohorts, probabilities of birth based on age of the mother, and various subcategories for birth and fertility rates. In many instances, use of those data

from the vital statistics system requires their linkage to census data or other survey data. That makes the data effective for demographic analyses related to natural growth and change of the population. Vital statistics are often used to evaluate the quality of population censuses, by comparing the total number of births or deaths in both sources.

537. Mortality data from the vital statistics system can provide indications of variations in the characteristics of the deceased and the cause of death. Those are important variables in the demographic analysis of mortality. Two of the most critical variables associated with demographic analysis related to mortality are the age and the sex of the decedent. The relationship between the risk and cause of death, on the one hand, and age and sex, on the other, makes them important factors in the demographic analysis of mortality. The fact that mortality varies by gender, geographical area, marital status, socioeconomic conditions and availability of health-care resources makes those characteristics essential in the analysis of mortality. Many variables are part of the vital statistics database derived from the registration programme. For those items not collected through registration, other options may be explored for obtaining the data. Those may include conducting surveys that use the vital records as the framework for identifying and locating individuals for the sample. Another option is to draw on other administrative databases that contain the data.

538. Mortality data from the vital statistics system are also used in the development of life-tables for the measurement of mortality. The basic life-table provides data on mortality, life expectancy and survivorship. Other applications include the projection of population size, natural population growth and length of life for selected subcategories. Essential to the construction of the life-table are the death data. The applications for life-tables and the mortality, natality and fertility data from the vital statistics system are described in detail in a number of publications.¹⁴⁷

539. Vital statistics can provide some of the essential data elements in the preparation of population estimates and projections. The basic process is to use the numbers of births and deaths and a migration measure, which may be obtained from other sources unless a population register is available. Those data can be used to update a previously conducted population census. Natural increase in the population based on birth and death information combined with net migration can be used to update an earlier census count. Another approach, the vital rates method, uses birth rates and death rates for selected geographical areas, and, combined with a previous census count, produces an intercensal estimate of the total resident population.

540. Various methodologies exist for the preparation of population estimates and projections for the total country or for selected geographical areas. Many of those include vital statistics data when it is determined that the registration programme has provided adequate reporting (see box 28 for an example of how census results and vital statistics are used jointly to assist the production of population estimates at the sub-national level). When the registration programme has not achieved adequate levels of completeness or accuracy and timeliness of reporting, other sources of data are used, but the methods become more complex and less reliable.

¹⁴⁷ Tom Moultrie and others, eds., *Tools for Demographic Estimation* (Paris, International Union for the Scientific Study of Population, 2013), available at <http://demographicestimation.iussp.org/>; *Handbook on the Collection of Fertility and Mortality Data* (United Nations publication, Sales No. E.03.XVII.11).

Box 28

Tunisia: Allocation of births at the subnational level for the production of population estimates, implemented by the National Institute of Statistics

The Tunisian Registration Act requires that both births and deaths be registered in the municipality or civil registration centre closest to where the event occurred. Not all governorates (major civil divisions) have hospitals or clinics, however, and that forces women residing in those governorates to deliver and register their babies in a governorate that is not their usual residence. Since place of usual residence is not recorded in the registration system, that leads to a problem when producing population estimates at the governorate level. The National Institute of Statistics solves the problem by using the geographical distribution of children under 1 year of age observed in the population census and applies it to the total number of births from the civil registration system.

Chapter VII

Digitizing civil registration and vital statistics

A. Introduction

541. The rapid development and ever-widening availability of information technology have facilitated the transformation of civil registration and vital statistics processes from paper-based to electronic formats. To succeed, however, that transformation requires a careful and deliberate design and implementation process. The topics covered in the present chapter include the technical details of the digitization of civil registration and vital statistics systems and their specific components. Based on the *Civil Registration and Vital Statistics Digitisation Guidebook* (version 0.10),¹⁴⁸ the present chapter outlines the preparation, analysis, design and implementation considerations and processes for the effective digitization of a civil registration and vital statistics system.

542. As noted earlier in this handbook, vital statistics and civil registration are separate entities, but it is crucial that they be established, maintained and exploited as components of a coordinated and coherent system for registering and producing vital statistics. In addition, the emergence of interconnections between civil registration and contemporary identity-management systems adds yet one more dimension to the structure of the civil registration and vital statistics system. A graphical representation of those relationships and functioning is presented in chapter I, figure 1. Civil registration is defined as the continuous, permanent, compulsory, universal recording of the occurrence and characteristics of vital events pertaining to the population, as provided through decree or regulation in accordance with the legal requirements in each country.¹⁴⁹ It is important to highlight the quality of universality in relation to people's rights regarding the registration of vital facts. In this regard, laws, policies, rules and regulations must not be a hindrance to the realization of that right. In particular, the registration of events must be performed even if the time frame given by law has expired, and regardless of migratory status, citizenship and any other request that may act as an obstacle to registering the vital facts occurred in the territory. Civil registration is carried out primarily for the purpose of establishing the documents provided for by law. The usefulness of the records as the best source of vital statistics is well established. The procedures for recording vital events are equally important for civil registration as a legal exercise and for vital statistics as a source of statistical information; hence the tasks performed by civil registrars and those of statisticians are interdependent.¹⁵⁰

B. General overview

543. Digitizing administrative processes is an indispensable element of contemporary approaches to government functions. In its essential meaning, "digitizing" refers to the generation of a series of numbers that represent a document, signal and so forth. The term is also commonly used to convey the process where a piece of information is converted into single binary code. In theory, digital information is not subject to dam-

¹⁴⁸ See www.crvs-dgb.org/en/Guidebook available at www.crvs-dgb.org/wp-content/uploads/2015/11/crvs-dgb-0.10-FINAL-EN-ALL.pdf.

¹⁴⁹ *Principles and Recommendations for a Vital Statistics System*, Rev. 3, para. 279.

¹⁵⁰ *Ibid.*, para. 274.

age or degradation over time, as it consists of strings of numbers recorded and stored in an appropriate device. As digitizing a certain process or information is not possible without the use of information technology, the meaning of the term also encompasses computerization of those processes and information—in other words, the use of automation by way of computers and software.

544. In the context of the systems of civil registration, vital statistics, population registers and identity management, digitization refers to developing an enterprise information system, that is, an information system that provides a technology platform that enables all components to integrate and coordinate business processes on a robust foundation.¹⁵¹ A functional system needs to be in place for the information to be transformed and digitized successfully. In addition, even if a system is functioning smoothly without automation, digitization needs to be conducted carefully, avoiding the overhasty application of technological tools and guided by international standards, in particular *Principles and Recommendations for a Vital Statistics System*, Rev. 3.

¹⁵¹ Chapter V of the present handbook discusses operational integration for civil registration, vital statistics and identity management.

545. Taking into consideration that information systems tend to be fairly complex and multilayered, recent developments include the introduction of a separate discipline: governance of enterprise information technology, which is concerned primarily with organizing the resources of an enterprise or organization for the purpose of satisfying stakeholders. Governance of enterprise information technology is intended to ensure that high-level strategic objectives are aligned with operational-level activities and work outcomes.¹⁵² It will make it possible to develop precise blueprints enabling all stakeholders to understand the business processes, even if they lack a full understanding of information technology.

