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GUIDELINES FOR MORTALITY SURVEILLANCE

A Practical Guide for Collecting, Reporting, and Using Surveillance Data for Estimating Mortality in Refugee Settings

Acknowledgments

UNHCR contributors

Ann Burton, Ibrahima Diallo, Edna Moturi, Meghan Obermeyer, Michael Woodman and Erin E Anastasi.

Institutional contribution

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UNHCR reviewers

Sandra Harlass, Heba Hayek, Vincent Kahi, Allen Gidraf Kahindo Maina, Florah Bukania and Kazi Nazmus Sakib

External reviewers

Technical inputs and feedback were received from Jonathan Polonsky (World health organisation), Ruwan Ratnayake (London School of Hygiene and Tropical Medicine), Amanda McClelland (Resolve to save the lives), Leslie Roberts (Columbia University), Philip Setel (Vital Strategies) and Martin Bratschi (Vital Strategies).

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Acronyms and Abbreviations

CBMS	Community-based mortality surveillance
CDR	Crude Death rate
CFR	Case Fatality Rate
CHW	Community Health Workers
CMR	Crude Mortality Rate
IMR	Infant Mortality Rate
iRHIS	Integrated Refugee Health Information System
MMR	Maternal Mortality Ratio
MoH	Ministry of Health
NCDs	Non-communicable Diseases
NMR	Neonatal Mortality Rate
PHO	Public Health Officer
TBA	Traditional Birth Attendant
U5DR	Under-five death rate
U5MR	Under-five mortality rate
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
VA	Verbal Autopsy
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization

Key Concepts and Definitions

Concept	Definition
Active Surveillance	A type of surveillance in which cases of a particular condition are proactively sought after. Compared with passive surveillance, active surveillance provides more comprehensive and complete information, which tends to be timelier and more accurate, but can also be more expensive to collect.
Acute Emergency Phase	The early phase of a crisis where disease and death rates are markedly elevated from baseline, and response activities are prioritized around ensuring survival.
Bias	A systematic error that occurs or is introduced into sampling or data collection that can influence the results. Potential biases can include selection, recall, survival, non-response, and reporting bias. In mortality surveillance, consideration of potential biases in data collection is important to understand specific issues related to over- or underreporting of deaths, particularly among different demographics groups.
Burial Counting	A method usually used early in an emergency to provide basic counts based on visual observation of new graves. This can also include counting the number of burial cloths or shrouds distributed.
Community Cause of Death Interview	A method of community-based mortality surveillance in which a community volunteer interviews household member(s) about a death, using a short and structured interview form that focuses on basic circumstances around the death and signs or symptoms exhibited by the decedent to ascribe a potential cause of death. It is similar in structure to a formal verbal autopsy but collects less data, is less rigorous, simpler to conduct and is reported as a suspected cause of death.
Community-based Mortality Surveillance (CBMS)	The ongoing and systematic collection of mortality data at the community level.
Community Health Worker (CHW) OR **Community Volunteer (CV)**	Any person who is working within the community, outside a health facility. CHWs/CVs are an integral part of conducting mortality surveillance activities in emergencies.
Counts of Deaths	A count is the simplest measure of mortality in an emergency, as it lacks a population denominator. In the absence of reliable population estimates, required for mortality estimates, disaggregated numbers of deaths by age and sex can provide valuable information. This measure is difficult to interpret without denominators and restricts the ability to make fair comparisons in different populations and or settings.
Crude Death Rate (CDR) OR **Crude Mortality Rate (CMR)**	An incidence rate of deaths, that includes all deaths regardless of cause, age, or sex. It is measured for a given population for a specified recall period. This should include deaths both in the community and facility-based deaths. During humanitarian emergencies it is usually reported as deaths per 10,000 per day but can also be reported as deaths per 1000 per month or per person-time. These terms are interchangeable. In this guidance CMR will be used.
Data Triangulation	The synthesis and integration of data derived using different methods from multiple sources, including from facility and community sources, through collection, examination, comparison, and interpretation.
Direct (immediate) cause of death	The final disease (condition), injury, or complication resulting from the underlying cause of death, occurring closest to the time of death, and directly causing the death (cardio/pulmonary/respiratory arrest).

Emergency Mortality Threshold[1]	A mortality magnitude that indicates a level requiring an urgent public health response. For example, a doubling of a known or estimated baseline of crude mortality or under five mortality rate should be used to signify an emergency mortality threshold.
Event Calendar	A recall aid or assistive tool that helps reduce recall and/or event reporting bias (both types that could affect accuracy of data). This tool provides timelines and memory references for an interviewee to determine the events surrounding a specific household event, like a death or birth. For example, this could include holidays, first day of harvest, etc.
Excess Death Rate OR Excess Mortality Rate	A death rate that occurs in a given population and over a given period that is above the expected baseline death rate that would have occurred in the absence of an emergency.
Facility-Based Mortality Surveillance	The ongoing systematic collection, analysis, and interpretation of mortality data collected from health facilities which should also include cause of death. All deaths that occur at the health facility level are collected and reported.
Focus Group Discussions	A participatory method for collecting qualitative data that brings together individuals from the community to discuss specific topics or themes.[2] Focus group discussions can be used to gain insight into specific issues, beliefs, perceptions and or practices that might exist among members of a community. It can also be used before designing questionnaires and tools, in addition to exploring specific topics or themes.[3] Questions are often open-ended to create an informal discussion with a small number or a set number of participants (6-12). This provides information complementary to that collected through other methods (e.g., surveys).
Household	The most basic unit from which information is collected during surveys. Often defined as people who slept in the household the previous night or ate from the same cooking pot. As there is no universal definition of household, it is important to develop a working definition that is agreed upon in each specific situation prior to household data collection so that both the interviewer and interviewee have the same understanding of who is included as a household member and what information is required.
Maternal Mortality	A maternal death is the death of a female[4] while pregnant or within 42 days of the end of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.
Mid-period Population at Risk	An estimated population at risk at the middle point of a given time period. It is used in the expression of mortality rate.
Passive Surveillance	A type of surveillance in which cases of a condition are reported through a routine system, such as from a laboratory or health care facility; cases are not actively sought. Compared with active surveillance, passive surveillance provides less complete information, which can lead to under-reporting. It tends to be simpler and less expensive that active surveillance.
Post-emergency Phase	The period that follows the acute emergency phase, where basic health interventions are implemented, and mortality begins to stabilize.

1. Historically, a CMR (CDR) of 1/10,000/day, or an under 5 mortality rate (U5MR) of 2/10,000/day was used as a standard emergency mortality threshold, but that standard is no longer applicable, and a doubling of a known or estimated baseline according to the context is used.
2. **Focus Group Discussion Guide for Communities (2020) International Federation of the Red Cross**.
3. **Focus Group Discussion Research Tools (2009) Overseas Development Institute**.
4. While the WHO definition specifies women, it is important to highlight the risks to girls who are pregnant.

Proportional Mortality	The number of deaths within a population attributed to a specific suspected cause of death category divided by the total number of deaths, to demonstrate the percentage of total deaths attributed to a given cause category.
Prospective Mortality Surveillance	Numbers of deaths systematically collected on an ongoing basis (real-time) starting from the present and going forward in time. This is done by collecting basic information from households using a weekly household visit, or from systematically counting graves or burial shrouds when household-based data collection is not feasible. Collecting prospective mortality data is an important component of community-based mortality surveillance.
Refugee	The 1951 Refugee Convention defines a refugee as "a person who is unable or unwilling to return to their country of origin owning to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion." Refugees are people who have crossed an international border to find safety in another country. For more information see **UNHCR Master Glossary of Terms**.
Retrospective Mortality Estimates	Examines mortality that occurred in the past and most often collected through surveys with a defined recall period.
Social autopsy	The process of interviewing and dialoguing with individuals, groups of caregivers and/or community members to identify social, cultural, and behavioural determinants of mortality to help identify systematic barriers and bottlenecks that contributed to mortality.
Underlying cause of death	The disease or injury that initiated the train of events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury. The underlying cause of death is selected for reporting cause of death in the central mortality register.
Under-five-Death Rate (U5DR) OR **Under-five mortality Rate (U5MR)**	An incidence rate of all deaths regardless of cause, or sex, among children 0-59 months. It is measured for the 0-59 months population for a specific recall period. This should include deaths both in the community and facility-based deaths. This is an age-specific measurement, and thus is not affected by the age structure of the population. It is considered the most sensitive indicator for the overall health of a population in an emergency. These terms are interchangeable. In this document, the term under-five mortality rate (U5MR) will be used.
Verbal Autopsy	Verbal autopsy (VA) is a method for estimating population-level cause of death patterns for mortality surveillance purposes; information is obtained from the caretaker of a deceased; whereby trained interviewers visit the relatives to conduct VA interviews using electronic data capture instruments or paper questionnaires. Information obtained during VA interviews include the circumstances, signs, and symptoms during the terminal stage to find out the likely cause of death, health care seeking in the period leading to death, and history of events leading to death. Cause of death determination from VA can be done using physicians review or using automated computer algorithms.[5]

5. **WHO 2022 Revision of the 2016 WHO Verbal Autopsy Instrument**.

Background

Globally, the number of refugees has steadily increased since 2012, with an estimated 21.3 million refugees under the protection of the United Nations High Commissioner for Refugees (UNHCR) at the end of 2021[6]. Refugees cross internationally recognized borders to flee crises or other circumstances in their countries, a situation that often results in a humanitarian emergency in cases of large and sudden population influxes. UNHCR defines a refugee humanitarian emergency as "any situation in which the life or well-being of refugees will be threatened unless immediate and appropriate action is taken; this demands an extraordinary response and exceptional measures"[7].

Historically, humanitarian emergencies have significant impacts on the health and well-being of affected refugee populations, generating high number of deaths from both preventable and treatable causes. Refugees are at an elevated risk of death in the period immediately before, during and after displacement, including as they settle in refugee camps, informal settlements, or in host community settings. This elevated mortality risk can be a result of either direct causes (i.e., injury and death due to violence from the crisis), or indirect causes (i.e., deterioration of living conditions, food insecurity, lack of potable water, poor shelter, hygiene and sanitation, and disruption to health care services). In humanitarian emergencies, the health system may be overwhelmed and/or fragmented and its ability to respond may be limited, which exacerbates the potential for excessive loss of life.[8]

Mortality is a critical indicator measuring the overall health of a population in both emergency and non-emergency settings. Thus, conducting mortality surveillance in refugee settings (encompassing acute emergency and post-emergency phases) is essential to measure the public health impact on refugees, estimate the magnitude of needs, monitor the effectiveness of response efforts, and to advocate for additional resources and action. The primary goal of any humanitarian public health response is to reduce excess morbidity and mortality. Monitoring death counts and rates over time and trends in suspected causes assists in evaluating the effectiveness of responses, identifying major causes of excess mortality, and for prioritizing health services. Accurate and timely mortality data in refugee settings is critical throughout the acute emergency and post-emergency phases to guide the humanitarian response and reduce preventable deaths.

Collecting and reporting real-time standardized and continuous mortality data should be a priority at the start of a refugee emergency and throughout its duration. However, collecting mortality data is difficult in humanitarian emergencies where mortality surveillance systems are often multiple and uncoordinated, overlapping, ad hoc, or not timely. In camps and informal settlements supported by UNHCR, the aim is to establish a single, relatively straightforward, and regular mortality surveillance mechanism that can be integrated in a comprehensive health surveillance system. Such a system should be established early in the emergency, and it should be robust enough to provide reliable data, but flexible enough to adapt to the changing emergency and post-emergency landscape.

In refugee settings, mortality data includes data from all sources, health facilities (inclusive of referral hospitals) and the community, inclusive of any site outside a health facility (at home or in transit). In refugee camps or informal settlements supported by UNHCR, mortality data are recorded in a central mortality register, which serves as the primary reporting source for the **Integrated Refugee Health Information System** (iRHIS). This document provides practical guidance for UNHCR Public Health Officers (PHOs) and partners in conducting mortality surveillance.

6. **UNHCR Global Trends Report (2021)**.
7. UNHCR Handbook for Emergencies. V4.7 **Policy on Emergency Preparedness and Response** Accessed 19/09/2021.
8. **Toole, Michael & Waldman, Ronald. (1997). The Public Health Aspects of Complex Emergencies and Refugee Situations. Annual review of public health. 18. 283-312**.

Audience

This document is intended for UNHCR PHOs and partners.

Purpose and scope of the document

This document provides practical guidance to establish, collect, report, and use mortality surveillance data in refugee settings, to improve the comprehensiveness and quality of reporting of mortality data. UNHCR's surveillance platform, iRHIS is a standardized and robust system employed by UNHCR and partners in humanitarian situations in refugee camps and settlements that facilitates the collection, analysis and dissemination of mortality and comprehensive health data. In settings where iRHIS is not functional, complementary, country-specific facility-based and community-based mortality surveillance methods and approaches described in this document may exist and can still be used. The aim is to report community and facility mortality through iRHIS; however, in many settings, both facility- and community-based mortality surveillance systems are often weak, and the data generated from them may be incomplete. Additionally, mortality surveillance needs change over time as a humanitarian emergency evolves. For these reasons, mortality surveillance must be both robust and flexible, and facility- and community-based mortality surveillance must be integrated. Mortality surveillance forms just one part of a more comprehensive health surveillance system, so coordination of surveillance systems through a nominated agency and/or through the Ministry of Health (MoH) and a centralized system (when available), including a centralized mortality register, is important. This document includes guidelines for both facility- and community-based mortality surveillance in refugee settings. UNHCR operations are encouraged to explore linkages with national systems for mortality data collection. However, the means by which information on refugee mortality is transmitted into national data collection systems will vary from country to country and are beyond the scope of this guidance.

