

Filling the gaps in cause-specific mortality in Senegal: a verbal autopsy study in death registration centers in Dakar

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Background

Counting who is dying and what they are dying from is one of the best investments to reduce premature mortality [1]. The ideal source of data on the major causes of death is a comprehensive and continuous system of vital registration. However, in low-income countries, local conditions are often far from this ideal, due to scarcity of resources. In Senegal, only about one in three deaths is recorded in vital registers. Yet, in urban centers such as Dakar, Saint-Louis and Ziguinchor, high completeness of death registration is achieved. The 2002 and 2013 national censuses asked all household heads about recent deaths that took place in their households in the 12 months prior to the census. For each death, respondents also stated if the deaths had been notified to civil registration offices. Based on this information, the completeness of death registration in Dakar was estimated at 88,6%, against about 14,2% in rural areas [2]. The death registration data are however, under-exploited and they do not provide any information on causes of death. As a result, Senegal still lacks timely and reliable data on causes of death, despite efforts to improve the health information system. The country recently invested in DHIS-2, an health information platform, but the system has been able to collect less than 10% of the deaths observed in 2018 [3].

To collect cause-of-death data, verbal autopsies (VAs) have been used in some post-census surveys or in areas where populations are closely monitored, such as in Health and Demographic Surveillance Systems (HDSS). In verbal autopsies, relatives and caretakers of the deceased are interviewed to collect data on circumstances and symptoms preceding the death through a structured questionnaire, in order to identify causes of death. A probable cause of death is assigned by physicians reviewing each VA, or a cause is automatically assigned from the reported symptoms, based on statistical models [**Erreur ! Source du renvoi introuvable.**, 5]. In addition to providing estimates of the causes of death, InterVA5 also provides results on death circumstances. Indicators have been added to the 2016 Autopsy Guide to study social determinants in general, especially those related to the organization of the health care system, which establishes the circumstances of death [4, 6]. Verbal autopsies have been used for decades in HDSS sites in Senegal [7,8], but they have never been integrated in civil registration offices.

In this study, we conducted a verbal autopsy study in vital registration centers in Dakar, to evaluate the feasibility of scaling-up autopsies in this context.

Data and methods

This work was conducted at the 72 civil status centers of the Dakar region. This involved identifying all reported deaths for a period of two months (from December 20, 2018 to February 20, 2019) and sending a team of young doctors to the home of relatives of the deceased for the administration of a verbal autopsy questionnaire. Only cases of deceased who were resident of Dakar during the collection period were included. The latest version of the World Health Organization 2016 verbal autopsy guide was used, deployed on tablets using *Open Data Kit (ODK) Collect*. The collected data were processed and analyzed using the R software with an identification of the causes of death thanks to the InterVA5 package.

Results

During the reference period, 3075 deaths were reported in vital registration centers. Of these, 98.0% (3015) were received by staff in registration centers that had been trained in the study. Of the statements made by the civil registrars trained for the survey, 1042 or 34.6% were not eligible for the verbal autopsy, due to the absence of a relative in the Dakar region during the collection period. 1973 cases were eligible for this survey. At the vital registration center, 86.5% (1706) of the declarants agreed to participate in the study. Enumerators were able to obtain 1334 respondents (acceptance rate = 78.2%). Of the 1334 verbal autopsy interviews administered, 1315 (98.6%) were complete and exploitable by both physician-based and automatic methods. Of the 3075 deaths recorded at the vital statistics centers, 1315 were fully investigated, or 42.8%. The following diagram illustrates this selection process.