¹⁵² See ISACA, *Getting Started with Governance of Enterprise IT (GEIT)*, ISACA White Paper (ISACA, 2015). Available at www.isaca.org/Knowledge-Center/Research/Documents/Getting-Started-With-GEIT_whp_Eng_0314.pdf?regnum=353307.

546. In this context, the notion of a “business process” is defined in the *Civil Registration and Vital Statistics Digitisation Guidebook* as a self-contained, logical set of activities performed by humans or machines with the aim of accomplishing a specific business objective. Triggered by specific events, a business process has one or more outcomes that may result in the termination of the process, or their handover to another process. It is often presented in the form of a figure or map and is composed of a collection of interrelated tasks or activities that solve a particular issue. A business process comprises end-to-end work that delivers value to customers (or users) and may involve crossing functional boundaries.

547. The first step in applying contemporary mechanisms and their operational logic is to develop a clear understanding of the current and ideal business processes and their stakeholders. Chapters II and III of the present handbook elaborate on those issues, and the integration of civil registration, vital statistics, population register and identity management functions and components is presented in chapter V. Consequently, the present chapter focuses in more technical detail on the implementation of the enterprise information system paradigm and the features of the governance of enterprise information technology adapted for civil registration and vital statistics, which then leads to the feeding of population registers and identity-management systems. More and more countries are introducing identity cards and identity-management systems with biometric markers. Such systems have great potential for improving vital statistics, but that is often not realized. Some of those identity systems are closely linked to the civil registration system, while others have little or no connection. A database including all identity numbers with particulars about individuals can be developed into a population register if it is regularly updated with birth, death and migration details. The transition is particularly smooth if identity numbers are assigned at birth, rather than when a person reaches a required age.

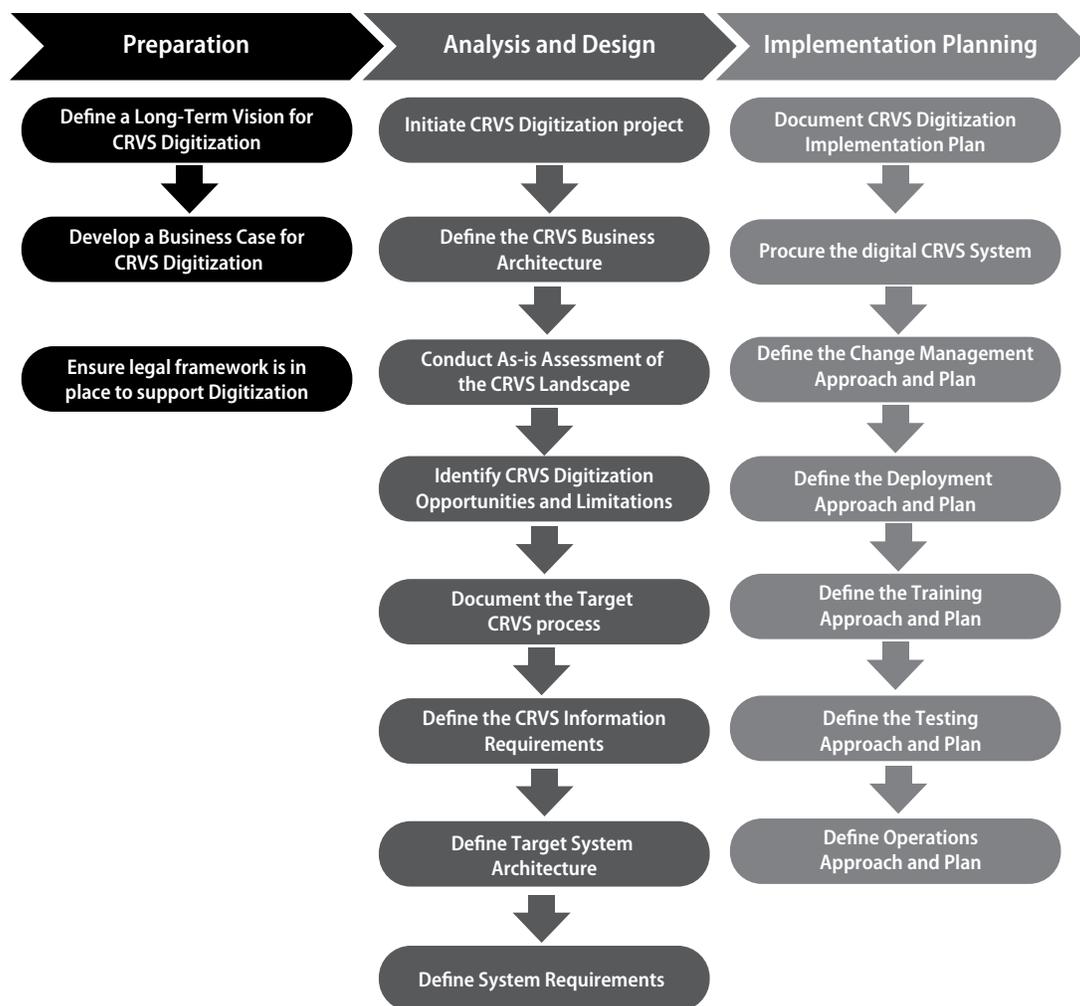
548. The principal reference in this area is the *Civil Registration and Vital Statistics Digitisation Guidebook*, which was developed for the purpose of supporting the Africa Programme for Accelerating Improvement of Civil Registration and Vital Statistics, a regional programme prepared in fulfilment of the political commitment and policy directives of the ministers in charge of civil registration to reform and improve civil registration and vital statistics systems on the African continent.¹⁵³

¹⁵³ For more information, see www.apai-crvs.org/.

C. Developing blueprints

549. The general framework for implementing an efficient enterprise information system needs to be adapted to the process of conducting civil registration of all the various vital events, collecting the necessary information, ensuring the production of comprehensive vital statistics and generating input for population registers. Figure 14 presents the digitization life cycle for civil registration and vital statistics.

Figure 14
Digitization project life cycle for civil registration and vital statistics



Source: Adapted from the online *Civil Registration and Vital Statistics Digitisation Guidebook*, available at www.crvs-dgb.org/en/.

550. Each of the phases and recommended activities is presented below in a prescribed sequence that may be accomplished in its entirety or taken step by step, depending on the system, stakeholders and resources in place.

1. Preparation phase

551. The activities of the preparation phase need to be completed prior to commencing a civil registration and vital statistics digitization project. That phase includes alignment with a country's broader programme of strengthening civil registration and vital statistics and lays the foundation for a business case for digitized civil registration and vital statistics. It comprises the following steps:

- (a) *Defining a long-term vision for digitization:* The long-term vision for digitization sets out a desired future state for civil registration and vital statistics that can specifically be achieved through the use of digital technologies. Aligned with a strategic plan for civil registration and vital statistics, the long-term vision is based on high-level needs and sets the direction for the digitization project;
- (b) *Developing a business case for digitization:* The business case explores the manner in which technology can provide a cost-effective means of improving civil registration and vital statistics systems and processes. The document should be used to indicate the expected benefits of digitization, to generate support from key stakeholders, to justify the technology investment costs and to raise funds for project implementation. The business case is developed in two parts. The initial business case, developed in that activity, outlines the actual costs of the analysis and design phase and indicative costs for full implementation. This business case will be revisited and updated at the beginning of the implementation phase to give a more accurate reflection of the findings of the analysis and design phase, including an accurate representation of the defined digital civil registration and vital statistics system and the benefits and costs associated with its implementation;
- (c) *Ensuring that a legal framework is in place to support digitization:* An appropriate legal framework is developed or reviewed for a national civil registration system that highlights its statistical function and takes into account the identity management system, in the context of e-government. Gaps in the current legal framework are identified and a plan devised to align it with the needs of a digitized system.