According to estimates, over 60% of the world's refugees live in non-camp settings in urban or rural dispersed settings amongst host communities[9]. In such settings they may access a variety of health services, including national services. The ways in which mortality among these refugees is collected and reported may differ from the system for refugees in camps or settlements. This document primarily focuses on refugee camp and settlement settings but does provide some guidance on possible data sources for mortality in non-camp/settlement settings.

9. **Muggah, Robert, and Adriana Erthal Abdenur. 2018. Refugees and the City: The Twenty-First Century Front Line (WRC Research Paper No. 2.). World Refugee Council**.

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Setting the Scene

The phases of an emergency response

The mortality rate, as well as likely causes, change as a humanitarian emergency evolves through time. As such, the needs and implementation of a mortality surveillance system in a given emergency also change. For the purpose of this document, humanitarian emergencies will be divided into two phases: acute emergency and post-emergency.

- **Acute Phase**

  The acute phase is usually at the start of the crisis, when disease and mortality rates are expected to be high, and response activities are prioritized around ensuring survival. In the acute phase, mortality surveillance often focuses on establishing reporting systems and utilizing available data and human resources to count deaths.

- **Post-Emergency Phase**

  The post-emergency phase follows the acute phase when essential health services and other interventions are in place and mortality begins to stabilize. In the post-emergency phase, mortality surveillance focuses on strengthening ongoing household data collection, ensuring standardized and complete reporting into a centralized mortality register from both facility- and community-based surveillance, and gathering and interpreting more in-depth information on presumptive causes of deaths to guide targeted responses.

! In both phases it is crucial to establish as accurate a denominator as possible and to regularly verify this.[10] Although the post-emergency phase follows the acute phase, some contexts can move backwards from a post-emergency phase to another acute phase.

10. World Health Organization/Health Cluster. Estimation of population mortality in crisis-affected populations: Guidance for humanitarian coordination mechanisms. London School of Hygiene and Tropical Medicine, 2018.

Challenges with mortality surveillance in refugee settings

Mortality surveillance in refugee settings has a number of challenges including:

- Capturing or reporting deaths that occur outside of health facilities (i.e., at home, in the community, outside of a refugee camp or settlement); specifically, an issue for capturing stillbirths and neonatal deaths
- Misclassifying still births as neonatal deaths (and vice versa)
- Capturing deaths that occur in referral facilities
- Using mortality thresholds that are too high for the current context that may no longer be appropriate thus missing elevation in rates requiring a response
- Lack of disaggregated data in national systems by population status (refugee versus national)
- Limited cause of death information with high proportion of deaths being categorised as unknown or "other"
- Difficulties in establishing an accurate denominator and/or denominators which change frequently

While a number of these challenges are not unique to refugee and other humanitarian contexts, they are often exacerbated in these contexts.

Throughout an emergency, it is important to meet the main objective of the mortality surveillance system to capture and integrate both facility-and community-level deaths:

1) To continually provide information on the health status of the population and the nature and scale of the emergency by initially providing counts and estimating the CMR and U5MR over time and through integrating both sources.
2) To evaluate the impact of health programming by detecting and monitoring changes in mortality indicators over time as interventions are implemented.
3) To advocate for an appropriate response including additional health services, to mitigate and minimize excess deaths by identifying signals of excess mortality, and assigning suspected causes of death.

Continuously reviewing these actions and priorities over time will help guide adaptations to the surveillance system as the situation evolves.

Methods of mortality data collection and reporting in refugee settings

The method(s) to be used in a refugee response depend(s) on the local context and needs, as well as the phase of the emergency. Generally, using multiple methods concurrently, may be helpful to ensure comprehensive mortality data collection and reporting. Such an approach also facilitates data triangulation across different sources or methods, which can be useful to understanding and interpreting mortality data. Ultimately, methods that provide information needed for decision-making and response should be prioritized. It is important to consider if secondary data reviews or reports regarding the health status of the population and diseases relevant to the emergency (e.g., vaccination surveys or government reports) are available and could complement primary mortality surveillance data.

Generally, there are two main categories of methods for collecting mortality data in emergency settings:

1) Count deaths as they occur by implementing an ongoing ***prospective*** surveillance system.
2) Count deaths which have occurred in the recent past by conducting ***retrospective*** surveys.

Prospective Surveillance

Prospective mortality surveillance is commonly used in emergencies because it provides a more up-to-date count of deaths and allows for continuous monitoring of trends in death counts and rates. It also allows for immediate data analysis and timely responses.

Prospective mortality surveillance includes:

a) Facility-based Mortality Surveillance

Prospective mortality surveillance in refugee emergencies is generally first implemented through facility-based systems. Facility-based mortality surveillance aims to collect information regarding all deaths, including their causes, occurring at health facilities. Any deaths that occur in a health facility in the camp (e.g., health centre or nutrition stabilization centre) or among camp residents in a referral hospital should be collected in a facility-based line list format in a register. They should be reported as soon as possible to the health partner(s) with overall responsibility for health services in the camp or settlement for inclusion in the central mortality register. A cause of death, even if presumptive, should be established for any death in a health facility.

b) Community-based Mortality Surveillance

In many refugee settings, a sizeable proportion of deaths occur outside of health facilities. For this reason, community-based mortality surveillance (CBMS) is critical in capturing overall mortality. A robust CBMS system often includes more than one method. Community-based mortality data should be triangulated with facility-based sources and included in the central mortality register.

Reporting of deaths to UNHCR registration personnel

Mortality data collected through health programmes is for the purpose of monitoring and responding to the health situation. The information on individuals collected through a health programme is strictly confidential and identifying information should not be shared with UNHCR registration staff. Sharing such information may undermine community confidence in the overall health programme and efforts to improve mortality surveillance. UNHCR registration staff must put in place measures to incentivize reporting of deaths to them that does not undermine health programme efforts.

Reporting of deaths to the national civil registration system

In line with the Global Public Health Strategy, UNHCR aims to include refugees in national data collection systems including civil registration (of births, deaths, and stillbirths). Thus, links between the refugee mortality surveillance systems and the government entity responsible for civil registration should be established. Such links would include facilitation of access of refugees to death certification. (See Health sector contributions towards improving the civil registration of births and deaths in low-income countries).

Retrospective methods

During emergency situations, there is often no system of counting deaths nor available information on past mortality rates. Retrospective surveillance methods derive past mortality rates during a specific period of time (the recall period). As the population is often too large to be studied exhaustively, mortality information is usually collected from a sample of a population using questionnaires to methodically collect agreed-upon variables. An advantage of using such methods is that one does not need to know the size of the total target population or the total number of deaths in that population in order to measure the mortality rate. This is very useful in emergencies given that the total population is often unknown or may not always be accessible. Potential sampling and response biases can be minimized through well-designed and implemented data collection.

During retrospective mortality data collection, information is collected from randomly sampled sampling units (usually households). The people living in the selected households are interviewed about demographic events within the household (births, deaths, arrivals, and departures) over a given time period[11]. The population should ideally have had a relatively constant mortality rate during the recall period (usually up to 90 days). This constancy may have to be assumed if no information is available. It is important to remember that the mortality rate obtained by retrospective surveillance represents an average of the whole recall period. Therefore, if the recall period is long, the average mortality rate might not represent what is happening at the time of the survey, which may lead to inappropriate decisions.

Methods of retrospective mortality surveillance include

a) Rapid household assessment of mortality

b) Cross-sectional household mortality survey(s)

These methods will be explained later in the document.

Measures of mortality

In humanitarian emergencies, key mortality measures include crude mortality rate (CMR) and under 5 mortality rate (U5MR).[12] In refugee settings, UNHCR emphasizes additionally monitoring maternal mortality (though maternal deaths are statistically relatively rare, and maternal mortality ratios are usually only measured at national level and at five-to-ten-year intervals before they can be reliably interpreted and used). See Key Concepts and Definitions for definitions of these measures and other important mortality indicators including infant and neonatal mortality and **Annex 1** for their calculation. Where available it is useful to know the baseline CMR of the refugee population prior to displacement, and that of the host population, to estimate an appropriate baseline for any given situation, which will contribute to the assessment of the public health impact of the emergency and monitoring of trends over time.

CMR and U5MR are key indicators to describe the magnitude of a humanitarian emergency. A doubling or more of the known or estimated pre-emergency baseline CMR or U5MR, or the crossing of a certain context-specific, pre-established threshold, is considered to indicate an acute emergency. As acute emergencies evolve quickly, a determination and reporting of a daily CMR is appropriate. Where available, national mortality rates from countries of origin or asylum should be used as the baseline reference. Regional baseline and emergency thresholds can also be used. It is important to consider local context when determining appropriate emergency mortality thresholds.

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11. **Checchi and Roberts. (2005). Interpreting and using mortality data in humanitarian emergencies: A primer for non-epidemiologists. Humanitarian Practice Network**.
12. While UNHCR documents use the term “mortality rates” in emergency settings, guidance from the Health Cluster use “death rates” in these contexts. See **Estimation of population mortality in crisis-affected populations (2018) London School of Hygiene and Tropical Medicine**.

Evolution of Mortality Thresholds

Historically, a CMR of 1/10,000/day, or an under 5 mortality rate (U5MR) of 2/10,000/day was used as a standard emergency mortality threshold, but because baseline mortality rates have fallen considerably since that standard was established, this threshold may be too high to be applied to assess the adequacy of a humanitarian response.

The key factors to consider are how elevated the mortality rate is (i.e., the excess death rate compared to a plausible baseline), how long this elevation lasts for, and how many people experience this elevation: these three parameters multiply to yield the excess death toll.[13]

TIP: Baseline mortality estimates

Baseline mortality estimates among refugee populations are difficult to obtain. Estimates may need to be drawn from similar populations:

- In the acute emergency phase, baseline mortality estimates could be taken from country of origin of the refugees
- In the post-emergency phase, baseline estimates could be taken from host country of the refugees

In both cases, the most recent and reliable source of data including surveys (demographic health survey, multiple indicators surveys, etc.) should be used. Other sources of mortality estimates can be found below:

- World Bank Open Data - Death rate, crude (per 1,000 people)
- WHO Global Health Observatory: Life expectancy and leading causes of death and disability

Determination of mortality rates and their validity depend on the mortality surveillance system operating in a humanitarian emergency. Expressing rates requires having acceptable population denominators, which is often not feasible in an acute emergency setting when the population may be changing rapidly. Even in the absence of accurate denominators, useful mortality data, including death counts and use of proportional mortality, can still be collected, and reported.

13. **Ibid**.

Practical steps to implementing mortality surveillance in refugee settings

The following steps should be undertaken to initiate mortality surveillance. These steps can be in parallel and are not necessarily sequential.

1. **Establish a general framework for planning**

   Implementation and adaptations of mortality surveillance systems in humanitarian refugee emergencies require planning, both before initial implementation and before introduction of any new or additional components. Planning can be done during either of the two phases of an emergency and planning for a new or additional surveillance component can be done concurrently to conducting ongoing surveillance activities.

   Prior to collecting data in any specific phase of an emergency, a general framework for planning of implementation can be used, intended to optimize the quality and functionality of data collection. This framework can be used to better inform decision making and quality of data collected later.

2. **Coordinate planned activities with the surveillance coordination team or committee (UNHCR and partners)**

   It is essential that surveillance activities are well coordinated to avoid duplication and inaccurate reporting. A team made up of the UNHCR PHO and all agencies operational in the camp should meet regularly and discuss needs and approaches, to ensure that all components of health and mortality surveillance are included. As much as possible this is ideally integrated into the established health sector coordination mechanism. Mortality data collection should not be done in isolation, but in the context of surveillance for morbidity, nutrition, reproductive, health, water, sanitation, and hygiene (WASH), and other areas, and that both community- and facility-based settings are included. Someone ideally with an epidemiological background should be assigned the ultimate responsibility to oversee all mortality data, and that specific deaths trigger a response e.g., deaths from acute watery diarrhoea, a maternal death, a cluster of deaths or deaths from immediately notifiable causes such as suspected viral haemorrhagic fever.

3. **Develop or adapt data collection tools**

   Tools for conducting mortality surveillance in refugee settings should be as simple as possible and therefore rapid and straightforward to implement. Tools can be adapted from standard templates (**Annexes 2-7, 9**) or national tools where available. A system that tries to collect too much information, including disaggregating by too many age groups or other characteristics, can become dysfunctional very quickly and death information can become diluted, never analysed, and ultimately not used in the response. Thus, the initial focus should be on the minimum requirements, and these can be built upon as the situation stabilizes and time allows for more detailed data collection. For instance, recording cause of death can be done by categorizing deaths in a pre-determined list based on the risk profile of the population and generated from simple case definitions based on signs and symptoms. Tools should be translated and back-translated into the spoken languages of the community. There are instances where the spoken language is not traditionally a written language so extra steps must be taken to ensure that the data collector can effectively interview community members. Initially a paper-based system may be implemented before transitioning to electronic tools, as available.