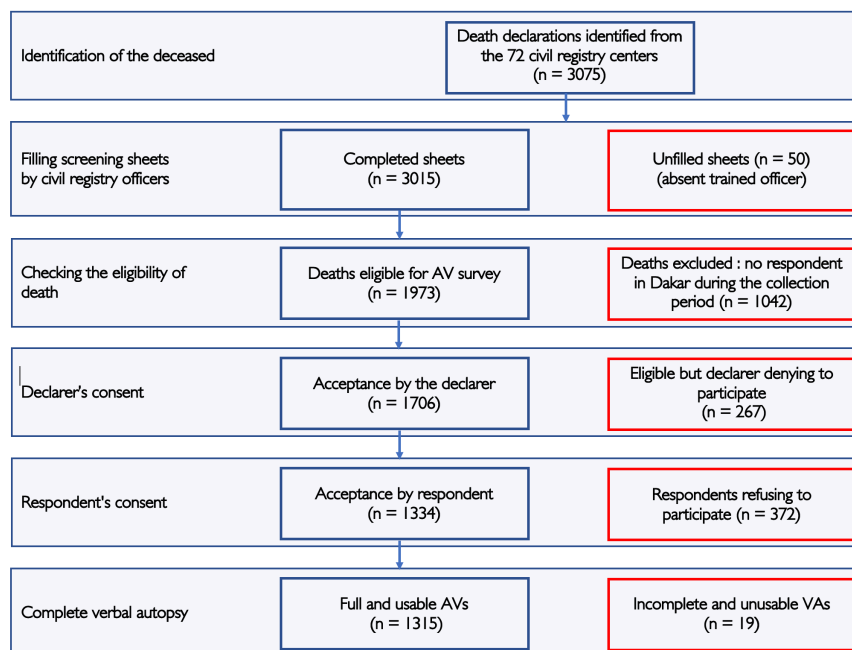


Figure 1 : Flow diagram of the survey observation selection strategy

The deaths who were verbally autopsied in this study were female deaths in 44.9 % of the cases (590). The survey sample consisted of 19.8% of newborns and stillbirths, 6.0% of children between 28 days and 12 years, and 74, 2% of people aged more than 12 years. The death occurred at home in 35.9 % of cases, in a health facility in 36,6 %. A proportion of 4.7% of deaths occurred on the way to the health center. According to respondents' statements, among deaths that occurred

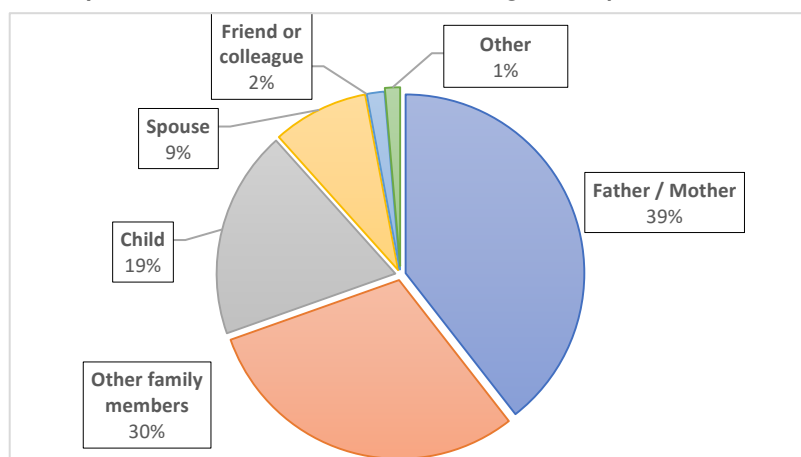


Figure 2 Distribution of respondents based on kinship with the deceased (n = 1315)

in the hospital, 7.7% occurred before the start of care. A proportion of 89.7% of respondents lived with the deceased. The primary respondent assigned to answer verbal autopsy questions was the father or mother of the deceased in 39.5% of cases (see Figure 2).

Data analysis with the InterVA 5 algorithm showed that cardiovascular diseases were the most common cause of death. Cerebrovascular accidents had a cause-specific mortality fraction of 13.7%, followed by other cardiac disorders and myocardial infarction with 8.1% and 5.1%, respectively. The analysis also reveals 10.0% of undetermined causes. Figure 3 illustrates the cause-specific mortality fractions of the 20 most common causes of death identified by the InterVA5 algorithm. For this extended abstract, we report on the study results without age standardization. For the conference, we will standardize our sample of deaths based on the age distribution of the deaths reported in the census.