2. Analysis and design phase

552. The activities outlined in the analysis and design phase must provide step-by-step guidance on how to align information and communications technology with the civil registration and vital statistics business need. Following the activities in a sequential manner ensures that the relevant country context is fully analysed and traceable, from the civil registration and vital statistics business requirements through to the detailed requirements for an enabling civil registration and vital statistics system. That process comprises the following stages:

- (a) *Initiating the digitization project:* In order to implement a successful digitization project, it is critical that the project be initiated in a structured manner, clearly defining expectations and standards to all relevant actors and stakeholders. To do that, a project initiation document should be created, formally documenting the purpose, approach, standards and timelines of

the analysis and design phase. The project initiation document should be shared with all relevant parties, so that the scope of work and their roles and responsibilities are acknowledged and accepted before formal work begins. In subsequent activities, advanced project planning will help guide project decision-making and management and will be updated to reflect the change in focus of activities at the beginning of the implementation phase;

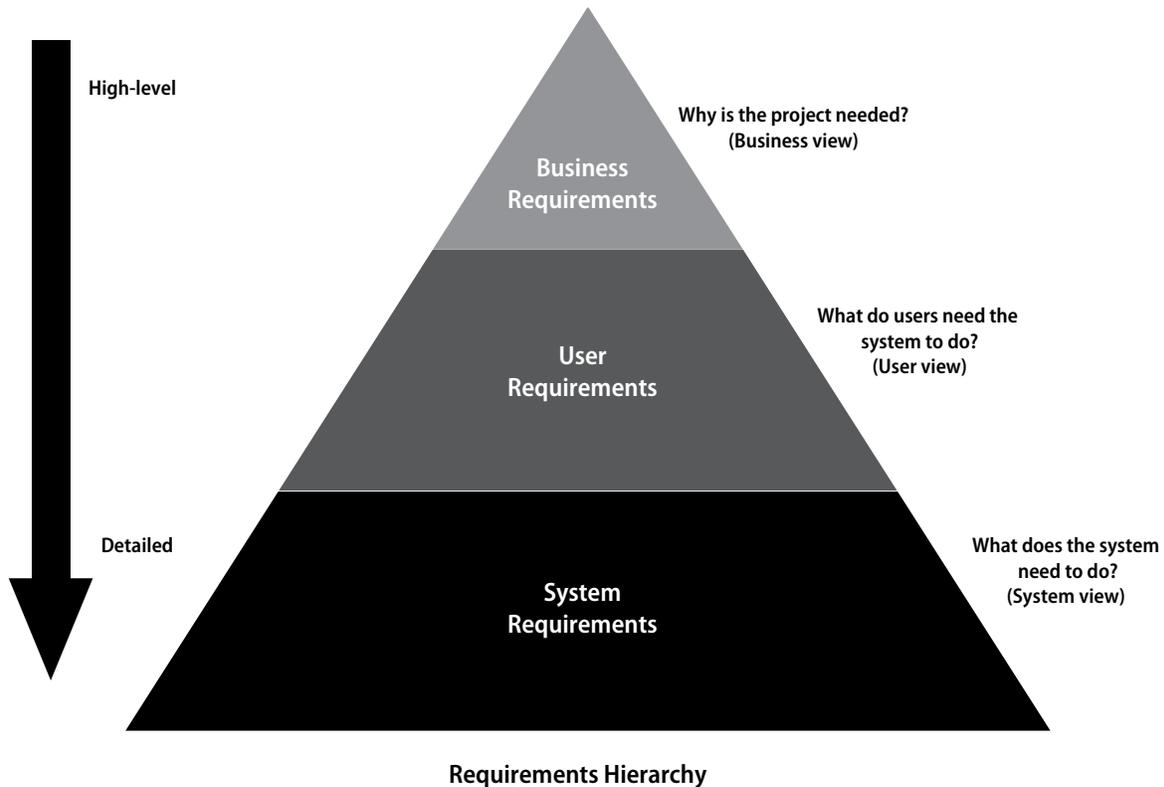
- (b) *Defining the civil registration and vital statistics business architecture:* The purpose of defining a business architecture is to build a common understanding of the organization's purpose, functions and needs, in order to guide and manage organizational activities and change. In that context, the organization comprises the authorities responsible for civil registration and vital statistics. Subsequent steps in the digitization process must be aligned with the organizational foundations defined in the business architecture. In other words, the targeted digitized systems and processes must meet the business requirements;
- (c) *Conducting an as-is assessment of the civil registration and vital statistics landscape:* In order to identify appropriate technologies to support civil registration and vital statistics, an assessment of the status quo, known as an "as-is" assessment, must be conducted to understand the strengths and weaknesses of the existing landscape, including several components documented in the business architecture, such as the civil registration and vital statistics business processes. Basing subsequent technology decisions on those findings ensures that technology interventions directly address identified weaknesses;¹⁵⁴
- (d) *Identifying digitization opportunities and limitations:* In order to identify appropriate technologies that are feasible in the current context, it is important to understand what opportunities and limitations exist in the country to support a digital civil registration and vital statistics system. Those opportunities will later be used to inform the definition of the target digital civil registration and vital statistics system and processes;
- (e) *Documenting the target civil registration and vital statistics processes:* Target civil registration and vital statistics processes are redefined processes that respond directly to the weaknesses identified in the as-is assessment and the opportunities identified in the previous activity. The target processes should simplify and streamline existing processes by reducing bureaucracy, facilitating the decentralization of civil registration, remedying bottlenecks and improving service provision to citizens. The target processes will be supported by the target system architecture, which is conducive to simplification and automation;
- (f) *Defining the information requirements:* Before being able to define the systems that are required to support the business needs of civil registration and vital statistics, it is necessary to understand what information requirements exist—in other words, what data are collected, stored and put to use within the existing system. At the highest level that means understanding what logical entities exist within the business domain and the relationships between them. Together with the data dictionary,¹⁵⁵ they form the basis of the data architecture, which, when detailed at the lowest level, will later define the database design for civil registration, vital statistics and population registers, and also for interactions with identity management systems;

¹⁵⁴ If a rapid or comprehensive assessment has been conducted, it should be used as an input.

¹⁵⁵ As defined in the *Civil Registration and Vital Statistics Digitization Guidebook* (available at www.crvs-dgb.org/en/glossary/), the term "data dictionary" refers to a set of information describing the content, format, and structure of a database and the relationship between its elements, used to control access to and manipulation of the database.