4. **Identify, train, and install required human resources**

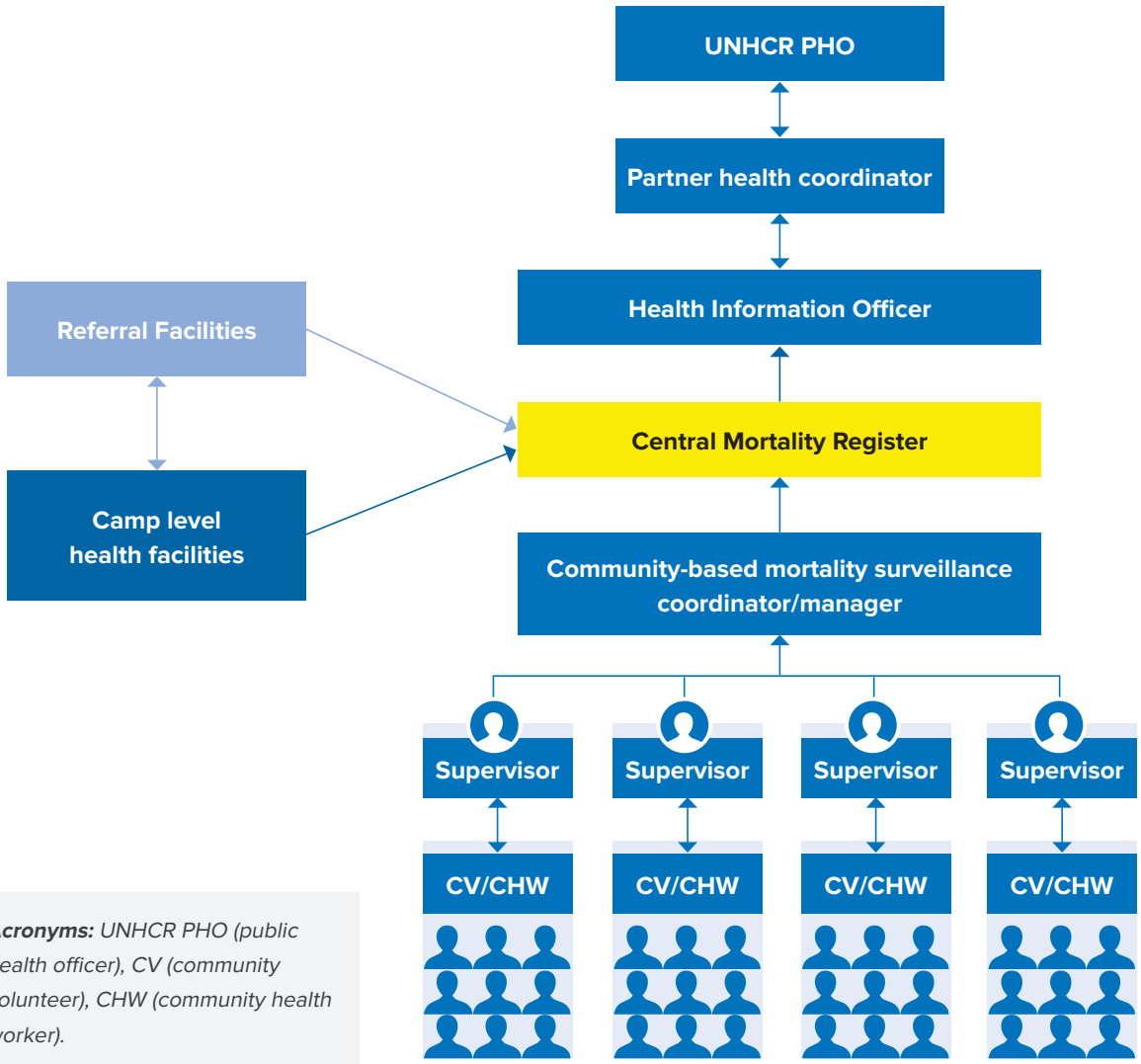
   In planning to conduct mortality surveillance, it is important to identify the cadre of workers who will collect mortality information. In most settings, these will be community health workers (CHWs) or other community

volunteers (CVs). Those without prior experience can still be recruited and trained to conduct elements of CBMS. CBMS information provided by CHWs/CVs will then be coordinated and reported through supervisors to a CBMS coordinator or manager, who then reports to the health information officer, who then reports to the implementing partner health coordinator and the UNHCR PHO. In parallel, health facility staff will also report facility-based mortality data to the central mortality register which will then be collated along with the community-based data. For more information on the community-based health workforce in refugee settings see **Operational guidance: community health in refugee settings**.

Recommended staff requirements for conducting mortality surveillance are as follows (see **Figure 1**):

- UNHCR PHO
- Implementing partner health coordinator
- Health Information Officer/ Epidemiologist
- 1 CBMS coordinator/manager
- Sufficient CHW/CV Supervisors (with 1 supervisor assigned to every 5 CHW/CVs)
- Sufficient CHW/CVs (in acute emergency phase, 1 CHW/CV per 500 people; in post-emergency phase, 1 CHW/CV per 1,000 people or 200 households; can reduce the number of households covered if the population is scattered/dispersed)

Figure 1: Staff requirements for conducting mortality surveillance in refugee settings



Acronyms: *UNHCR PHO (public health officer), CV (community volunteer), CHW (community health worker).*

It is critical that training on collecting quality data and establishing good practices be done early and on an ongoing basis. All relevant staff should attend trainings on the use of all data collection tools, interviewing skills, estimating age (**Guidelines for Estimating Age (2008) FAO**), and assessing cause of death.

5. Conduct introductory focus group discussions

Introductory focus group discussions with community members can help sensitize the community to mortality surveillance activities, identify pertinent cultural details to facilitate surveillance activity implementation, and inform development and adaptation of training and data collection tools. Additionally, because mortality surveillance is an ongoing and systematic process and not a one-time exercise, such introductory interviews can help sensitize the community to the activity, maximize community engagement, and avoid perceptions that reporting to the mortality surveillance system is directly linked to registration related to food assistance or other distributions. Effective engagement of and buy-in from the community will greatly improve the quality of reporting.

Within a focus group discussion, UNHCR recommends engaging 6-12 participants, plus a facilitator and a notetaker. The group's composition should be planned to create a non-threatening environment, so that participants feel free to talk openly and give honest opinions. Questions can be open-ended to facilitate an informal discussion. These interviews should take around one hour. The focus group team and those responsible for developing training and data collection tools for surveillance should then discuss together the information generated from the focus group and important points to consider or incorporate into the surveillance tools or approach. For further guidance please see **UNHCR's Brief Instruction for Rapid Assessment Focus Group Discussions** and other **online resources**.

6. Map the camp/settlement and its health facilities

Mapping the refugee camp or settlement to identify the number and placement of households is useful for several purposes, including determining logistics and resource needs for conducting mortality surveillance and for surveillance beyond mortality. Additionally, because it documents household numbers and relative density, it can help determine the number of data collectors that may be required to conduct ongoing mortality surveillance in the camp. Coordinating entities should work together to create smaller administrative units within the camp to facilitate the distribution of surveillance and response resources. A map of the area may already have been created but if not, at least initially a crude map could be made by walking around the camp. If mapping software and phones/tablets are available, then more sophisticated maps can be created. Teams should ensure that boundaries are outlined, landmarks are indicated, and all structures are labelled to differentiate between administrative and residential structures. Noting burial sites is also important. Satellite images could be used, if available; however, groundwork is still very useful. Note that this mapping information can be used later for other programmatic planning. UNHCR has **other resources** for community mapping exercises. In the initial phase of an emergency the mapping should not be too detailed and should not be time intensive. At a minimum it should result in a rough sketch of the camp layout with boundaries. In addition to mapping the camp or settlement, a list and/or mapping health facilities in the camp or settlement is critical for planning and implementation of facility-based mortality surveillance.

7. Conduct a baseline household census

If there are no other sources of reliable population data, then conducting a household census is important for targeting humanitarian resources and response generally. Household census data are key specifically in planning and revising mortality surveillance if no other reliable estimates are available. The initial data collection may be limited to a representative sample of households in a block or section of the camp, or, depending on the initial capacity of the implementing partner, a complete baseline household census of every household in the camp could be conducted. It is recommended that mixed-gender teams of two make up each survey team for access, security, and data quality. Each individual team could be assigned a geographic area of about 100 households or 500-600 people. The team will approach each household in the assigned area and request to speak with the head of household and/or the female head. Using a household definition, this household representative will be asked about all individual household members prior to transiting to the camp or settlement (age and sex) and whether they are part of the current

household. It is important to introduce the census via community sensitization prior to household visits and data collection. A census activity can even be leveraged to conduct retrospective health surveillance, including household births and deaths over a given time period.

Information gathered on household size in households visited in a given administrative area can then be used to construct crude population estimates, key for providing population denominators for mortality rate calculations. The average household size in visited households in a given administrative unit can be multiplied by the total counted households in that unit to give a crude population estimate of that administrative unit (See **Table 1** for an example).

Table 1: Example of using households to estimate total population

Administrative unit/ Section	Average household size of visited households	Total households counted in the section	Total estimated population in the section
1	9	300	2,700
2	4	150	600
3	4	160	640
4	9	325	2925
5	7	350	2,450
6	7	400	2,800
7	9	504	4,536
Totals	**7**	**2,186**	**21,187**

! Of note, the UNHCR field office, or registration or operational data management staff may also have information on the camp or settlement population demographics. Having this information need not preclude conducting a household census if warranted.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Choosing the Type of Surveillance for the Situation

Depending on the timing and specific need, a surveillance system may prioritize specific aspects or require additional layers or tools (i.e., maternal death triggering a maternal death audit). Monitoring cause of death trends, including further exploration of the most common causes or causes central to programming, becomes a top priority when the goal is to improve prevention programs and health services. In addition, mortality is one of the key determining factors to declaring a famine. While famine declaration is outside the scope of UNHCR, in situations when surveillance is not routinely conducted and a true mortality rate is required, UNHCR estimations based on mortality surveillance and surveys may be requested.[14] Passive surveillance is appropriate for identifying these trends supplemented by sensitivity assessments carried out periodically (every few months) to ensure the sensitivity of the system is not weakening.

14. Mortality rates, in addition to, food security and malnutrition rates are required prior to declaring a famine. UNHCR does not declare famine, however UNHCR could declare an emergency based in a specific refugee setting.

Conducting prospective mortality surveillance in refugee settings

In the acute phase, prospective mortality methods of facility- and community-based mortality surveillance should be the focus. In most scenarios, facility-based mortality surveillance can start immediately, while community-based surveillance will take more time and work to put in place.

How to conduct facility-based mortality surveillance

In conducting facility-based surveillance, a mortality register in line list format should be placed in each health facility to document deaths taking place in the facility (see **Annex 2**). If national mortality line lists formats are available these should ideally be used. Data on line list variables and cause of death (both direct and underlying causes) can be drawn from facility records (patient individual records, accident and emergency records, referral register [line-list information on refugees referred to hospitals for specialized or higher-level care outside the camp or settlement, see **Annex 3** for an example], and the UNHCR medical referral database [Database maintained by UNHCR staff and partners]) and recorded into the facility mortality register.

For deaths occurring in health facilities, medical personnel are required to document cause of death (even if presumptive) information in the facility mortality register. A direct (or immediate) cause of death, followed by any underlying causes, should be stated. As a general rule, a single reason should be given as the direct cause of death, and this may be "due to or as a consequence of" a sequence of (normally one or two) underlying conditions. Where staff have been trained, the cause of death should be collected using the WHO 2016 medical certificate of cause of death (**International form of medical certificate of cause of death**).

TIP: Cause of Death Consideration

For statistical tabulation and reporting, a single cause that leads to death must be selected for each death. According to the rules of the World Health Organization, this is the underlying cause that was at the beginning of the course of the disease and not the last event that finally led to the death. Even in case of multiple illness, only one underlying cause should be reported.

Example: A 73-year-old refugee male patient, known medical history of hypertension (5 years) and diabetes (7 years), visited a health facility. His blood pressure was 180/120 mmHg. He was admitted and managed with antihypertensives, then discharged home. He died suddenly one week later at home. His wife reported that the right side of his body became completely flaccid just before he died.

Conclusion: In this scenario, the direct (immediate) cause of death is hypertensive stroke due to an underlying cause of uncontrolled hypertension. His diabetes may be a contributing factor but not directly linked to the death. The cause of death for primary tabulation and reporting should therefore be the underlying cause of death: Hypertension.

TIP: HIV/AIDS and malnutrition

Considering their public health importance, careful attention should be given to HIV/AIDS and malnutrition related deaths in order to prevent potential underreporting, misclassification and reporting bias due to stigma and other reasons.

Reporting frequency of facility-based mortality may be daily or weekly. Facility mortality data should be combined, cross-verified and de-duplicated with community-reported deaths into a central mortality register (see **Annex 4**) to prevent double counting. Depending on thresholds or other requirements, certain cause of deaths (such as maternal mortality, violence) should prompt a more detailed investigation of the exact cause

and circumstances surrounding the death and in the case of a maternal death a maternal death audit would be triggered. Sometimes, death investigation may also be linked with wider outbreak alerts and response efforts (e.g., cholera, hemorrhagic fever). The need to conduct a case investigation or issue an outbreak alert should be documented in the central mortality register.

