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Revealing the Toll of COVID-19: A Technical Package for Rapid Mortality Surveillance and Epidemic Response



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“Know your epidemic, know your system, know your response.”

— UNAIDS, 2008

“No country is really sure how many people it has lost in the [COVID-19] pandemic”

— New York Times, 2020

Preface

On Jan. 30, 2020 the World Health Organization (WHO) declared the outbreak of coronavirus disease 2019 (COVID-19) a Public Health Emergency of International Concern.^A Even before this declaration, counts of deaths and cases were a primary means of tracking the growth and trajectory of the pandemic. In particular, graphs depicting excess total mortality by week from countries around the world have been an increasingly common and powerful way to capture and present the impact of the COVID-19 pandemic.

The purpose of this document is to provide practical guidance to implement rapid mortality surveillance (RMS) and measure excess mortality in the context of the COVID-19 pandemic, with a focus on implementation in low-resource settings. This includes settings with largely paper-based systems of data collection.

We define RMS as “a system for generating daily or weekly counts of total mortality by age, sex, date of death, place of death, and place of usual residence.” Excess mortality is the degree to which currently measured mortality exceeds historically established levels. In the context of COVID-19, increases in total mortality are attributed to direct and indirect effects of the pandemic.

While this guidance is COVID-19 specific, the basic concept of rapid mortality surveillance adds to the international architecture of population health surveillance and civil registration and vital statistics (CRVS) systems.

A [https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-\(2005\)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-\(2019-ncov\)](https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov))

At one end of the spectrum, CRVS systems are fully functional, with digitization speeding up the recording of deaths and causes of death in near real-time. In these circumstances there is no distinction between RMS and CRVS. At the other end of the spectrum are settings in which CRVS systems are fragmented, have low completeness and coverage and are partially digitized, and are not yet able to report weekly mortality in a timely fashion. In these contexts, RMS can play important functions – particularly where restrictions on movement may be depressing death registration during the epidemic. These functions include: I) providing more timely weekly counts of death than would otherwise be possible; and II) obtaining and retaining the information sufficient for the later official registration of each death in the CRVS system.

In this document we provide:

- The rationale for and conceptual model of RMS
- Guidance for facility- and community-based surveillance
- Guidance for the analysis, visualization and use of the data
- A checklist for establishing a rapid mortality surveillance system

In addition to data collection for total mortality, we also discuss integration with other surveillance systems and the inclusion of information on the manner or cause of death. The guiding principles of RMS should be those that pertain to any system innovation: country ownership and leadership; capacity building; adaptability; and sustainability. Furthermore, it should be stressed that RMS should, wherever possible, be integrated into the national CRVS system—the essential nature of which, even under pandemic conditions, has been made clear by the United Nations.^B

This Technical Package is one of several global resources developed and supported by WHO and partners, including those of the Bloomberg Philanthropies Data for Health Initiative. In addition to this document, these global resources include:

- A technical note on Medically Certifying, International Classification of Diseases (ICD) mortality coding, and reporting mortality associated with COVID-19
- Technical guidance on COVID-19 coding in ICD-10^C
- A web portal where countries are being requested by WHO to report weekly mortality based on aggregate data from official cause-of-death death certification

According to Article 64 of its constitution, WHO is mandated to request each Member State to provide statistics on mortality. Furthermore, the WHO Nomenclature Regulations of 1967 affirms the importance of compiling and publishing statistics of mortality and morbidity in comparable form. Member States started to report mortality data to WHO since the early fifties and this reporting activity is continuing until today. Every year WHO issues an annual call for data on mortality and causes of death and those data have driven major global health policies and research.

B <https://unstats.un.org/legal-identity-agenda/COVID-19/>

C <https://www.who.int/classifications/icd/COVID-19-coding-icd10.pdf?ua=1>

Why Implement Rapid Mortality Surveillance?

The slogan “Know your epidemic. Know your response” is as relevant today as it was when first coined to link evidence to action in the face of AIDS [1]. How then do we “know” the epidemic? How do we measure it? In the current context, two key indicators of impact are the number of COVID-19 cases and the number of COVID-19 deaths as reported on global dashboards.^D Yet these indicators are challenging to measure and reflect only part of the burden and distribution of the outbreak. Existing data from routine, and particularly syndromic, surveillance systems may address some of the shortfalls by serving as an early signal of undiagnosed COVID-19 cases [2]. However, understanding the true impact of COVID-19 on mortality requires reliable data that are not always available in a timely manner in many low-resource settings. Rapid mortality surveillance (RMS) can fill this gap where existing civil registration and vital statistics (CRVS) systems are unable to meet the need.

There are many approaches to mortality surveillance, involving all-cause and cause-specific mortality systems in the health sector, as well as civil registration systems and medicolegal death investigation systems. Ideally, countries have a digitized, unified death notification and registration system with high levels of coverage and completeness that captures all deaths from all causes in all settings (e.g. hospitals; care facilities; homes; or prisons) and can, therefore, be used to generate all necessary mortality data promptly.

However, in many low- and middle-income countries, the coverage and completeness of civil registration of deaths is often below 20%. Hospitals, as the main source of cause-of-death data, are frequently not integrated into the civil registration system, and many systems are only partially digitized, leading to significant lag times in reporting. Furthermore, not all countries use the international standard form of the medical certificate of cause of death and hence are unable to apply the International Classification of Diseases (ICD) rules of mortality coding. This makes it difficult to statistically analyze cause-of-death data over time and to compare between jurisdictions—even where deaths are carefully certified.

Perhaps more importantly, a focus on total mortality encourages the measurement of deaths occurring outside of a health facility, which can be the norm in many low- and middle-income countries. In some countries up to 70% of deaths may occur in the community, and therefore out of the reach of any likely COVID-19 testing or clinical case detection.

^D See e.g. World Health Organization (<https://covid19.who.int/>); Johns Hopkins (<https://coronavirus.jhu.edu/map.html>); Google (<https://www.google.com/covid19-map/>)

Why Total Mortality?

Identifying COVID-19-specific mortality is a challenge across the globe. In many countries, limits on test availability have led to restrictive criteria for access and use, even for people with symptoms. This makes the generalization of testing results impossible and counts of COVID-19 “cases” and “deaths” extremely difficult to interpret.

Without the testing of all suspected cases, health care providers, medical examiners and coroners are left to rely on evolving knowledge of the signs and symptoms associated with COVID-19 deaths. Our ability or inability to differentiate these from other causes of death may result in misclassification. Furthermore, due to societal and health system disruptions, the epidemic contributes to deaths from other causes.

Given these challenges, WHO is calling on all governments to report weekly total mortality based on registration data. Aggregated data can be uploaded to WHO via a global portal. Particularly if begun early enough in the epidemic, visualizations of total mortality even without age and sex disaggregation are readily interpretable. For example, Figure 1 was produced using publicly available data for a large city Brazil. It clearly shows the weekly excess mortality in 2020 compared to 2019 starting in week 14. Even without the historical comparison, the conclusions would be stark. Figure 2 shows a historically expected range of deaths by week, a preferred way to display the historical range if data are available.

FIGURE 1

Weekly deaths Manaus, Brazil 2020 (source: Civil Register COVID Portal/Brazil)^A

— 2019
— 2020

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