- (g) *Defining the target system architecture:* The target system architecture is a holistic, interoperable model of the applications and computer programmes required to fulfil business needs and support target processes;
- (h) *Defining system requirements:* System requirements are clearly articulated statements of what a system must be able to do in order to satisfy stakeholder needs, and are derived from business requirements and user requirements, as set out in the requirements hierarchy in figure 15. They should be divided into two clear categories, functional and non-functional. Functional requirements describe the required behaviour and functions of the system. Non-functional requirements describe specific criteria that can be used to judge the operation of a system—in other words, its performance, security and accessibility.

Figure 15
Requirements hierarchy



Source: Civil Registration and Vital Statistics Digitisation Guidebook.

3. Implementation planning phase

553. The activities of the implementation phase will support the creation of a comprehensive workplan for the digitization project, ranging from the selection of software vendors to the testing and deployment of information and communication technology solutions in the field and their subsequent scaling-up. This process comprises the following components:

- (a) *Documenting the digitization implementation plan:* On completion of all activities in the analysis and design phase, it is important that the next phase of activities, from system procurement to the beginning of full system deployment, be carefully planned. Conducting a comprehensive planning exercise will mitigate the risk of schedule and cost overruns, and a well-defined implementation plan provides a structured framework for continuous project monitoring and reporting. That should be carried out as part of the wider strategic plan, to ensure that the project is not operating in isolation and that any interdependencies are clearly acknowledged by all parties. The shift from analysis and design to implementation necessitates returning to the project initiation document and adjusting the project team and governance to support the changing nature of activities. It is also necessary to update the business case template, with a view to completing the costing sections related to systems development, testing and implementation;
- (b) *Procuring the digital system for civil registration and vital statistics:* Conducting a rigorous procurement process ensures a strong contractual position for the government and mitigates delivery risk in the provision of software and services. Central to that is a request for proposals that clearly defines the system, requirements, deliverables and delivery timeframes. The procurement of the system should follow the regular government-issued procurement guidelines and regulations;
- (c) *Defining the change-management approach and plan:* Change management refers to the management of transformative activities within an organization in such a way as to ensure that the changes that occur are fully accepted and integrated into the daily routine. An effective change-management approach is crucial to facilitating the acceptance and use of the digital system and processes across the organization and should be effected in alignment with wider strengthening activities. Clear and targeted communications through a variety of channels should be used to explain what changes are happening and when, and how they will affect each stakeholder;
- (d) *Defining deployment approach and plan:* Deployment is the act of introducing a new technical solution or platform and services to an organization in a coordinated manner. The success of such deployment will depend on forward planning, the availability of adequate resources, continuous monitoring and evaluation and strong communication;
- (e) *Defining the training approach and plan:* Training staff and users in the use of the digitized civil registration and vital statistics system and processes ensures that the system is used effectively, mitigating the risk of business rejection and safeguarding against improper use;
- (f) *Defining the testing approach and plan:* Rigorous testing of the newly developed digital system is essential to ensure that the system is fit for purpose when it is deployed. Testing should be carried out sequentially and traced directly back to the system requirements defined in the analysis and design phase;
- (g) *Defining the operations approach and plan:* During the operations and maintenance phase, the fully tested and accepted system is released into the full-scale production environment for sustained use with operational and maintenance support. That activity focuses on planning for the transition from the implementation phase to normal operational use and handover

to the operations and maintenance team. The operations and maintenance plan should define the tasks, activities and parties responsible for carrying them out, to ensure that the live system is fully functional and is performing as expected.

554. The following examples from the Philippines, Mongolia and Ghana demonstrate the varying ways in which system digitization can be designed and implemented. The Philippines embarked on the project of digitizing its civil registration and vital statistics system through a public–private partnership, details and outcomes of which are described in box 29.

555. Another example may be seen in Mongolia, where an electronic system for data capture has recently been introduced and has had a positive impact on the completeness of birth and death registration. Details are provided in box 30.

556. A third example, the digitization plan of the entire civil registration and vital statistics system in Ghana, is described in box 31.

D. Key considerations

557. The development and deployment of digitized system for civil registration, vital statistics, population registers and identity management, using the governing enterprise information technology approach described in section B above, are also subject to several key considerations that are outlined below.

558. The system's foundation must be well established with a strong design, stakeholder engagement and a supportive legal framework, as detailed below:

- (a) *Business process map*: Key stakeholders involved in the system under consideration should be gathered together to map out the current business process (the as-is situation) and proposed business process (the ideal situation). Each map should include participants, processes, time periods, outputs and bottlenecks. That activity elicits discussion among key stakeholders and ensures a common understanding of the current and proposed systems. The map of the proposed system should be used to guide digitization activities;¹⁵⁶
- (b) *Legal review*: A review should be conducted to ensure that laws and regulations are in place to support the proposed digitized system. The laws should be compared with the business process map of the proposed system to ensure that the role of participants, processes and outputs are in line with the legal framework. The process of revising the laws should be initiated prior to the implementation of any system changes.

559. Digitization needs to be guided by international standards, in particular those set out in *Principles and Recommendations for a Vital Statistics System, Rev. 3*.

560. The first of those relate to the selection of technology. The selection of hardware and software should be integrated to ensure compatibility, keeping in mind the need to update hardware periodically. The technology for the holistic system of civil registration, vital statistics and identity management has to be developed within the framework of contemporary solutions for computer networking and use of the Internet. In addition, the fact that collecting biometric characteristics will, at some point, be part of the system, entails the need to adapt the system to accommodate that type of information, primarily storage and retrieval. The selection of technology must be based on an objective assessment of needs and a comparative analysis of the cost-efficiency ratio of available technology options. An option for technology selection and maintenance is the implementation of public–private partnerships, with carefully spelled-out terms

¹⁵⁶ In the course of strengthening civil registration and vital statistics systems in 16 countries as part of the Bloomberg Data for Health Initiative, 10 milestones have emerged from the use of business process mapping. Those milestones can help support digitization planning and also facilitate quality assurance and monitoring. Further details of the Initiative may be found at <https://crvsgateway.info/learningcentre/crvs-processes>.

Box 29

Philippines: Public-private partnership for digitization of the civil registration and vital statistics system

The civil registration and vital statistics system in the Philippines follows the public–private partnership model. The Philippine Statistics Authority, which is both the national statistics office and also the civil registration authority, entered into a contractual arrangement of the kind referred to as “build-transfer-operate” with a private entity. The resulting arrangement is known as the second Civil Registry System Information Technology Project and is the successor to a project implemented since 2000 which led to the digitization of civil registration documents and the provision of front-line civil registration services. With the original Civil Registry System Information Technology Project, service times were reduced from between 7 and 10 working days to less than a single day, and customer satisfaction increased from 18 to 82 per cent.

Under the second Civil Registry System Information Technology Project, the contractor builds the facility on a turnkey basis, assuming cost overruns, delays and specified performance risks. Supervision is exercised by the Public–Private Partnership Centre in line with the Philippine law on public–private partnerships. Once the facility has been commissioned satisfactorily, title is transferred to the Philippine Statistics Authority. The private entity operates and maintains the information technology system on behalf of the Authority under an agreement, while the Authority operates the Civil Registry System Service Facility. The second Civil Registry System Information Technology Project is scheduled to run for a period of 12 years under the concession agreement described above (starting in 2016), inclusive of a 2-year development phase and a 10-year operations and maintenance period. Revenue sharing is based on the bid of the private partner.