Deaths occurring among refugees admitted to referral hospitals are documented in both the referral register (see **Annex 3**) and the UNHCR medical referral database. In the UNHCR medical referral database, implementing partners managing refugee referrals to outside hospitals input and manage line list data on those referred refugees, including patient outcome of death. Line list information is recorded and reported back to the implementing partner health coordinator and UNHCR PHO staff, and this information will be reported in the central mortality register with the same frequency as camp-based facility reporting.

How to conduct community-based mortality surveillance

With many deaths occurring outside of the facilities, it is essential to capture deaths that occur at home or en route to health facilities. The types of community-based surveillance used in these settings could include a combination of grave or shroud counting, key informant interviews, and community health worker-led surveillance.

a) Grave or shroud counting

One method to conduct community-based mortality surveillance in emergencies is counting new/freshly dug graves or the number of burial shrouds distributed. Context specific information on practices relating to disposal of dead bodies and rites associated with this should ideally have been collected through either focus group discussions or key informant interviews. This will also provide information on where burials or cremations take place and who is distributing shrouds or other materials associated with the burial or cremation. Grave or shroud counting is often most useful in newly established camps or settlements in the absence of other more reliable methods; however, this can still be a useful tool at any time during an emergency to triangulate with other methods to ensure deaths are not being missed.

When preparing to conduct grave or shroud counting, a specific training for CHWs/CVs or directly with the grave attendants collecting the information should be held (lasting perhaps a few hours) to ensure they correctly collect the data on a dedicated form, such as that in **Annex 5**.

Components of grave or shroud counting

Grave counters

Implementing partners can identify teams of two grave counters to immediately count new graves from the start of an acute emergency by visiting and monitoring the area designated as the graveyard or cremation site. Depending on the number of active sites and or new deaths, multiple teams should be organized. It is recommended to have a team of two people who will each count the number of new graves created in the previous 24 hours twice. The average number will be taken as the final count for that day. The team can add the number of new graves to that from the previous six days' visits to give a weekly total of new graves. To avoid recounting graves, each day a marker can be used to indicate where the team last left off. It is important to carefully examine the site to ensure that no graves are missed, and to be aware of, and include, graves outside of designated burial sites. More information could be obtained by attempting to count, and thus establish a rough distribution of, deaths by <5 years ("small" graves) and ≥5 years ("large graves") based on grave size.

Under certain arid or semi-arid conditions or during the rainy seasons 24-hour monitoring may be required as it can be difficult to determine new from old graves. Under these circumstances grave watchers should be based in the graveyard or cremation site to follow trends in burials or cremations prospectively.

Example of grave counting and its use in mortality surveillance

In Camp X, grave counters recorded the following numbers of new graves per day, for consecutive days 1-7. In the below table, one can see whether daily new grave counts are going up or down, but these numbers do not provide a mortality rate.

Table 2: Example of counting and documenting number of new graves per day

Day	Totals
1	5
2	8
3	11
4	4
5	8
6	9
7	12
Total	**57**

If we know how many people have been registered as living in Camp X, we could estimate a crude mortality rate. Say there were 22,000 people registered in Camp X. Crude mortality rate for the camp could then be calculated as the following:

$$\frac{\textbf{57 graves}}{\textbf{22,000 population}} \times \textbf{10,000} \mid \textbf{7 days= CMR of 3.70} \mid \textbf{10,000} \mid \textbf{day}$$

Shroud counting

Similar to grave counting, teams can be assigned to count the number of burial shrouds distributed at designated shroud distribution points. The same calculations in using grave counting to estimate a crude mortality rate can be performed using data from shroud counts.

Formation and maintenance of a burial committee

To supplement information provided by counting graves or shrouds, a burial committee should be formed and maintained to implement and monitor burials and grave/shroud counting. Burial committee staff (e.g., CHWs/CVs, UNHCR staff, partners, camp management, community members and/or leaders, etc.) could put in place a system at shroud distribution points to record death information in a logbook. Details on sex, age, and place of death can be recorded to better identify and understand the characteristics of those dying. Data gathered by committee staff at shroud distribution points could be later triangulated with counts from the grave counters.

Burial teams

In addition to grave counters, camp management may organize burial teams. These burial teams assist families with burying the deceased in a designated burial or cremation site. As at the shroud distribution points, burial committee staff could be present with the burial teams to record information on a logbook. Again, the count of deaths gathered by committee staff from the burial teams could then be triangulated with counts from the grave counters.

In all components of grave or shroud counting, all line lists maintained in related logbooks should be reviewed and recorded into the central mortality register (see **Annex 4**) on a weekly basis.

b) Key Informant reporting on numbers and causes of death

In addition to grave or shroud counting, key informants can be trained to count and report on numbers of community deaths. This is usually done in the acute phase but can also be potentially done in the post emergency phase if no community health worker led surveillance is in place. Within a given camp's administrative units, key informants should be identified within the community. These should be someone who has a deep knowledge of their community because of their professional role (e.g., block or section leader, midwife, traditional birth attendant, teacher, religious leader). Having more than one key informant is important as each will focus on one geographic administrative unit only.

Key informants can be trained to visit households in their assigned area on a regular basis to collect data on any deaths among people living in the household (that took place outside of a health facility). In addition to regular visits of households, key informants can also make ad hoc visits to a given household when they hear about a death in that household. Key informants should be provided with a logbook to collect and record basic demographic information such as sex and age group, and signs and symptoms prior to death (see **Annex 6**). Key informants can also provide additional useful information about the community regarding possible barriers to reporting deaths in the community.

The relevant health partners could assign for example one supervisor per five informants for regular supervision. On a regular basis the supervisor can visit or communicate with each key informant assigned to him/her to ask about any deaths recorded by the key informant since the last visit from the supervisor. Information from key informant logbooks should be collected by the supervisor and recorded in the central mortality register (see **Annex 4**).

c) Community health worker-led household mortality surveillance

Community-based mortality surveillance led by CHWs/CVs is increasingly being used to collect mortality data in refugee settings. It requires regular exhaustive enumeration of individual births and deaths in real time. In this method, well-supervised and trained CHWs/CVs are tasked to visit households weekly to collect health-related data, demographics, numbers of births and deaths, and cause of death using a standardized line list tool (**Annex 7**). A well-managed community surveillance systems can identify in real-time households with new deaths, localize these deaths, seek detailed information as needed, and identify clustering of deaths by location, time, and demographic group and thus potentially emerging problems.

In emergencies where there are no other reliable population estimates, CHWs/CVs may also report in- and out-migration from the household. The collected data is then presented weekly to the CHW/CV supervisor, who in turn supports data entry into the central mortality register (**Annex 4**).

To overcome potential social, political, economic and/or cultural barriers to collecting mortality data, select literate, motivated CHWs/CVs from the community they are serving who speak the community's language(s), and maintain an even gender representation of CHWs/CVs, all to the extent possible. CHWs/CVs are often tasked with several different activities, and it is important for managers to prioritize their scope of work in supporting mortality surveillance. Experience has shown that the effectiveness of exhaustive household mortality surveillance by CHWs/CVs improves when adequate supportive supervision is provided[15]. As part of this supervision, CHW/CV supervisors may conduct visits to households previously visited by CHWs/CVs to verify correct implementation of data collection procedures and the information obtained. Financial and/or non-financial incentives may be provided to the CHWs/CVs to increase their effectiveness (**Operational guidance: community health in refugee settings**).

The options for conducting prospective mortality surveillance in refugee settings, as well as the advantages and limitations of each, are captured in **Table 3** below for reference.

15. **Bowden, Braker, Checchi, and Wong. (2012). Implementation and utilization of community-based mortality surveillance: a case study from Chad. Conflict and Health 6 (1):11**.

Table 3: Options for conducting prospective mortality surveillance in refugee settings

Method	Advantages	Limitations	When to Use
Facility-based surveillance	• Most situations will have early establishment of health facilities making it easier to implement facility-based mortality surveillance. • Can disaggregate by age and sex. • In most cases, the cause of death (even if presumptive) is documented. • Can be used to triangulate with other methods regardless of the emergency phase.	• Not representative of the whole population as many deaths occur outside health facility so cannot be used to calculate mortality rates. • Underreporting of deaths if the surveillance is passive as opposed to active. • Vigilance needs to capture deaths occurring in a referral facility.	Acute and post-emergency phases
Grave or shroud counting	• Recommended method in emergency settings before functioning central mortality register is established. • Provides mortality approximations when population estimates are available, when no population estimates are available or when they are changing rapidly. • Can be used to triangulate with other methods regardless of the emergency phase.	• Difficult to: - interpret without a complete census of all burial sites (formal/informal). - distinguish new from old or unmarked graves under certain conditions (after rain, arid conditions) or residents vs displaced. • Requires constant supervision to ensure reliability. • May not capture deaths that occur in a referral facility. • Likely to underestimate deaths. • Limited to no information on cause of death, sex, or age of deaths.	Acute phase
Key informant reporting on numbers of deaths	• Key informants can be community leader or other authority figures, a fact that can help ensure trust (i.e., the information will not be used to reduce entitlements). • Can disaggregate by estimated age and sex. • Provides opportunity to regularly update the total population size of the area, thereby providing a reliable denominator for MR calculation.	• Interpretation difficult without denominators, restricting ability to compare with other emergencies or through time. • Need to consider the potential for double counting with facility deaths; records should be cross checked for matching identifying information. • Depending on the cadre of key informants, the quality is likely to wane over time as exhaustive household visits unlikely to be conducted weekly on an ongoing basis. As a result, the reporting will become more passive than active leading to incomplete data and underestimation of mortality.	Acute phase Potentially in post-emergency phase if no community health worker led surveillance in place.
Community health worker-led household mortality surveillance	• Can be integrated into the work of CHWs/CVs. • Most sustainable method that can be continued in the post-emergency phase. • Good for collecting information about more complex or sensitive issues, or in more technical areas.	• Requires finding and engaging/maintaining cadre of CHWs/CVs representing varying age groups and an even gender representation. • Requires that managers continually organize the CHWs/CVs' scope of work to improve outputs. • Requires appropriate numbers of personnel: UNHCR recommends at least 1 CHW/CV per 500 persons in an acute emergency, and at least 1 CHW/CV per 1,000 persons post-emergency. • Requires strong supervisory systems to maintain quality. • May lead to induced social desirability or deception (if perceived as being linked to aid).	2,Acute phase (as soon as community health workers established). Post-emergency phase

Conducting retrospective mortality surveillance in refugee settings

Once the acute phase has passed and mortality rates are more stable during the post-emergency phase, mortality surveillance can be complemented by retrospective mortality surveillance methods when warranted. Prospective mortality surveillance methods already in place can be strengthened in the post-emergency phase through regular reviews of implementation to improve completeness and quality of data collected and reported. In addition, retrospective methods, such as rapid assessments or surveys, can be used to generate more comprehensive or representative results.

However, these assessments and surveys require funding and time, so attention should be paid in planning them so that only data that are needed and that can be used to facilitate a response is collected. Additionally, such assessments and surveys provide a snapshot in time, so are not helpful in describing trends, unless they are repeated periodically. They are most useful if there are doubts about the reliability of prospective surveillance or more specific information including on age, gender, and cause of death is being sought.

To enhance cost efficiency, mortality surveys should be included as components in other planned surveys whenever possible. For example, if a **UNHCR Standardised Expanded Nutrition Survey (SENS)** is being undertaken, a mortality module could be included **Mobile Phone Questionnaires**.

a) Rapid household assessment of mortality

Generally, a sample of households should be selected to represent the targeted camp/settlement population of interest. Depending on the objectives of the survey, the sample can be drawn from a subpopulation according to predetermined criteria. A good example would be interviewing heads of households of new arrivals where those who have been displaced wait to be assigned a plot/shelter in a designated camp. Those household units can be selected by systematic random selection and basic information can be recorded (number of household members by sex and age and any deaths of household members that occurred during transit or since arrival at the centre).[16]

A rapid household assessment of mortality is a valuable tool, can be done quickly and easily while providing some quick insightful information on mortality. Conclusions drawn using this sampling method should not be used to infer anything about the general population to avoid introducing selection bias.

b) Cross-sectional household mortality survey

For mortality data that is more representative of the general population than those collected from the rapid assessment described above, a cross-sectional household survey of mortality could be conducted. The ability to make statistical inferences about collected data is improved in cross-sectional household mortality surveys, when compared with rapid household assessments of mortality, through their use of probability sampling, which requires selection of a sample from an established sampling frame.

Cross-sectional household mortality surveys are often conducted for immediate operational purposes and the following challenges need to be considered:

- May be subject to non-sampling error (including bias), as are rapid household assessments of mortality, and sampling error
- Require a high level of coordination
- While analysis can often be done within a relative short time frame it requires statistical expertise
- Finalisation and clearance of the findings report may not be timely
- Results often reflects mortality occurring over a period of time with a recall period be up to 3 to 6 months in the past and so is not reflective of the current situation

16. Centers for Disease Control and Prevention (CDC). Notes from the field: mortality among refugees fleeing Somalia--Dadaab refugee camps, Kenya, July-August 2011. MMWR Morb Mortal Wkly Rep. 2011 Aug 26;60(33):1133.

When asking participants about household mortality in the recent past, it is often essential to develop use event calendars to determine if a household death occurred in the survey timeframe (**Annex 8**).

Deciding when to conduct a mortality survey

The decision to undertake a mortality survey should be made in conjunction with the MoH, UNHCR, partner agencies and donors. Surveys are often more informative and lead to public health action if they are well-coordinated from the start, so that data from several agencies can be reviewed together to give a wider perspective on the situation. Moreover, because conducting a survey is expensive and is a time-consuming exercise, coordinating efforts will ensure that efforts are not duplicated.