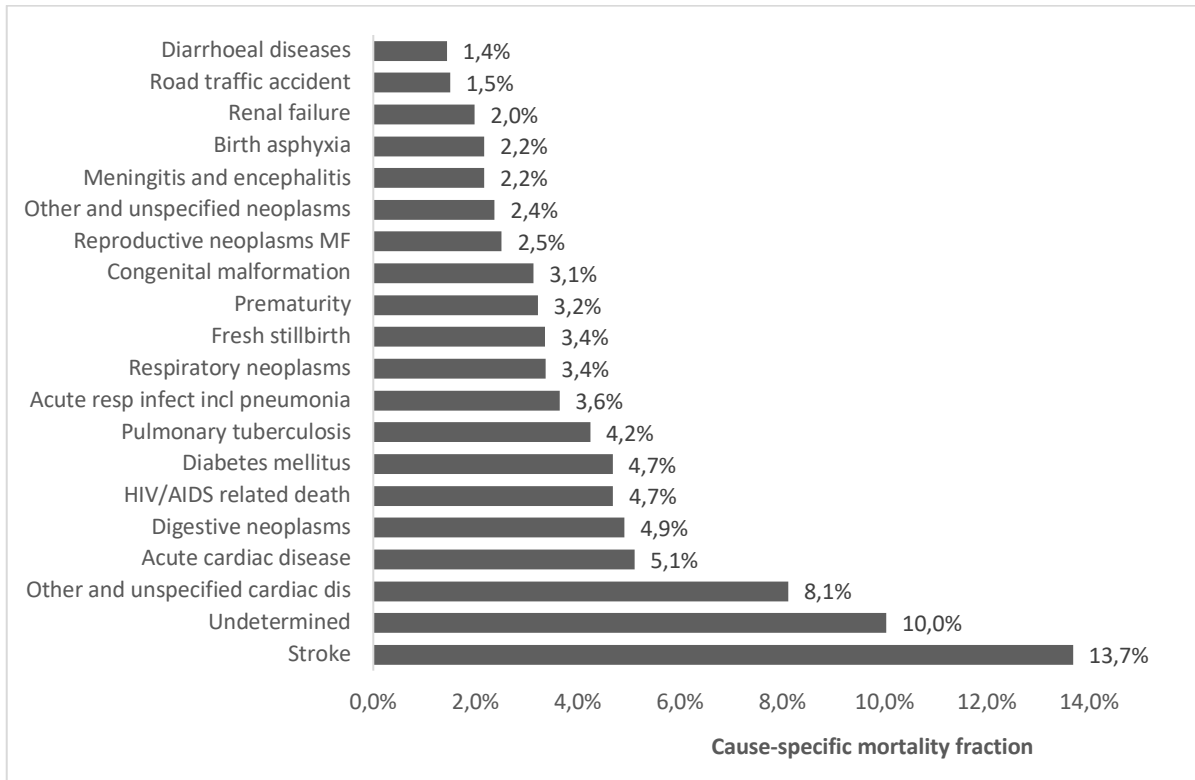


Figure 3 : Cause-specific mortality fractions of the top 20 causes of death estimated from InterVA5 (n=1315)

The InterVA5 algorithm can also be used to classify the cause of death according to its circumstances. Thus, it appears that 46.9% of deaths were deemed inevitable (chronic diseases, serious illnesses ... or having received medical care). 21.3% of the deaths were related to causes unknown by the entourage, which could lead to delays in care seeking. The emergencies were responsible for 13.6% of observed deaths and the lack of means (finance, transport ...) for 9.6%. A lack of care at the level of health facilities caused 8.6% of deaths. Figure 4 illustrates the distribution of the circumstances of deaths.

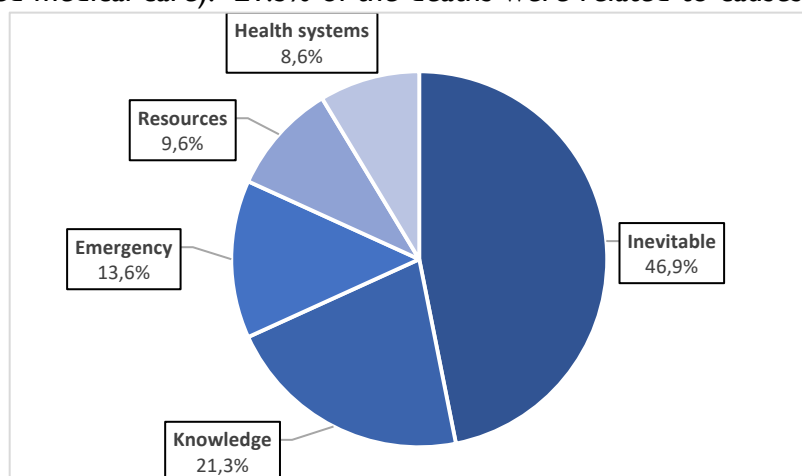


Figure 4 : Distribution of circumstances of death identify by InterVA5 (n=1315)

Conclusion

In recent years, there has been a growing momentum for strengthening civil registration systems. For instance, timely, high-quality and disaggregated data on vital events has been recognized as a key component of efforts to monitor progress towards Sustainable Development Goals. There are many challenges in increasing completeness of death registration in low-income countries, such as revising procedural rules and regulations, providing all registration centers with qualified staff and infrastructure, and developing incentives to encourage registration. In Senegal, completeness remains low at the national level, but some major cities have attained high level of completeness. These cities could be used as stepping stones for developing death registration at the national level.

In this study, we demonstrate that reliable cause-of-death mortality estimates can be obtained for death registration centers, based on verbal autopsies. Verbal autopsies integrated in vital registration centers provide a simple and replicable approach to identifying causes of death. The acceptance rate was high in the population of Dakar. Progressive scaling up in other areas of country can be an effective and sustainable way to address the incompleteness of cause of death data in the health information systems.

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