The second Civil Registry System Information Technology Project involves further computerization of the civil registration operations of the Philippine Statistics Authority and is designed to collect, access, store, maintain and manage civil registration documents and specimen signatures of all city and municipal registrars using imaging technology. It also includes faster production of vital statistics and makes available civil registration services nationwide through the civil registry system outlets and other authorized partners. It will develop a new civil registry system application based on modern architecture that will support the central and end-user computing operations for system management, system performance and security. Other access channels to civil registry system services, such as the use of the web, mobile and kiosk devices, and the integration of services with other government agencies and partners, will also be established, along with site preparation for 40 additional outlets nationwide and their establishment.

Among the objectives of the second Civil Registry System Information Technology Project is the provision of enhanced frontline civil registration services through copy issuance of birth, death, and marriage certificates, authentication, certificates of no marriage and new services such as certificates of no death. Key performance indicators have been set as follows (only basic services are shown):

Service	Former PPP (2000–2016)	New PPP (2016–2028)
Copy issuance	2 hours	1 hour
Authentication	2 hours	1 hour
Certificate of no marriage	5 days	1 day
Certificate of no death	N/A	1 day

Lastly, the second Civil Registry System Information Technology Project establishes a geographically separate disaster-recovery environment in an undisclosed location within the Philippines.

Box 30

Mongolia: Improved processes through digitization of the civil registration and vital statistics system

Mongolia has achieved a very high level of birth and death registration in recent years. An important factor in that achievement is the country's introduction of an electronic system for data capture. Wherever possible, digital data which have been collected from the local registration units are transmitted through the online system to the central database. As the majority of the country's administrative districts (*soums*) are not yet able to have direct access to the online system for civil registration, however, an offline program has been introduced in these offices.

The registrar at the district level enters a vital event using the offline program. The program includes checks and controls and ensures that the forms are entirely filled out and in line with nationally standardized questions. If one information item is missing, a warning is shown by the registration program and no further processing is accepted. Once the registration is complete, the local civil registrar prints the official registration form, including a quick response (QR) code where information has been saved in a machine-readable format.

The registrar and the informant sign the registration form, which is sealed by the registrar. The registration form, which contains also digital information in the QR code, is then delivered to the registration unit at the province (*aimag*) level, where a superior registrar verifies the information on the registration form, together with other attached documents, such as the birth notification form issued by the health facility, copies of the identity papers of parents and acknowledgement of parentage. If everything is in order, the information is scanned through the QR code and entered into the online registration system. If not, a correction procedure is required and the registration form is returned to the district registrar. At registration centres without access to the Internet, information about vital events is also computerized. The computers are used to print a QR code with all relevant information on a copy of the certificate, which is then forwarded to the higher-level civil registration centre, where the QR code is scanned and this information is entered into the national database.

Before the offline system was introduced, inaccurate information on vital events due to mistakes was frequently encountered. Since the offline program has been in operation, the inaccuracies caused by manual errors have almost disappeared. In addition, significant time is saved as data only have to be entered once and many errors are avoided through automatic checks.

of reference for accountability and ownership. The considerations outlined in the following paragraphs should be kept in mind in this context.

561. Where hardware is concerned, while it is well documented that hardware becomes obsolete relatively quickly, and that this creates an incentive to acquire the latest and most modern solutions, and thus the most expensive, it is also well documented that basic maintenance of the population and civil registers and related data processing does not require the most advanced technological features available. In this context, consideration should be given to hardware that meets system specifications but is compatible with the environment (in terms of battery power, durability and other attributes) and is user-friendly (where screen size, durability, weight and other properties are concerned).

562. Where software is concerned, consideration should be given to developed platforms rather than home-grown solutions. Technical staff-supporting software solutions require less historical training if a developed platform is used. The disadvantage

Box 31

Ghana: Civil registration and vital statistics digitization strategy based on a comprehensive assessment

Ghana conducted a comprehensive assessment of its civil registration and vital statistics system and prepared a national civil registration and vital statistics strategic plan in line with regional and international requirements for the development of efficient such systems. The comprehensive assessment exercise revealed among other findings that interoperability of stakeholder databases was virtually non-existent, many parallel databases of individual identifications were being operated by various government institutions at great cost to the country, stakeholders were sharing data on an ad hoc and infrequent basis, and the paper-based nature of the system was a major barrier to improving the civil registration and vital statistics system.

The current national medium-term development policy framework—the Ghana Shared Growth and Development Agenda 2014–2017—also identified underdevelopment and underuse of the civil registration information systems, lack of awareness and non-compliance with civil registration regulations as further drawbacks.

Thus, the civil registration and vital statistics strategic plan proposed the digitization of the entire system to improve its efficiency and provide reliable and timely statistics to monitor and evaluate achievement of national goals and the Sustainable Development Goals at all levels of governance. In line with that undertaking, stakeholder institutions were entrusted with the design of an information and communications technology strategy for civil registration and vital statistics and with the development of a business case for its implementation. A team of consultants conducted a needs assessment of the information technology systems of stakeholder institutions, after which selected participants were trained in the use of the civil registration and vital statistics digitization guidebook (published by the Economic Commission for Africa), to cover the first phase of the civil registration and vital statistics digitization programme.

In the second phase of the programme, participants gathered in a workshop to subject the first draft of the as-is civil registration and vital statistics business process maps to a critical review, and to identify any bottlenecks in the proposed processes for registering births, deaths, marriages and divorces. System analyses were also carried out to confirm the current processes and identify missing steps. At the end of the workshop, participants proposed the expansion of service-delivery points for the registration of all the vital events considered under the programme.

A number of initiatives in the civil registration and vital statistics strategic plan encourage the automation and digitization of the system and processes, with a view to extending their registration coverage, standardizing and streamlining civil registration and vital statistics processes, integrating data from multiple systems and securely storing data at scale, all in a cost-effective manner. If properly employed, information and communications technology can make a significant contribution to achieving the universal registration of vital events, providing legal documentation of civil registration as necessary to claim identity, civil status and ensuing rights, and producing accurate, complete and timely vital statistics.

of using a developed platform is that it might not meet all system specifications. The pros and cons need to be carefully weighed to ensure that the software meets system needs, but can be maintained within the system architecture, regardless of the maintenance team. The software solution must also be userfriendly. With the advent of personal portable digital devices and the accompanying shift in communication behaviour, users expect to have the necessary access to service provided by the sys-

tem handy and as interactive as possible. The system architecture needs to incorporate those interfaces in a manner that meets most, if not all, expectations.