The following questions should be asked when considering a mortality survey:

A) Is there any other way of estimating mortality rates?

PHOs should review available health data (existing programme data, surveillance reports etc.) and decide on the need for a mortality survey.

B) Are the survey results crucial for decision–making?

A standalone mortality survey need not be undertaken if the populations' needs are obvious. PHOs should review the existing mortality data to assess whether it meets program needs. A standalone survey should only be done if the existing mortality data has limitations which the survey would help to mitigate. For example, if the information available is only reflecting deaths taking place in health facilities, one could conduct a survey to learn about community deaths. As much as possible, preference should be given to the inclusion of mortality in a planned SENS survey.

C) Are the survey results going to be used to take action?

A mortality survey should only be conducted if there is capacity to implement interventions to address potential identified needs. Stakeholders should discuss and agree on the expected outcomes and actions based on the expected results.

D) Is the affected population accessible? Is the population relatively stable?

PHOs must consider the security situation and geographical context before undertaking a survey.

E) Are there adequate resources to fund a mortality survey?

Mortality surveys require expertise that will involve hiring a consultant; identifying, training, supporting and supervising enumerators; survey logistics, data entry and analysis, report writing and dissemination.

The options for conducting retrospective mortality surveillance in a post-emergency phase, as well as the advantages and limitations of each, are captured in **Table 4** on the following page for reference.

Table 4: Options for conducting retrospective mortality surveillance in refugee settings

Method	Advantages	Limitations
Rapid household assessment of morality	• Applicable when there is a new sudden influx of refugees. • Rapidly generates estimates in the absence of information on population size. • Reconstructs mortality over a given period. • Useful for obtaining limited amounts of mortality information rapidly on specific sub-populations. • Allows mortality surveillance among displaced populations very early in the emergency, even before housing is assigned.	• Reflects mortality in past as a snapshot, so does not describe trends (unless repeated periodically, e.g., every one to two months). • Representativeness is limited to the sub-population sampled.
Cross-sectional household mortality survey	• Permits collection of additional demographic or health data beyond only mortality.	• Reflects mortality in past as a snapshot, so does not describe trends (unless repeated periodically, e.g., every one to two months).
	• Can be integrated into existing surveys where the relevant expertise is available e.g., SENS.	• Results may not be timely, and thus results may not be helpful in making urgent decisions about interventions. • Prone to non-sampling error (e.g. recall bias) and sampling error that may affect validity of mortality estimates. • Resource- and time-intensive • Requires ongoing technical oversight and support to complete.

Considerations for mortality surveillance in refugee populations living in urban or rural dispersed settings

In urban or rural dispersed settings, mortality surveillance may differ from mortality surveillance in refugee camps or settlements. Refugees in urban settings may be more dispersed than those in camps or settlements and are often embedded in host communities. Where refugees in urban or rural dispersed settings access national health services, mortality may be recorded through the national civil registration and vital statistics (CRVS) systems. However, this information is not disaggregated by refugee status or, in many cases, by nationality. The information is also not available in aggregate form in a timely manner. Thus, it cannot be used to monitor the health status of refugees or guide public health response in an acute emergency. Under the

Global Compact for Refugees, UNHCR calls for disaggregation of CRVS mortality statistics by refugee or nationality status. While some information on mortality among refugees in urban or rural dispersed settings may be available from existing sources (referral facilities, community leaders, family members), this information is unlikely to be complete. Furthermore, unregistered refugees may not be sampled thus limiting the generalizability to this population.

Thus, in refugee settings, recommended methods for assessing mortality in refugee populations in urban or rural dispersed settings are similar to those used in camps or settlements, and may include:

a. prospective surveillance using community-based surveillance methods (led by community health workers or community volunteers and may be done by systematic calls or visits to known refugee households).

b. retrospective methods using rapid convenience sampling or cross-sectional household survey including through the mortality module in SENS Mobile Phone Questionnaires.

c. When there are national surveys such as national maternal and neonatal mortality surveys, UNHCR can work with the MoH, the World Health Organization (WHO), the United Nations Children's Fund (UNICEF), and other partners to include refugees in the sampling frame with oversampling in order to obtain a robust mortality estimate for refugees.

Improving Data Quality

Triangulating mortality surveillance data across multiple sources

Triangulation is broadly defined as synthesis and integration of data from multiple sources, including from facility and community sources, through collection, examination, comparison, and interpretation. Data collected through mortality surveillance systems should be reviewed for validity or "trustworthiness." A good mortality surveillance system should have systems to regularly examine information collected by different methodologies, and by different persons. The findings can corroborate each other and reduce the likelihood of errors, thereby improving the accuracy of the mortality estimates.

To triangulate mortality data in refugee camps or settlements, PHOs need to cross-verify/deduplicate data collected from community-based and facility-based sources to avoid double counting. In addition, this data could be compared with figures reported from grave counts or shroud distributions (when done) and/or retrospective assessments to examine whether trends are broadly similar. In places where refugee vital events information is recorded in a national system, PHOs can utilize data linkage capability to also triangulate mortality data. Another method of data triangulation is capture-recapture methodology which estimates the completeness of different lists/registers[17],[18]. However, this may not be feasible in some contexts.

17. Caleo, Sy, Balandine, et al. (2012). Sentinel site community surveillance of mortality and nutritional status in southwestern Central African Republic, 2010. Population Health Metrics. 10:18.
18. Roberts, Morgan, Sultani, et al. (2010). A new method to estimate mortality in crisis-affected and resource-poor settings: validation study. International Journal of Epidemiology. 39(6):1584-1596.

Another approach for improving data quality, meant to complement ongoing prospective mortality surveillance methods, is to periodically evaluate the sensitivity of the methods in capturing deaths. This sensitivity analysis assessment could include conducting prospective or retrospective data collection from a complementary data source or using a different, independent method.

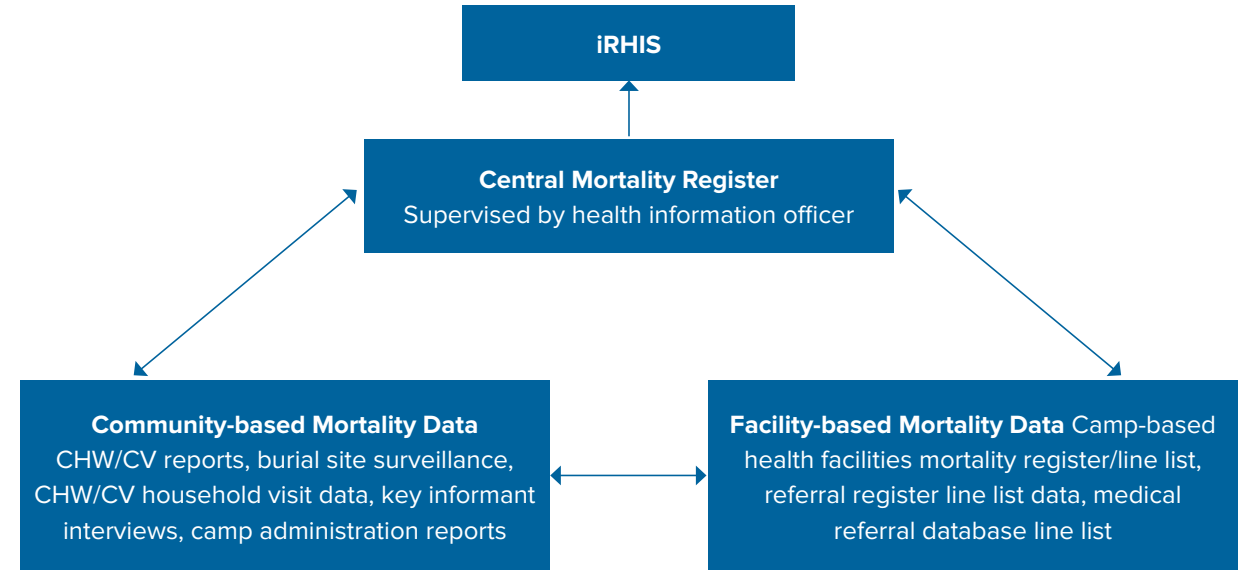
Sensitivity Analysis Assessment of Mortality Surveillance

Assessing the sensitivity of the system of mortality surveillance in refugee settings should be conducted periodically to ensure that the system is completely reporting deaths. A separate source of information independent from the formal reporting system is used to compare the deaths captured every few months. Depending on the context and reporting system, key informants such as settlement block leaders, religious leaders, or midwives could be asked about deaths they know about and compare the reported numbers to those reported to the formal system over the same time period to see if the formal system is capturing most of the deaths. A sensitivity analysis assessment can be a cost-effective way to check the quality of the formal mortality surveillance system. The most challenging part of conducting a sensitivity analysis assessment is finding a truly independent source of death reporting separate from the formal system.

Central mortality registers have been shown to improve accuracy of mortality reporting by reducing double counting and providing a single place where all people involved in collecting data can record, clarify, and compare the number and characteristics of deaths. However, effective use of central mortality registers requires training and good supervision. The UNHCR PHO, implementing partner health coordinator, and health information officer must ensure that deaths are not counted multiple times within the system by applying deduplication rules. Studies have found that for the central mortality register to be effective, only one person (e.g., the health information officer or his/her designee) should be in charge of registering mortality information there[19]. The persons responsible for coordinating mortality surveillance should screen submitted data collection forms from all systems for abnormal or missing values and discuss these issues directly with those responsible to avoid future errors. Where feasible, s/he could convene weekly meetings to discuss each reported death before its inclusion in the central mortality register or integrate this work into existing meetings.

See **Figure 2** for a schematic of triangulation and data flow of mortality surveillance data in refugee camps or settlements.

Figure 2: Triangulation of mortality surveillance data



19. Spiegel, Sheik, Woodruff, and Burnham. (2001) The Accuracy of Mortality Reporting in Displaced Persons Camp during the Post-emergency Phase. Disasters. 25(2):172-80.

Reporting Mortality Data into iRHIS

1. Both facility- and community-based mortality data are encoded into iRHIS through the line list data captured in the central mortality register, a paper-based compendium of line lists from all facility and community-based streams of mortality surveillance.
2. On a regular (usually weekly) basis, the HIS officer or his/her designee reviews these line list entries in the central mortality register for the week to count aggregate numbers of deaths, and to count them across disaggregates of age group, sex, population status (refugee or national), site of death (facility or community), and cause of death.
3. The HIS officer or his/her designee may first track these aggregate and disaggregate counts on a tally sheet prior to entering these counts in iRHIS web application.
4. The health coordinator or PHO should be responsible for ensuring complete and timely submission of mortality data into the central mortality register, then in the weekly tally sheet and thereafter into iRHIS, so that iRHIS includes up-to-date information.

TIP: Aggregate Cause of Death Reporting

For a given camp/settlement, iRHIS tracks and reports aggregate deaths within selected underlying cause-of-death categories (based on major causes of morbidity and mortality in refugee settings), and these death categories are included in weekly tally sheets. Reporting of aggregate underlying cause-of-death categories may include injuries, communicable diseases, malnutrition, or non-communicable diseases (NCDs).

TIP: Individual-level Data Collection

In some settings where tablet-based mortality reporting has been activated, surveillance personnel in health facilities can report individual-level data on deaths (so far limited to those occurring in health facilities) via an individual form on iRHIS Android application using the central mortality register as the source document.

Upon receipt of reporting into iRHIS, the database automatically combines the reports and calculates mortality indicators (crude or under five mortality rate) if accurate population statistics are available. These will be displayed on the iRHIS Power BI dashboard including formulae, units of expression and the corresponding UNHCR standard.

In refugee settings where iRHIS is not being used, the same principles of review and compilation into a single, deduplicated system for calculating and displaying population mortality variables of interest can be followed.

Additional methods to improve quality of mortality surveillance data

One of the criticisms of mortality surveillance in refugee and other humanitarian settings is that it often does not provide any information on presumptive cause of death, which limits the ability to develop a targeted and appropriate response. Methods and tools exist for investigating and assigning cause of death, but these are often too resource-intensive for regular use in humanitarian settings. However, they can still serve to complement the above methods and improve the quality of mortality data.

a) Cause of death community interviews

Presumptive cause of death data can be collected in emergencies by conducting cause of death community interviews using a short, standardized questionnaire conducted with the decedent's household members (**Annex 9**). This structured questionnaire is based on the same methodology as the more

comprehensive verbal autopsy (VA, see below), but is shorter and does not require clinician review, although review is recommended where possible. Information collected on basic circumstances and signs and symptoms preceding death can facilitate assignment of a presumptive cause of death category by the interviewer. There is operational experience in use of this method in humanitarian settings.[20,21,22,23] These methods work best where the suspected cause of death aligns well with a known cause, such as a current epidemic disease with specific signs and symptoms or a violent cause; they work less well with other causes where multiple conditions can result in similar signs and symptoms. Use of a standardized questionnaire such as that in Annex 9 also facilitates querying and documentation of any non-communicable diseases (NCDs) that may contribute to the death.

Presumptive or suspected cause of death can be assigned by matching signs and symptoms preceding death to simple syndromic case definitions (**Table 5**).