563. Second, data safety considerations mean that the process and the public must be taken into account. These considerations include the following:

- (a) *Transmission and encryption*: Digitization of the civil registration and vital statistics system may result in the change to electronic from hard-copy format, for electronic transmission. To limit a data breach in which transmitted data are intercepted, encryption should be considered and applied to the necessary level of the system—file, application, database and others;
- (b) *Storage*: Digitization of the civil registration and vital statistics system, including the population register and identity management, may also entail scanning old records and entering their data. That does not mean that those paper records can be abandoned. Instead, they need to be carefully maintained and stored, with restricted access and regulated handling, as some of these documents might be centuries old. An example of the importance of preserving historic records is described in chapter III, box 13;
- (c) *Retention*: As with storage, the retention of electronic records necessitates a clear policy. Server space may become an issue for long-standing programmes such as civil registration and vital statistics. Thus, the information-management strategy of the relevant agencies must clearly state whether, when and how digitized and electronic records may be destroyed;
- (d) *Authenticity*: Civil registration systems that provide online birth and death certificates need to carefully consider methods to ensure authenticity, in order to minimize identity theft and child trafficking using stolen certificates. An example of the use of checks and safeguards in the production of certified copies, implemented by the Civil Registration and Identification Service of Chile, is provided in chapter II, box 6.

564. The third standards-related issue is confidentiality of an individual's information. That is one of the basic principles of civil registration and vital statistics. Ensuring the safety of the individual information stored in the digitized system requires robust security setups and multilayered protection against attempts to break into the system and retrieve the records. The potential mishandling—or even abuse—of individual information does not necessarily always come from outside the system, hence the need to carefully limit access to the register to only the necessary officials. Even then, a hierarchy for allowing different levels of access to the records and their manipulation has to be established. In addition, physical security also has a role to play. For example, workstations should not be equipped with interfaces for portable memory cards, which might enable the unauthorized downloading of the records.

565. Lastly, the issue of digital identity has been the subject of debate in recent years. While there is as yet no universally adopted definition of digital identity, the notion is generally understood as unique and constant identity—a virtual identification card—assigned to individuals that authenticates them as users of all their portable digital devices, both in the digital world, such as online banking, commerce and also in the physical world whenever such identification may be required (for example, to authenticate their identity at a health-care centre, or when asked for by the police). It involves biometrics, such as fingerprint or iris scanning, which are increasingly available on contemporary portable digital devices. The fact that digital identity is not yet universally implemented is due to a number of issues, such as the need for such screening to be platform- and device-independent.¹⁵⁷ As it can be expected that the concept of digital identity will take hold more and more, and is likely to take over from the user-

¹⁵⁷ See Bob O'Donell, "The digital identity dilemma", *Recode*, 10 August 2016. Available at www.recode.net/2016/8/10/12413592/digital-identity-virtual-id-card-fido-web-api.

name-plus-password model, the digitized civil registration, vital statistics, population registers and identity management systems need to take that development into consideration and perhaps provide this additional service to their users. A discussion of the potential use of blockchain technology in this context is provided in box 32.

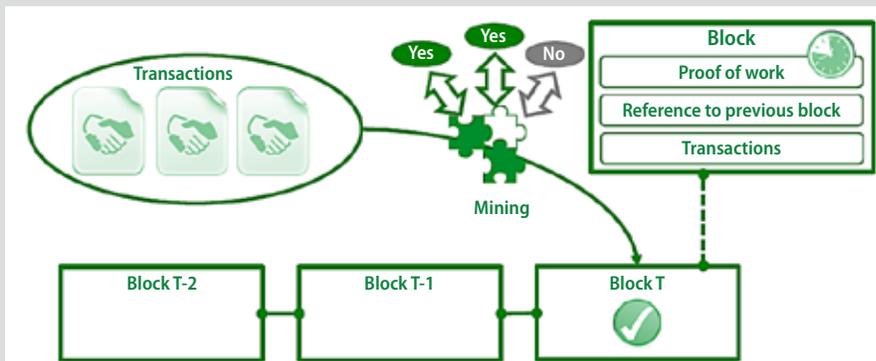
Box 32

Blockchain and civil registration and identity management

The recent surge of interest in what is known as “blockchain” (distributed ledger technology) and cryptocurrency technologies has brought the attention of many governments, United Nations agencies and civil society to their potential applications in civil registration and identity management.

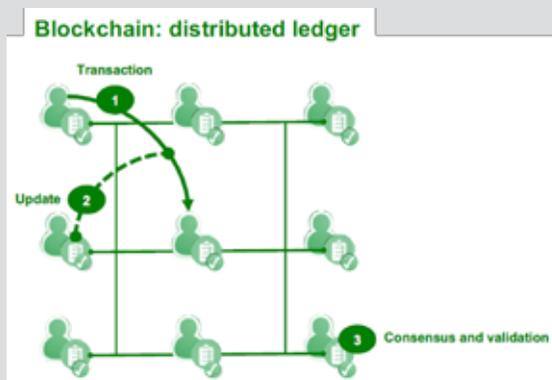
As its name implies, a blockchain is a chain of blocks; each block contains records of information and is connected by hash pointers (mathematical functions) and secured using cryptography. A blockchain may be seen as a decentralized network which has the objective of maintaining synchronized copies of a digital ledger distributed among the members of the network. In the world of blockchain, each participant keeps one ledger, which registers all events occurring in the platform. Once a piece of new information pertaining to a participant is announced, it is verified by the “miners”, as those who conduct this verification are known, then it will be added and reflected in the ledger of each participant.

By design, blockchains are inherently resistant to modification of data. Once an information entry has been created and verified, it is saved permanently, as the information is verified and saved by consensus, which makes modification extremely hard. In consequence, falsification is expensive. That is the reason blockchain technology is potentially suitable to applications related to record management, such as civil registration and identity management.



Source: Presentation of blockchain for identity management by IBM Corporation, Seoul, November 2016. Available at www.slideshare.net/eburon/blockchain-for-identity-management-ibm-part-1-of-3.

In the simplest and most practical case of implementation of blockchain in civil registration, everything in the system would appear unchanged to the public and also to civil registrars. People would go to the civil registration office and provide requested information, and local registrars would enter the required information into the system. The differences lie only in the background—in other words, the technology embedded in the system for data input, storage and update changes. No single local registrar would be able to alter any information in the system without it being verified by others, and audit trails are left whenever information is edited.



Source: Ibid.

In addition to its usual applications, blockchain technology may also be applied to many current problems arising in civil registration and identity management. Hypothetically, the public could register all vital events from any point with an Internet connection by reaching into the blockchain network. For example, to notify a birth, parents could enter the data themselves, identifying themselves using their own identity particulars, or, if this is permitted by the web application, even by uploading a link to a digitally signed video or photograph to the blockchain, stating the baby's full name, date and location of birth and other pieces of information. The miners would record the new birth and associate it irrevocably with the applicant parents and then all ledgers would be updated. To validate the process further, parents could also add their testimony or that of a third party or both, along with additional proof such as the medical birth certificate from the hospital.

Just as all data are stored digitally and cannot be erased or modified, so are personal identities, no matter if the person moves. Accordingly, loss of identity documents would no longer be a concern and the problems arising in proving identity would be eased. In fact, people may no longer need to carry and show any physical identity documents, so long as they can connect online and present information that they have at their disposal, such as a password or biometric information such as a retina scan or fingerprint to identify themselves. That would be particularly valuable for refugees and displaced persons who may not be able to carry their identity documents when fleeing their usual place of residence.

Despite the excitement about the potential revolution in civil registration and identity management brought about by blockchain technology, applications are still at the exploratory stage and only a few small pilot projects have been carried out, let alone implemented on any meaningful scale. At this stage (late 2017), it is more of a conceptual exercise as there is a need for further consideration of the use of this technology from the point of view of ensuring the proper and comprehensive input of relevant information into the statistical function as well.

Annex I

Medical certification of cause of death form recommended by the World Health Assembly

INTERNATIONAL FORM OF MEDICAL CERTIFICATE OF CAUSE OF DEATH

Cause of death		Approximate interval between onset and death
I		
Disease or condition directly leading to death*	(a) due to (or as a consequence of)
Antecedent causes	(b) due to (or as a consequence of)
Morbid conditions, if any, giving rise to the above cause, stating the underlying condition last	(c) due to (or as a consequence of)
	(d)
<hr/>		
II		
Other significant conditions contributing to the death, but not related to the disease or condition causing it
<p><i>*This does not mean the mode of dying, e.g. heart failure, respiratory failure. It means the disease, injury, or complication that caused death.</i></p>		

Annex II

Computer software for the selection and coding of the underlying cause of death

Manual coding is a laborious process requiring understanding and skill in applying the rules and principles of the International Classification of Diseases for the correct coding and selection of the underlying cause of death. Since the 1960s, automated coding systems have been developed to streamline the coding process and improve uniformity in the application of coding rules and principles for the selection of the underlying cause of death. Those automated systems do not, however, replace trained coders, who are still required to support automated coding systems for death certificates rejected by the system and to perform the quality control of automatically coded records, in particular when changes are made to the automated systems. Currently, across the world, the Mortality Medical Data System and IRIS are the two most commonly used automated coding systems. Both systems require deaths to be reported in line with WHO death certificate recommendations.

The Mortality Medical Data System is a software package developed in the 1960s by the United States National Center for Health Statistics. It includes components for the conduct of various coding data management processes: data entry, cause-of-death coding, selection of the underlying cause of death, and data translation for statistical analysis. Mortality Medical Indexing Classification and Retrieval (MICAR) is the component that codes using the rules and principles of the International Classification of Diseases for multiple cause coding. MICAR codes the causes of death entered in text format, a process that is language dependent. It has been used in Australia, the United Kingdom of Great Britain and Northern Ireland and the United States of America. The Automated Classification of Medical Entities (ACME) is the component that determines the underlying cause of death from the codes selected in MICAR. Since the data are in numerical format, ACME is language independent. Brazil, France and Sweden have used ACME, but it does not perform as well without MICAR because of the very specific coding instructions. Currently, the United States National Center for Health Statistics maintains the Mortality Medical Data System and is its primary user.

In the 2000s, five countries collaborated on the development of a language-independent automated coding system. Initially based on MICAR and ACME, IRIS was developed as free, closed-source software with a language-independent component. Similar to the Mortality Medical Data System, IRIS conducts multiple cause coding and selects the underlying cause of death. IRIS can be used in two modes: code entry or text entry. For code entry, it selects the underlying cause of death from the codes entered directly into the system. That mode can be used once IRIS is installed and data are prepared in the required data-entry format. For text entry, causes of death are entered in text format and coded in accordance with the rules and principles of the International Classification of Diseases for the selection of the underlying cause of death. The text-entry mode requires the development and maintenance of a local dictionary, allowing application in any language. Dictionary development and maintenance is a substantial investment but can be facilitated with the modification of an

existing dictionary, such as the French dictionary used for the development of the French-language Moroccan local dictionary.

IRIS is currently being used or in the process of implementation in many countries around the world: Australia, Brazil, Canada, Czechia, Fiji, France, Luxembourg, Mexico, Philippines, South Africa, Sweden and others. The IRIS Institute, established within the German Institute of Medical Documentation and Information and supported by partner countries, maintains IRIS through its Core Group, ensuring its conformity with the rules and principles of the International Classification of Diseases; issues software updates; and organizes annual training meetings.

References

- Blakely, Tony, Alistair Woodward and Clare Salmond. Anonymous linkage of New Zealand mortality and census data, *Australian and New Zealand Journal of Public Health*, vol. 24, No. 1 (2000), pp. 92–95.
- Bopp, Matthias and others. Cohort profile: the Swiss national cohort—a longitudinal study of 6.8 million people, *International Journal of Epidemiology*, vol. 38, No. 2 (April 2009), pp. 379–384.
- Boyle, Paul J. and others. Cohort Profile: The Scottish Longitudinal Study (SLS), *International Journal of Epidemiology*, vol. 38, No. 2, April 2009, Pages 385–392, <https://doi.org/10.1093/ije/dyn087>.
- Brazil, Ministry of Health, National Health Foundation. Manual de procedimento do sistema de informações sobre mortalidade (Mortality information system handbook), (Brasilia, 2001). Available at http://bvsmms.saude.gov.br/bvs/publicacoes/sis_mortalidade.pdf.
- Brunborg, Helge. Civil registration and vital statistics for refugees, in UNHCR, *Statistical Yearbook 2014*, chap. 5, pp. 67–73. Available at www.unhcr.org/56655f4c16.html.
- Brunborg, Helge, Vibeke Oestreich Nielsen, United Nations Economic Commission for Africa (2017–09). Guidelines and template for developing a vital statistics report. Addis Ababa. UN. ECA, ESCAP and Statistics Norway. Available at <https://hdl.handle.net/10855/24163>.
- Carter, Karen and others. Mortality and life expectancy in Kiribati based on analysis of reported deaths, *Population Health Metrics*, vol. 14, No. 3 (2016).
- Chandra Sekar (Chandrasekaran), Chidambara and William Edwards Deming. On a method of estimating birth and death rates and the extent of registration, *Journal of the American Statistical Association*, vol. 44, No. 245 (March 1949), pp. 101–115.
- Couet, Christine. L'échantillon démographique permanent de l'Insee, *Courrier des statistiques*, No. 117–119 (2006), pp. 5–14; Stéphane Jugnot, (2014).
- De Savigny, Don and others. Integrating community-based verbal autopsy into civil registration and vital statistics (CRVS): system-level considerations, *Global health action* vol. 10,1 (2017): 1272882.
- Dusetzina, Stacie B. and others. Linking Data for Health Services Research: A Framework and Instructional Guide (Rockville, Maryland: Agency for Healthcare Research and Quality, United States, 2014).
- Gupta, Mamta and others. Estimating mortality using data from civil registration: a cross-sectional study in India, *Bulletin of the World Health Organization*, 2016, vol. 94, No. 1, pp. 10–21.
- Hill, Kenneth. Analytical methods to evaluate the completeness and quality of death registration: current state of knowledge, Technical Paper No. 2017/2 (New York, United Nations, Department of Economic and Social Affairs, Popula-