Table 5: Example list of potential suspected cause of death list based on syndrome preceding death

Syndrome	Suspected cause of death
Acute watery diarrhoea	Cholera
Bloody diarrhoea	Shigella
Fever/Rash	Measles
Fever, malaria diagnostic test positive	Malaria
Respiratory difficulties (shortness of breath, cough)	Respiratory infection (upper/lower)
Acute Jaundice Syndrome	Hepatitis
Injury	Trauma

Cause of death community interviews can be conducted by community health workers, other community workers, trusted community members or health partner staff after appropriate training in the use of the form and determination of presumptive cause of death. Supervisors will be expected to review all data collection forms. Once they are reviewed, forms will be passed to the person responsible for coordinating/managing community-based mortality surveillance who will review all deaths and compare with facility report.

20. Mortality rates, in addition to, food security and malnutrition rates are required prior to declaring a famine. UNHCR does not declare famine, however UNHCR could declare an emergency based in a specific refugee setting. Metuge A, Omam LA, Jarman E, Njomo EO. Humanitarian led community-based surveillance: case study in Ekondo-titi, Cameroon. Confl Health. 2021 Mar 26;15(1):17. doi: 10.1186/s13031-021-00354-9. PMID: 33771200; PMCID: PMC7995751.(**Link here**)
21. Centers for Disease Control and Prevention (CDC). Notes from the field: mortality among refugees fleeing Somalia--Dadaab refugee camps, Kenya, July-August 2011. MMWR Morb Mortal Wkly Rep. 2011 Aug 26;60(33):1133. PMID: 21866087.(**Link here**)
22. Fottrell EF, et al: Dying to count mortality surveillance in resource-poor settings. Global Health Action 2009, 2. Doi: 10.3402/gha.v2i0.1926.(**Link here**)
23. Tiffany A, Moundekeno FP, Traoré A, Haile M, Sterk E, Guilavogui T, Serafini M, Genton B, Grais RF. Community-Based Surveillance to Monitor Mortality in a Malaria-Endemic and Ebola-Epidemic Setting in Rural Guinea. Am J Trop Med Hyg. 2016 Dec 7;95(6):1389-1397. doi: 10.4269/ajtmh.16-0376. Epub 2016 Oct 3. PMID: 27698277; PMCID: PMC5154456.(**Link here**)

b) Comprehensive verbal autopsy

Comprehensive verbal autopsy (VA) questionnaires are used to ascertain and attribute cause of death. VA are not done routinely but may be undertaken as part of research into health status of the population. The main objective of VA is to determine possible reasons for, and a most likely cause of, death in situations where there is no medical record or formal medical attention given. The VA interview is done using a standardized questionnaire that elicits information on signs, symptoms, medical history, and circumstances preceding death. The cause of death or sequence of causes that led to death are assigned based on the data collected using the VA questionnaire and any other available information. The questionnaire is more comprehensive than that used in cause of death community interviews, and it is more rigorous. The questionnaire can be administered by a non-clinician or clinician, and the assigned cause of death is generally reviewed and finalized by a clinician, although there exist published algorithms that non-clinicians can be trained to apply to finalize cause of death.

TIP: Verbal Autopsy Resources

Additional guidance on use of verbal autopsy techniques is available at the links below:

- WHO: Verbal Autopsy Standards
- WHO: Verbal Autopsy Instrument (2022)
- Institute for Health Metrics and Evaluation: Verbal Autopsy Tools
- InterVA: Suite of computer models to facilitate interpreting verbal autopsy data
- InSilico: A method of automatic cause of death assignment for verbal auto

c) Specialized death audits

Maternal deaths

The majority of maternal deaths are preventable and maternal death audits are a key tool for understanding why a woman/adolescent girl died and what actions can be taken to prevent such deaths in the future. All maternal deaths should be reported and investigated according to the **UNHCR Maternal Death Review Guidance**. For more information on maternal mortality (including a systematic analysis of global causes of maternal death, please refer to: **WHO Maternal Mortality Fact Sheet**.

TIP: Maternal Death Audits

Maternal deaths should be included in the facility and community-based line lists, and in turn included in the central mortality register, which should automatically trigger a maternal death audit.

Neonatal deaths

Neonatal deaths are more likely than any other death to be underreported, yet they constitute nearly 50% of under five deaths globally[24]. The 2021 WHO Guidance **Maternal and perinatal death and surveillance and response** provides step-by-step guidance for assessing the burden of maternal and neonatal deaths and stillbirths (including causes of death, trends and how to link maternal and perinatal death reviews), using a confidential and blame-free approach. The guidance also includes audit review forms for neonatal deaths and still births.

24. **https://data.unicef.org/topic/child-survival/neonatal-mortality**/Accessed 19/09/2021

In refugee settings, any maternal death should be reported and audited. In context where coverage of maternal deaths reporting, and audit and neonatal death reporting are satisfactory, neonatal death should be audited. While ideally all neonatal deaths should be investigated, it may not be feasible to audit every neonatal death where there is a high number of neonatal deaths. In these settings, it is recommended that a representative sample of all neonatal deaths in a given time period be audited through systematic random sampling, for example every third or fifth neonatal death. First ensure the surveillance system captures the majority of neonatal deaths before focusing on neonatal death audits (**Table 6**).

Table 6: Summary of Approach to Maternal and Neonatal Death Reporting and Auditing in Refugee Settings

Activity	Appropriate for Settings
Maternal Death Reporting	All settings
Maternal Death Auditing	All settings
Neonatal Death Reporting	All settings
Neonatal Death Audits	Given satisfactory maternal deaths reporting and audit and neonatal death reporting coverage **Neonatal deaths should be audited.** Given it may not be feasible to audit every neonatal death where there is a high number of neonatal deaths. **A representative sample (every nth selected through systematic random sampling) of all neonatal deaths in a given time period should be audited.**

Misclassification of neonatal deaths as stillbirths and vice versa

It is important that neonatal deaths be differentiated from stillbirths.

- Neonatal death is the death of a baby born alive within the first 28 days of life.
- The internationally comparable definition of stillbirth as defined by WHO is death before birth, among fetuses that are, by order of priority, of at least 1000 g birthweight, and/or at least 28 weeks gestation, and at least 35 cm long.

When recording and collating neonatal deaths and stillbirths it is important to note that stillbirths count towards perinatal mortality but not neonatal, under-five mortality or crude mortality. For additional information on calculating stillbirth rate, neonatal mortality rate, etc., please refer to **Annex 7**.

d) Social autopsy

Social autopsy is an interview process used to determine and attribute social barriers to receiving the appropriate care (i.e., decisions to seek care, the actual steps in seeking care, and in reaching care and receiving appropriate care). It can be done as part of cause of death interviews or specialized death audits. Social barriers elicited may complement clinical care barriers, which can facilitate more holistic or multifaceted corrective actions to prevent mortality among the refugee population.

Mortality Reporting Consideration

Keep in mind that is possible that routine community monitoring of deaths may affect people's behavior which may lead to a reduction in mortality. Conversely monitoring by service providers can also influence people to tell surveillance monitors what they want to hear.[25],[26]

The additional methods for improving quality of mortality surveillance data, along with their advantages and limitations, are described in Table 7 below for reference.

Table 7: Summary of Additional Methods to Improve Quality of Mortality Surveillance Data

Method	Advantages	Limitations
Cause of Death community interview	• Provides context around presumptive causes of community deaths. • Takes less time and is easier to administer, compared with standard VA tools. • Allows for rapid response • Can be done periodically to monitor the situation over time.	• Does not provide same level of details as verbal autopsy. • Requires training and supervision.
Comprehensive Verbal Autopsy	• Enables collection of wider scope of mortality-related information. • Can use validated tools and standardized diagnoses. • Good for gathering information on deaths from both infectious and chronic diseases.	• Resource- and time-intensive. • Requires technical oversight to complete. • Requires clinicians to review and code. • Data collection deteriorates over time without ongoing supervision and incentives for reporting.

25. Jarrett P, Zadravecz FJ, O'Keefe J, Nshombo M, Karume A, Roberts L. Evaluation of a population mobility, mortality, and birth surveillance system in South Kivu, Democratic Republic of the Congo. Disasters. 2020 Apr;44(2):390-407. doi: 10.1111/disa.12370. Epub 2019 Oct 16. PMID: 31231822; PMCID: PMC7154676.(**Link here**)

26. Wol P, Kay C, Roberts L. Surveys about attended births appear to be deceptive in CAR: are the population saying what they think NGO's want to hear? Confl Health. 2021 Jun 13;15(1):48. doi: 10.1186/s13031-021-00381-6. PMID: 34120637; PMCID: PMC8201712.(**Link here**)

		• Timeliness and response to information are weak as large amounts of data are not analysed or are not analysed on time to act due to time constraints. • Poor in detecting or reacting to diseases of outbreak potential.
Specialized death audit (e.g., maternal and neonatal deaths)	• Provides detailed context leading up to and around death in these special populations with special risks for elevated mortality. • Can mobilise the community and health providers to address maternal and neonatal death. • If done well can lead to concrete actions at all levels of the health system.	• Subject to social desirability response bias and reporting bias especially from health providers. • Time-consuming. • Risk of being seen as a way to assign blame so must be done in a sensitive and non-accusatory way. • Subject to various types of bias (recall bias, interviewer bias, hostility bias, etc.).
Social Autopsy	• Provides more details on the cultural, behavioural, and health system barriers that contribute to death. This often complements verbal autopsy methods.	• Subject to various types of bias (Social desirability response bias, recall bias, interviewer bias, hostility bias, etc.). • Time-consuming.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Conclusions

Mortality is a critical indicator of the overall health of the population in refugee settings. Accurate death counts and mortality rates and trends facilitate estimation of the severity of a crisis, estimate the magnitude of needs, and assist in evaluating the effectiveness of the humanitarian public health response. Cause of death data can be used to identify the relative proportions of causes of excess mortality and to guide health services' efforts to target these identified causes.

A comprehensive, flexible mortality surveillance system in refugee camps or settlements is one that utilizes planning and coordination with health partners, rapidly implements simple surveillance activities and adds complex activities later and integrates facility- and community-based mortality information streams into a central mortality register and iRHIS and that are linked with national mortality surveillance systems. Additionally, a useful mortality surveillance system is one that is integrated as a module within a comprehensive health surveillance system operational in the refugee camp or settlement. This integration facilitates an effective public health response to reduce excess mortality in refugee settings.

Annex 1:

Commonly Used Mortality indicators in Humanitarian Settings

Indicator	Numerator	Denominator	Formulas*	Reporting unit of measure	Notes
Crude Death Rate (CDR) OR Crude Mortality Rate (CMR)	Total # of all deaths during a selected time-period.	Mid-period population at risk during the selected time-period*.	Total # of all deaths during a selected time-period. Mid-period population at risk during the selected time-period.	Deaths/10,000/day* Deaths/1,000/month Deaths/1,000/year	Baseline mortality and emergency thresholds are context specific- a doubling or more of the baseline from pre-emergency levels indicates a significant public health emergency. An age-specific mortality rate including all genders and causes.
Under-Five Death Rate (U5DR) OR Under-five Mortality Rate (U5MR)	Total # of deaths among children U5 during a selected time-period.	Mid-period population of children U5 during the selected time-period.	Total # U5 deaths during a selected time-period. Mid-period population of U5 children during the selected time-period.	U5 deaths/10,000/day U5 deaths /1000/month U5 deaths/1000/year	An age-specific mortality rate including all genders and causes.
Cause-Specific Mortality	Total # deaths due to a specific cause during a selected time-period.	Total # deaths during the time period.	Total # deaths due to a specific cause during a selected time-period x 100. Total # deaths during the time-period.	%	Also referred to as proportional mortality. This focuses on a specific cause such as measles-related deaths. Can calculate for any cause.
Case-Fatality Rate or Case-Fatality Ratio	Total # of deaths due to a given cause during a selected time-period.	Total # of cases of the same given cause during the same time-period.	Total # of deaths due to a given cause during a selected time-period x 100. Total # of cases of the same given cause during the same time-period.	%	Indicates issues related to case management. May indicate delay in care seeking behaviour.
Excess Mortality Rate	Observed CDR and Expected Non-Emergency CDR.		(Observed CDR – Expected CDR) x Total Mid-period Population.		Measuring death that is attributable to the emergency.
Neonatal Mortality Rate (NMR)	Total # of deaths among children < 28 days during a selected time-period.	Total # of live births during the same time-period.	Total # of deaths among children <28 days during a selected time-period.	Deaths per 1000 live births.	Probability of dying before 28 days of life.
Infant Mortality Rate (IMR)	Total # of deaths among children <1 years during a selected time-period.	Total # of live births during the same time period.	Total # of deaths among children < 1yrs during a selected time-period. Total # of live births during the same time- period.	Deaths per 1000 live births.	Probability of dying before the age of 1.
Maternal Mortality Ratio (MMR)**	Total maternal deaths during a selected time-period.	Total # of live births during the same time-period.	Total maternal deaths during a selected time-period. Total # of live births during the same time-period.	Per 100,000 live births.	This ratio is used to measure mortality among women during pregnancy or within 42 days of pregnancy termination due to pregnancy-related causes (delivery, miscarriage, or abortion), but not from accidental or incidental causes. However, MMR is usually only measured at national level over a 5-to-10-year period. It is generally not measured at sub-national level as it is relatively rare, and the confidence intervals are too wide for meaningful interpretation.

*. Rates can be expressed by calculating deaths per time-period or person-time. **The format used in the acute emergency phase (when mortality rates are changing rapidly) is generally deaths per 10,000 persons per day (deaths/10,000/day), and deaths are reported daily or weekly**. The number of deaths per 1,000 person-month (deaths/1,000 person-month) is typically used during the post-emergency phase, and deaths are reported monthly.