- tion Division, 2017). Available at www.un.org/en/development/desa/population/publications/pdf/technical/TP2017-2.pdf.
- Hill, Sarah, June Atkinson, and Tony Blakely. Anonymous record linkage of census and mortality records: 1981, 1986, 1991, 1996 census cohorts, NZCMS Technical Report No. 3 (Wellington, Department of Public Health, Wellington School of Medicine and Health Sciences, University of Otago, 2002). Available at www.otago.ac.nz/wellington/departments/publichealth/research/hirp/otago020541.html.
- India, Ministry of Home Affairs, Office of the Registrar General and Census Commissioner, Vital Statistics Division. Sample Registration System (New Delhi, 2007). Available at www.censusindia.gov.in/Vital_Statistics/SRS/Sample_Registration_System.aspx.
- ISACA. Getting Started with Governance of Enterprise IT (GEIT), ISACA White Paper (ISACA, 2015). Available at: https://informationsecurity.report/Resources/Whitepapers/54de6804-71c8-4aed-a044-8263345c2b6c_Getting-Started-With-GEIT_whp_Eng_0314.pdf.
- Joubert, Jané and others. Evaluating the quality of national mortality statistics from civil registration in South Africa, 1997–2007, *PLOS One*, vol. 8, No. 5 (2013).
- La constitution de l'échantillon démographique permanent de 1968 à 2012, Institut National de la Statistique et des Etudes Economiques, Direction des Statistiques Démographiques et Sociales, Document de Travail No. F1406 (September 2014); www.insee.fr/fr/metadonnees/source/s1166.
- Mahapatra, Prasanta and others. Civil registration systems and vital statistics: successes and missed opportunities. *Lancet*, vol. 370, No. 9599, pp. 1653–1663 (2007).
- Moultrie, Tom and others. Tools for Demographic Estimation (Paris, International Union for the Scientific Study of Population, 2013), available at <http://demographicestimation.iussp.org/>.
- Murray, Christopher and others. What can we conclude from death registration? Improved methods for evaluating completeness, *PLOS Medicine*, vol. 7, No. 4 (April 2010).
- O'Donnell, Bob. The digital identity dilemma. *Recode*, 9 August 2016. Available at www.vox.com/2016/8/10/12413592/digital-identity-virtual-id-card-fido-web-api.
- Oestreich Nielsen, Vibeke and others. Status Analysis on Civil Registration and Vital Statistics (CRVS). Documents 2014/41 (Oslo-Kongsvinger, 2014). Available at www.ssb.no/en/befolkning/artikler-og-publikasjoner/status-analysis-on-civil-registration-and-vital-statistics-crvs.
- O'Reilly, Dermot and others. Cohort description: The Northern Ireland Longitudinal Study (NILS), *International Journal of Epidemiology*, vol. 41, No. 3, June 2012, Pages 634–641, <https://doi.org/10.1093/ije/dyq271>.
- Philips, David and others. A composite metric for assessing data on mortality and causes of death: the Vital Statistics Performance Index, *Population Health Metrics*, vol. 12, No. 14 (2014).
- Pinto da Silveira, Daniele and Elizabeth Artmann. Accuracy of probabilistic record linkage applied to health databases: systematic review, *Revista de Saúde Pública*, vol. 43, No. 5 (2009).

- Plan International (2014). Birth registration in emergencies: a review of best practices in humanitarian action. Available at <https://planusa-org-staging.s3.amazonaws.com/public/uploads/2021/05/birth-registration-emergencies-2014.pdf>.
- Proceedings of the International Identity Management Conference, Seoul, 23–25 September 2014, available at https://publications.iadb.org/bitstream/handle/11319/7125/International_Identity_Management_Conference_Proceedings.pdf?sequence=4.
- Rao, Chalapati and Matthew Kelly. Overview of the principles and international experiences in implementing record linkage mechanisms to assess completeness of death registration, Technical Paper No. 2017/5 (New York, United Nations, Department of Economic and Social Affairs, Population Division, 2017).
- Rao, Chalapati and others. Evaluating national cause-of-death statistics: principles and application to the case of China, *Bulletin of the World Health Organization*, vol. 83, pp. 618–625 (August 2005).
- Rao, Chalapati and others. Validation of cause-of-death statistics in urban China, *International Journal of Epidemiology*, vol. 36, No. 3 (2007), pp. 642–651.
- Report of the Delegates to the International Statistical Congress held at St. Petersburg in August, 1872 (Washington, D.C., Government Printing Office, 1875), p. 46.
- United Nations (1969). *Methodology and Evaluation of Population Registers and Similar Systems* (United Nations publication, Sales No. E.69.XVII.15).
- _____ (1985). *Handbook of Vital Statistics Systems and Methods, vol. II, Review of National Practices*, (United Nations publication, Sales No. E.84.XVII.11).
- _____ (1998a). *Handbook on Civil Registration and Vital Statistics Systems: Developing Information, Education and Communication* (United Nations publication, Sales No. 98.XVII.4).
- _____ (1998b). *Handbook on Civil Registration and Vital Statistics Systems: Preparation of a Legal Framework* (United Nations publication, Sales No. E.98.XVII.7).
- _____ (2000). *Handbook on geographic information systems and digital mapping* (United Nations publication, Sales No. 00.XVII.12).
- _____ (2004). *Handbook on the Collection of Fertility and Mortality Data* (United Nations publication, Sales No. E.03.XVII.11).
- _____ (2007). *Register-based statistics in the Nordic countries - Review of best practices with focus on population and social statistics* (United Nations publication, Sales No. E.07.II.E.11).
- _____ (2009). *Handbook on Geospatial Infrastructure in Support of Census Activities* (United Nations publication, Sales No E.09.XVIII.8).
- _____ (2014). *Principles and Recommendations for a Vital Statistics System, Rev. 3* (United Nations publication, Sales No. E.13.XVII.10).
- _____ (2017). *Principles and Recommendations for Population and Housing Censuses, Rev. 3*, (United Nations publication, Sales No. E.15.XVII.10).
- _____ (2022). *Handbook on Civil Registration, Vital Statistics and Identity Management Systems: Communication for Development* (United Nations publication).
- _____ forthcoming *Guidelines on the Legislative Framework for Civil Registration, Vital Statistics and Identity Management* (United Nations publication).

- World Health Organization (2010a). *Cause of death on the Death Certificate in line with ICD-10: Quick reference guide*. Available at http://apps.who.int/classifications/apps/icd/icd10training/ICD-10%20Death%20Certificate/html/ICD-10_Resources/causeofdeathflyer.pdf.
- _____ (2010b). *Rapid assessment of national civil registration and vital statistics systems*, (WHO/IER/his/STM/2010.1).
- _____ (2010c). *Improving the Quality and Use of Birth, Death and Cause-of-Death Information: Guidance for a Standards-based Review of Country Practices* (Geneva, 2010).
- _____ (2010d). *International Statistical Classification of Diseases and Related Health Problems, 10th revision* (Geneva, 2010). Details available at www.who.int/classifications/icd/en/.
- _____ (2013). *Strengthening civil registration and vital statistics through innovative approaches in the health sector*, report of a technical meeting, Geneva, 17–18 December 2013, document WHO/HIS/HSI/2014/1. Available at www.who.int/healthinfo/civil_registration/crvs_meeting_dec2013_report.pdf.
- _____ (2015). *International statistical classification of diseases and related health problems, tenth revision, fifth edition* (Geneva, 2016). Available at www.who.int/iris/handle/10665/246208.
- Yang, Gonghuan and others. Mortality registration and surveillance in China: History, current situation and challenges, *Population Health Metrics*, vol. 3(1), No. 3 (April 2005).

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