. **In emergency settings, all maternal deaths reported should trigger further investigation according to the **UNHCR Maternal Mortality Guidelines**.

Annex 2:

Health Facility Register/Line List for Facility-Based Deaths

Start Date: __ /__/____	Name of Health Facility:	Name of health partner:	Epi Week:
End Date: __ /__/____	_____	_____	_____

#	Name of deceased	Sex	Age	Status (Ref/Nat)	Camp Address	Date of death (D/M/YYYY)	Admission date (D/M/YYYY)	Time between admission and death	Direct (immediate) cause of death	Underlying cause of death
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Annex 3:

Referral Register

Start Date: __/__/____	Name of Health Facility:	Name of health partner:	Epi Week:
End Date: __/__/____			

#	Name of patient	Sex	Age	Status (Ref/Nat)	Camp Address	Date of referral (D/M/YYYY)	Name of Referral Facility	Final Diagnosis	Status upon discharge*	Direct (immediate) cause of death	Underlying cause of death
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											

. * **STATUS:** Recovered/Stabilized, Death, Discharged against medical advice

Annex 4:

Central Mortality Register

Notes:
If **sex** is unknown indicate with 0
If **age** at death is unknown indicate with 99 in the most appropriate category
If **date of death** is unknown indicate month and year
If **day/month** is unknown indicate with 00/00/**YYYY**

Date from: __/__/____ **to** __/__/____

#	Name of deceased	Sex	Age <5 =months <30 days=days	Address at time of death	Date of Death (D/M/YYYY)	Date Reported (D/M/YYYY)	Direct (immediate) cause of death	Underlying cause	Place of death 1 = Health facility 2 = Home 3 = Referral facility 4 = Other 99 = Unknown	Reported source						
										Health Facility	Home visit	Grave monitoring	Key informants	Community surveillance	Referral facility	Other (specify)
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

Annex 5:

Grave counting form

Start Date: __ /__/____	Camp / Neighbourhood Number:	Burial site name or ID:	Long/Lat:
End Date: __ /__/____			

Grave siteID		Number of graves Week X			Number of graves Week X+1			Number of graves Week X+2			Number of graves Week X+3			Number of graves Week X+4			Total monthly All weeks		
#	ID	Big	Small	Total	Big	Small	Total	Big	Small	Total	Big	Small	Total	Big	Small	Total	Big	Small	Total
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			

* This can be used if it is a burial site for refugees ONLY.

Annex 6:

Key Informant Community Mortality Reporting Sheet

Start Date: __/__/____	Province/Governorate Number:	District Number:	Camp/Neighbourhood/Block Number:	Key Informant Number:	Supervisor/Focal Point Number:
End Date: __/__/____					

Age groups	Sex	ID#	Day of the Week							Reported cause (if unsure indicate) or add signs and symptoms	Family Name	Tel # if available	Address - Block	Notes
			Mon	Tues	Wed	Thurs	Fri	Sat	Sun					
0-28 days	M	1												
		2												
		3												
	F	1												
		2												
		3												
28 d-59 m	M	1												
		2												
		3												
	F	1												
		2												
		3												
≥5	M	1												
		2												
		3												
	F	1												
		2												
		3												

Annex 7:

Line List for Community-Based Deaths (Community Health Worker/Community Volunteer Form)

Start Date: __/__/____	Name of the camp:	Name of health partner:	Epi Week:
End Date: __/__/____			

#	Name of deceased	Sex	Age	Status (Ref/Nat)	Camp Address	Date of death (D/M/YYYY)	For Females 15-49, was the female pregnant? If yes, complete status/outcome		Date reported to CHW/CV (D/M/YYYY)	Place of death[c]	Reported cause (Signs/ symptoms)	Days since last sought care[d]
							Female[a]	Fetus/Neonate[b]				
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												

a. **Female Status/Outcome: 1** = Pregnant at death; **2** = Died during delivery; **3** = Delivered then died (1-42 days)

b. **Child Status/Outcome: 1** = Born alive/still alive; **2** = Child born alive died first 28 days; **3** = Born dead when delivered; **4** = Born alive status unknown

c. **Place of death: 1** = home; **2** = health facility; **3** = other (specify)

d. **Days since last sought care:** How many days ago did the person last seek care? Indicate number of days if care sought. **88** = never sought care; **99** = not sure / unknown

Note: If an additional death is identified by asking the pregnancy outcome section, the death will be listed separately

Annex 8:

Using an event calendar

In many countries, recording an individual's date of birth and or death is not customary and therefore it is necessary to estimate the year (and sometimes month in children < 5) of birth to determine their age at the time of death, which is important in the context of mortality surveillance.

An assistive instrument that provides dates of significant events for a specific geographic area that can help data collectors gather more accurate information about age verification, births, deaths, and in/out-migration (especially useful in unstable populations with limited written records)[27].

- For regular, on-going mortality surveillance, a calendar is helpful to estimate the age of an individual at death.
- For less-frequent surveys, they can help to reduce event recall and bias surrounding when a death occurred.

Creating an event calendar

When creating an event calendar, it is essential to keep in mind your target audience, such as demographics, religion, and nationalities. You want to select events that are significant to this population. In the context of camps with multiple nationalities, multiple calendars with events specific to distinct groups that reside there may be needed (See Example 1).

- **Identify the time frame of the calendar:**
    - In the context of determining age at death, you will want to include a longer timeline that provides for significant historical events that span decades. It is ideal to have one major event per year or multiple events per decade if there are years without events. Examples could include an important national election, a major disaster, or a prominent figure's death.
    - When completing one-time surveys with more extended recall periods, you may want to be more detailed each year and not go as far back (See Example 2). Include more recent history and things like annual holidays or agricultural seasons to estimate month and year better. When the event's precise date is known, the date should be recorded in parenthesis on the calendar. When the event covers multiple dates or weeks, try to specify what part(s) of the month(s) the event occurred (for example, early, mid, or late September).

- **Determine sources of information for completing the calendar:** Gather information using key informants, including community leaders and religious leaders familiar with significant political and climatic events occurring in the area. Key informants, such as traditional birth attendants, women with children under five years, health staff, and teachers and focus groups comprised of diverse individuals of each group can be consulted to add more unique events. Be sure to share drafts between groups and with refugee staff to validate the accuracy and to ensure significant events are covered events are covered, recognizable, and pertinent to all sub-populations.

27. **Summarized and adapted from FAO Age Estimation Document: Guidelines for Estimating Age (2008) FAO**.

- Consider all the following types of events for inclusion in calendars.
  - Major historical events such as prominent elections, deaths of leaders, conflicts, etc.
  - Religious and national holidays/festivals.
  - Planting seasons, harvesting, hunger seasons, and climactic seasonal events (rainy, dry, etc.).

Considerations

- Many countries may use other calendars apart from the Gregorian (Western) calendar (e.g., Islamic, Hebrew, and Ethiopian or Amharic). Extra time must be budgeted for constructing these calendars and ensuring accurate dates.
- If data collection occurs routinely, through monitoring or surveillance activities, the calendar should be updated periodically to avoid having to recreate new calendars each time a survey is planned.

Using the calendar of events once created

- It is only necessary to use the calendar when date of birth is unknown (birth certificates, baptismal certificates, health cards, or religious text) or is not remembered, or in the case of deaths in retrospective mortality surveys.
- When records are unavailable, begin by asking the interviewee if they remember when the deceased was born or died (depending on the situation). This estimate is used as a starting point and should be followed up with a series of 'before and after' questions to identify two known events, one that occurred before and one which occurred after an individual was born or died.

Annex 9:

Cause of Death Community Interview Form

Instructions to the community health workers/data collector:

1) Introduce yourself and explain the purpose of the interview.
2) Ask to speak to those household members (>15 yrs.) most familiar with the illness leading up to the individual death, the person(s) who spent time with the person prior to their death (caregiver). Explain the reason behind collecting additional information concerning the persons death (see script).
   a. Obtain consent.
   b. If the person (s) is unavailable, arrange a revisit.
   c. If the HH refuses, thank them and go to next HH on your list.

I. Respondent Information

Sex:

Male ☐

Female ☐

Age (≥15): _____

Status visit	1	2	3
Completed			
Refused			
Unavailable			

II. Information on the deceased

Name: Do not record name but ask to refer to the person throughout the interview **Sex:** ☐ **Male** ☐ **Female** **Date of Birth:** ___ /___ /_____ (If unavailable note as 00/00/00 and estimate) **Age at death:** _____	**Arrival date:** _____ /_____ /_____ **Camp/settlement/location:** **Block:**	**Date of death:** ___ /___ /_____ **Place of death:** ☐ Home ☐ Hospital ☐ Other: _____

III. Respondent's account of illness

Can you tell me about the events that led to his/her death?

Can you think about the 1-2 days before death and tell me any events, or signs and symptoms or what was done, anything you remember:

☐ Seen at Health facility ☐ Discharged from the hospital ☐ Inpatient/outpatient diagnosis

Can you think about the 1-2 week before death and tell me any events, or signs and symptoms or what was done, anything you remember:

☐ Seen at Health facility ☐ Discharged from the hospital ☐ Inpatient/outpatient diagnosis

IV. Symptoms during illness (answer all questions)

I am going to ask you a number of questions about **(name of person). Did (name)** show any of the following signs/symptoms during their illness prior to death.

1. Did s/he have **cough/ difficulty in breathing?**

☐ **No** ☐ **Yes** ☐ **DK**

If NO/DK, go to question 2

If YES:

a. For how long did s/he have cough? _____ **days**

b. Did the person have a dry cough? ☐ **Yes** ☐ **No** ☐ **Don't Know**

c. Did s/he have fast breathing OR chest indrawing? ☐ **Yes** ☐ **No** ☐ **Don't Know**

d. Did s/he have difficulty in breathing? ☐ **Yes** ☐ **No** ☐ **Don't Know**

2. Did s/he have **fever?**

☐ **No** ☐ **Yes** ☐ **DK**

If NO/DK, go to question 3

If YES:

a. For how long did s/he have fever? _____ **days**

b. Did s/he have chills/rigors? ☐ **Yes** ☐ **No** ☐ **Don't Know**

3. Did s/he have **diarrhoea?**

☐ **No** ☐ **Yes** ☐ **DK**

If NO/DK, go to question 4

If YES:

a. For how long did s/he have diarrhoea? _____ **days**

b. When it was most severe, how many times did s/he pass stool in a day? _____ **times**

c. Was there blood in the stools? ☐ **Yes** ☐ **No** ☐ **Don't Know**

4. Did s/he **vomit?**

☐ **No** ☐ **Yes** ☐ **DK**

If NO/DK, go to question 5

If YES:

a. For how many days did s/he vomit? _____ **days**

b. When it was most severe, how many times did s/he vomit in a day? _____ **times/day**

c. Did s/he have abdominal pain? ☐ **Yes** ☐ **No** ☐ **Don't Know**

5. Did s/he have **headache?**

☐ **No** ☐ **Yes** ☐ **DK**

If NO/DK, go to question 6

If YES:

a. For how long did s/he headache? _____ **days**

b. Did s/he have **stiff neck OR bulging fontanelle?** ☐ **Yes** ☐ **No** ☐ **Don't Know**

c. If YES For how long did s/he have stiff neck? _____ **days**

6. Did s/he have **convulsions?**

☐ **No** ☐ **Yes** ☐ **DK**

If NO/DK, go to question 7

If YES:

a. For how long did s/he convulsions? _____ **days**

7. Did s/he have skin **rash?**

☐ **No** ☐ **Yes** ☐ **DK**

If NO/DK, go to question 8

If YES:

a. For how long did s/he skin rash? _____ **days**

b. What did the rash look like? ☐ **Measles rash** ☐ **Rash with clear fluid** ☐ **Rash with pus** ☐ **DK**

c. Where was the rash located? ☐ **Face** ☐ **Trunk** ☐ **All over the body**

d. Did s/he have red eyes/ running nose? ☐ **Yes** ☐ **No** ☐ **Don't Know**

8. Did s/he **become very thin**, or did s/he **have leg or foot swelling?** ☐ **No** ☐ **Yes** ☐ **DK** If NO/DK, go to question 9	**If YES:** a. Did s/he receive nutrition support? ☐ **Yes** ☐ **No** ☐ **Don't Know** b. If YES, please specify which programme ☐ **SFP/OTP** ☐ **Discharged from SC/ITFC**
9. Did s/he have **yellow discoloration of the eyes/ palms?**	☐ **Yes** ☐ **No** ☐ **Don't Know**

ONLY for FEMALES who died while pregnant or up to 6 weeks after delivery. Any suspected maternal death should trigger a maternal death audit

10. Where did she give birth?	☐ **Home** ☐ **Hospital/health facility** ☐ **Other e.g., en route to a facility**
11. Was there excessive bleeding before/during/ after delivery?	☐ **Yes** ☐ **No** ☐ **Don't Know**
12. Convulsions before or after delivery?	☐ **Yes** ☐ **No** ☐ **Don't Know**

ONLY for INFANTS who died in the first 28 days after birth. Any suspected neonatal death may trigger a neonatal death audit according to the country context

13. Where was the baby born?	☐ **Home** ☐ **Hospital/health facility** ☐ **Other e.g., en route to a facility**
14. Was s/he able to breathe after birth?	☐ **Yes** ☐ **No** ☐ **Don't Know**
15. Was s/he able to suckle in a normal way after birth?	☐ **Yes** ☐ **No** ☐ **Don't Know**

V. Ask if the person had any previously known medical conditions? ☐ **Yes** ☐ **No** ☐ **Don't Know**

If Yes, please specify: ☐ **Asthma** ☐ **Cancer** ☐ **Cardiovascular disease (other)** ☐ **Diabetes** ☐ **Hypertension** ☐ **Liver disease** ☐ **ental Health** ☐ **Renal disease** ☐ **Other NCDs**

CHW/CV suspected cause of death: _____

FOR CLINICIAN'S USE ONLY

Ia. Direct (immediate) cause of death: _____

Ib. Underlying cause of death: _____

Clinician Name: _____ Date of death certification: ____ /____ /____

Clinician Signature: _____

Additional Key Tools and Resources

Maternal and New-born Audits and Reviews

Tools and Guidance:

1. UNHCR Maternal Death Review Guidance (2020). (**Link here**)
2. UNHCR Maternal Death Audit Form (2020). (**Link here**)
3. UNHCR Stillbirth Event Review Form (2019). (**Link here**)
4. Uganda Ministry of Health – Newborn Perinatal Death Audit Form. (**Link here**)
5. WHO Maternal and Perinatal Death Surveillance and Response (MPDSR). (**Link here**)

Resources:

6. EMPHNET and UNHCR. (2019). Strengthening Neonatal Mortality Audits in Zaatari and Azraq Refugee Camps in Jordan – Mid-year/2019. (**Link here**)
7. Tappis, Ramadan, Vargas, Kahi, et. al. (2021). Neonatal Mortality Burden and Trends in UNHCR Refugee Camps, 2006-2017: a retrospective analysis. BMC Public Health, 21(390). (**Link here**)
8. Russell, Tappis, Mwanga, Black, et. al. (2022). Implementation of maternal and perinatal death surveillance and response (MPDSR) in humanitarian settings: insights and experiences of humanitarian health practitioners and global technical expert meeting attendees. Conflict and Health, 16(1):23. (**Link here**)
9. WHO. (2016). Making every baby count: audit and review of stillbirths and neonatal deaths. WHO Library Cataloguing-in-Publication Data. (**Link here**)

Mortality Surveillance: Data Collection Tools, Methods and Reports

Tools and Guidance:

1. UNHCR Health Information System (HIS): Standards and Indicators Guide. (2019) (**Link here**)
   This document lists the standards and indicators used within the Integrated Refugee Health Information System (IRHIS). Designed as a reference tool to help interpret indicators presented in HIS reports and to improve decision-making based on this information. Includes mortality indicators (separated by maternal status, by cause, and by age).
2. UNHCR Health Information System (HIS): Case Definitions (Revised 2019). (**Link here**)
   Disease and health events under surveillance in the health information system. Includes acute health conditions, notifiable diseases, chronic health conditions, mental health, injuries, and definitions of "New Visit" and "Revisit" for acute health conditions. Also defines case classifications (suspected, confirmed, syndromic and probable)
3. Integrated Refugee Health Information System (iRHIS) See User Guides including tally sheets and training slides. (**Link here**)
4. Measuring Mortality, Nutritional Status and Food Security in Crisis Situations: The SMART Protocol (2020). (**Link here**)

The Standardized Monitoring and Assessment for Relief and Transition (SMART) manual lists steps in undertaking a nutrition, and mortality surveys (planning, sampling, methods, training, analysis, and reporting), including ENA software, food security, and analysis, interpretation, and recommendation.

Resources:

1. Checchi. (2018). Estimation of population mortality in crisis-affected populations: Guidance for humanitarian coordination mechanisms. London School of Hygiene and Tropical Medicine. (**Link here**)
2. Checchi and Roberts. (2005). Interpreting and using mortality data in humanitarian emergencies: A primer for non-epidemiologists. Humanitarian Practice Network 2005. (**Link here**)

   The paper describes the practice and purpose of epidemiology concerned with population mortality during emergencies, including key indicators, how to measure mortality, methods for data collection, and how to interpret and use results to formulate policy.
3. Kalter, Salgado, Gittelsohn, and Parades. (2004). A Guide to Conducting Mortality Surveys and Surveillance. Published by Basic Support for Institutionalizing Child Survival Project (BASICS II) for the United States Agency for International Development. Arlington, Virginia. (**Link here**)
4. Weissman. (2018). Mortality emergency threshold: A case for revision. Published 25 June 2018 on MSF Crash. (**Link here**)

Community-Based Workforce

Tools and Guidance:

1. UNHCR Operational Guidance on Community Health Workforce in Refugee Settings. (**Link here**)
   Describes the typology of the health care workforce, examples of good practices, structural design of workforce in refugee settings, guidance in setting up community-based health workforce, monitoring, and reporting, challenges, and resources.

Emergency Guidance

Tools and Guidance:

1. United Nations High Commissioner for Refugees Emergency Handbook. (**Link here**)
2. Médecins Sans Frontières (MSF) Assessment Toolkit. (**Link here**)
3. The Sphere Project (2018) Sphere Handbook: Humanitarian charter and minimum standards in disaster response. (**Link here**)

Surveys and Surveillance

Tools and Guidance:

1. MSF Rapid population estimation in emergencies for field personnel working in camps or sites and wishing to rapidly draw maps and estimate population figure (2007). (**Link here**)
2. CDC and World Food Programme (2005) A Manual: Measuring and Interpreting Malnutrition and Mortality. (**Link here**)
3. WHO (2022) Verbal autopsy full instrument and tools standards. (**Link here**)
4. UNHCR Standardized Expanded Nutrition Survey Guidelines. (**Link here**)
5. WHO (2018) Population Mortality in Crisis-Affected Populations: Guidance for humanitarian coordination mechanisms. (**Link here**)
6. FAO (2008) Guidelines for Estimating the Month and Year of Birth of Young Children. (**Link here**)
7. SAGE (2008) Event History Calendar. (**Link here**)
8. Uganda Ministry of Health (2010) Health Management Information System: Health Unit Procedure Manual. (**Link here**)

The form that collects information for a summary of inpatient services each month. All health units (including hospitals) with inpatients must compile and submit the form. The form includes a section on the number of admissions and deaths by diagnosis separated by communicable diseases, epidemic-prone/ notifiable disease, maternal conditions, and chronic disease (section 6).

Resources:

9. Woodruff. (2005). Interpreting mortality data in humanitarian emergencies. The Lancet, 367(9504):9-10. (**Link here**)
10. De la Maisonneuve, Lyon, Musambo, and Ondeko. (2005). Joint UNHCR-WHO Evaluation of Health and Health Programmes in Refugee Camps in Zambia. Evaluation and Policy Analysis Unit. (**Link here**) Includes assessments of mortality data, rates, reporting, and collection methods along with recommendations for monitoring mortality.
11. Heudtlass, Speybroeck, and Guha-Sapir. (2015). Monitoring mortality in forced migrants – can Bayesian methods help us to do better with the (little) data we have?. PLOS Medicine. (**Link here**)
12. Polonsky, Luquero, Checchi, et al. (2013). Public Health Surveillance After the 2010 Haiti Earthquake: The Experience of Médecins Sans Frontières. PLoS Currents 5. (**Link here**)
Médecins Sans Frontières established surveillance for infections of epidemic potential, death rates, and malnutrition prevalence. Trends in infections of epidemic potential were detected through passive surveillance at health facilities serving as sentinel sites. Active community surveillance of death rates and malnutrition prevalence was established through weekly home visits.
13. N'Goran, Ilunga, Coldiron, Grais, and Porten. (2013). Community-based measles mortality surveillance in two districts of Katanga Province, Democratic Republic of Congo. BMC Research Notes, 6(537). (**Link here**)
Discusses the implementation of community-based methods of measuring measles mortality using standardized questionnaires. Found that a community-based network of volunteers recorded many more deaths compared to deaths recorded in health centers. Lack of reliable population data and incomplete surveillance system coverage makes it impossible to calculate overall attack rates and causes-specific mortality rates.
14. Bowden, Braker, Checchi and Wong. (2012). Implementation and utilisation of community-based mortality surveillance: a case study from Chad. Conflict and Health, 6(11). (**Link here**)
This is a case study investigating the implementation and utilization of mortality surveillance by Médecins Sans Frontières (MSF) in eastern Chad. The report described and analyzed the community-based mortality surveillance system, trends in mortality data, and data utilization to guide MSF's operational response.
15. Roberts, Morgan, Sultani, et al. (2010). A new method to estimate mortality in crisis-affected and resource-poor settings: A validation study. International Journal of Epidemiology, 39(6):1584-96. (**Link here**)
This study describes the development and validation of a new method to provide near real-time mortality estimates in crisis settings. The informant method currently features moderate sensitivity for accurately assessing mortality but warrants further development, particularly considering its advantages over current options (ease of implementation and analysis and near-real estimates of mortality rates)
16. Kallander, Kadobera, Williams, Nielsen, et al. (2011). Social autopsy: INDEPTH Network experience of utility, process, practices, and challenges in investigating causes and contributors to mortality. Population Health Metrics, 9:44. (**Link here**)
17. Ruwan Ratnayake, Meghan Tammaro, Amanda Tiffany, Anine Kongelf, Jonathan A Polonsky, Amanda McClelland (2020) People-centered surveillance: a narrative review of community-based surveillance among crisis-affected populations. The Lancet. Planetary health 4: 10. e483-e495 10. (**Link here**)
18. **https://doi.org/10.1186/1752-1505-6-11** Caleo GM, Sy AP, Balandine S, Polonsky J, Palma PP, Grais RF, Checchi F. Sentinel site community surveillance of mortality and nutritional status in southwestern Central African Republic, 2010. Popul Health Metr. 2012 Sep 4;10(1):18. doi: 10.1186/1478-7954-10-18. PMID: 22947146; PMCID: PMC3477098.(**Link here**)

19. Ratnayake R, Tammaro M, Tiffany A, et al. People-centred surveillance: a narrative review of community-based surveillance among crisis-affected populations. The Lancet. Planetary Health. 2020 Oct;4(10):e483-e495. DOI: 10.1016/s2542-5196(20)30221-7. PMID: 33038321; PMCID: PMC7542093. (**Link here**)

20. Baaees MSO, Naiene JD, Al-Waleedi AA, Bin-Azoon NS, Khan MF, Mahmoud N, Musani A. Community-based surveillance in internally displaced people's camps and urban settings during a complex emergency in Yemen in 2020. Confl Health. 2021 Jul 5;15(1):54. doi: 10.1186/s13031-021-00394-1. PMID: 34225760; PMCID: PMC8256204. (**Link here**)

21. Metuge A, Omam LA, Jarman E, Njomo EO. Humanitarian led community-based surveillance: case study in Ekondo-titi, Cameroon. Confl Health. 2021 Mar 26;15(1):17. doi: 10.1186/s13031-021-00354-9. PMID: 33771200; PMCID: PMC7995751. (**Link here**)

22. N'Goran, A.A., Ilunga, N., Coldiron, M.E. et al. Community-based measles mortality surveillance in two districts of Katanga Province, Democratic Republic of Congo. BMC Res Notes 6, 537 (2013). **https://doi.org/10.1186/1756-0500-6-537(Link here)**

23. Jarrett P, Zadravecz FJ, O'Keefe J, Nshombo M, Karume A, Roberts L. Evaluation of a population mobility, mortality, and birth surveillance system in South Kivu, Democratic Republic of the Congo. Disasters. 2020 Apr;44(2):390-407. doi: 10.1111/disa.12370. Epub 2019 Oct 16. PMID: 31231822; PMCID: PMC7154676. (**Link here**)

24. Wol P, Kay C, Roberts L. Surveys about attended births appear to be deceptive in CAR: are the population saying what they think NGO's want to hear? Confl Health. 2021 Jun 13;15(1):48. doi: 10.1186/s13031-021-00381-6. PMID: 34120637; PMCID: PMC8201712. (**Link here**)

25. WHO/Health Cluster- Estimation of population denominators for the humanitarian health sector: Guidance for humanitarian coordination mechanisms, 15 November 2018. (**Link here**)

26. Centers for Disease Control and Prevention (CDC). Notes from the field: mortality among refugees fleeing Somalia--Dadaab refugee camps, Kenya, July-August 2011. MMWR Morb Mortal Wkly Rep. 2011 Aug 26;60(33):1133. PMID: 21866087. (**Link here**)

27. Tiffany A, Moundekeno FP, Traoré A, Haile M, Sterk E, Guilavogui T, Serafini M, Genton B, Grais RF. Community-Based Surveillance to Monitor Mortality in a Malaria-Endemic and Ebola-Epidemic Setting in Rural Guinea. Am J Trop Med Hyg. 2016 Dec 7;95(6):1389-1397. doi: 10.4269/ajtmh.16-0376. Epub 2016 Oct 3. PMID: 27698277; PMCID: PMC5154456. (**Link here**)

28. Fottrell EF, et al: Dying to count mortality surveillance in resource-poor settings. Global Health Action 2009, 2. Doi: 10.3402/gha.v2i0.1926. (**Link here**)

For more information, please contact:

Division of Resilience and Solutions, UNHCR Geneva, hqphn@unhcr.org

https://www.unhcr.org/mental-health-psychosocial-support UNHCR Public Health Section