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ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Investigation of ill-defined causes of death: assessment of a program's performance in a State from the Northeastern region of Brazil

Avaliação da implantação do programa "Redução do percentual de óbitos por causas mal definidas" em um estado do Nordeste do Brasil

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ABSTRACT: ***Objective:*** The proportion of ill-defined causes of death (IDCD) was persistently high in some regions of Brazil in 2004. In 2005, the Brazilian government implemented a project in order to decrease this proportion, especially in higher priority states and municipalities. This study aimed to evaluate the performance of this project in Alagoas — a state from the Northeast region of Brazil. ***Method:*** We selected a probabilistic sample of 18 municipalities. For all IDCD identified in 2010, we collected the verbal autopsy (VA) questionnaires used for home investigation, and the Ministry of Health (MoH) form, which contains information about the final disease and cause of death taken from hospital records, autopsies, family health teams, and civil registry office records. The completion rate of the MoH form and VA was calculated using the number of deaths with specific causes assigned among investigated deaths. ***Results:*** A total of 681 IDCD were recorded in 2010 in the sample, of which 26% had a MoH and/or VA3 forms completed. Although the majority of cases were attended by health professionals during the terminal disease, the completion rate was 45% using the MoH form and 80% when VA was performed. ***Conclusions:*** Our findings provide evidence that the training of the epidemiological surveillance teams in the investigation and certification of causes of death could contribute to improve the quality of mortality data.

Keywords: Health evaluation. Information systems. Vital statistics. Mortality. Cause of death. Underregistration.

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RESUMO: ***Introdução:*** Em 2004, a proporção de óbitos por causas mal definidas (CMD) mantinha-se persistentemente elevada em algumas regiões do Brasil. Em 2005, o Ministério da Saúde implementou o programa Redução do percentual de óbitos por causas mal definidas para diminuir essa proporção, especialmente em estados e municípios considerados prioritários. Este estudo teve como objetivo avaliar o desempenho desse programa em Alagoas — estado da região Nordeste. ***Método:*** Foi selecionada amostra probabilística de 18 municípios e identificadas todas as CMD em 2010. Foram analisados os formulários de autópsia verbal (AV) utilizados para investigação domiciliar e o denominado Investigação do Óbito com Causa Mal Definida (IOCMD), que contém informações sobre a doença final e a causa de morte, obtidas de registros hospitalares, autópsias, equipes de saúde da família e cartórios. Analisou-se também a completude de preenchimento dos formulários e a proporção de óbitos por CMD com causas básicas reclassificadas após investigação. ***Resultados:*** Foram identificados 681 óbitos por CMD, dos quais 26% tinham sido investigados com uso do IOCMD e/ou AV3. Embora a maioria dos casos tenha sido atendida por profissionais de saúde durante a doença terminal, a proporção de reclassificação de CMD para causa definida foi de 45% com utilização do formulário IOCMD e de 80% quando a AV3 foi realizada. ***Conclusões:*** Nossos resultados fornecem evidências de que o treinamento da equipe de vigilância epidemiológica na investigação e certificação de causas de morte poderia contribuir para a melhoria da qualidade dos dados de mortalidade.

Palavras-chave: Avaliação em saúde. Sistemas de informação. Estatísticas vitais. Mortalidade. Causas de morte. Sub-registro.

INTRODUCTION

For consolidating the Brazilian Unified Health System an essential aspect refers to the development and management of health information systems (HIS). From this perspective, it is imperative to know the process of producing health information concerning its availability, quality, and timeliness. HIS should also provide inputs for the qualification of the work process management, and also for the reorganization of practices in health systems[1]. Therefore, information systems should collect and process updated and reliable data related to health conditions, in order to characterize the existing situation. Thus, stakeholders at different governmental levels can access the necessary information for decision making, taking heath service interventions closer to the real needs of the population.

In Brazil, due to the importance of registering vital events, the Ministry of Health (MoH) created the Mortality Information System (MIS) in 1975, responsible for routine data collection on deaths and their causes, using the standard international form of the Death Certificate (DC)[2,3]. Studies on mortality in general highlight the potentiality of more intensive use of information available in the MIS, but there are still challenges concerning data quality. Even when considering that the MIS is a well consolidated universal system, the coverage and quality of information on causes of death are not

equal among Brazilian regions and population groups stratified by socioeconomic status, with underregistration and a high proportion of ill-defined causes of deaths (IDCD) in some areas[4-6].

In order to tackle this situation, the active search for under registered deaths and the investigation of IDCD is an essential health service' strategy to qualify the information. The Ministry of Health Act n. 3,252, art. 44 established that the non entrance of data into the MIS in accordance with the expected targets and within the defined deadlines would lead to the suspension of federal funding. This proposition is part of a specific project for the improvement of vital registration (VR) [8,9]. This project, which was focused was focused on reducing the percentage of IDCD, was developed by the MoH surveillance team in particular in the North and Northeast regions of Brazil, and achieved promising results within a few years[10].

According to the MoH Manual for the Investigation of Ill-Defined Causes of Death, the MoH and the verbal autopsy (VA) standardized forms should be used in the investigation, and their analysis enable the identification of the sequence of events leading to death, therefore defining the underlying cause of death[11].The MoH form was proposed in 2005 for data collection in health institutions. For home interviews, the Ministry of Health launched a pilot project in 2007 to introduce standardized VA forms. Among the states that participated in the pilot project, there were nine in the Northeast region and some from other regions (three states in the North region and two in the Southeast region). From 2009 on, VA forms were implemented as part of routine death investigation activities in Brazil, particularly in the North and Northeast regions.

It is common knowledge that the quality of data is related both to adequate data collection and to quality control at all stages of the process[12]. Therefore, it is important to assess if the implementation of the investigation of IDCD is adequate, in order to contribute to data quality improvements in the MIS and to make the necessary adjustments in data collection and flows in the information system. So, this study aimed at assessing the process of IDCD investigation in one state of the Northeast region, Alagoas, and the use of investigation forms to define the causes of death. It is a pilot study for a proposed wider evaluation in all Brazilian states where the project has been developed.

METHODS

An evaluation study was performed in Alagoas in order to verify if the activities related to the investigation of IDCD in the municipalities had reached the proposed objectives. The inference of adequacy in evaluation studies depends on the comparison of the program' s performance or impact indicators and pre-established criteria[13].

The following indicators of adequacy concerning the performance of the IDCD investigation were selected: 1) proportion of investigated deaths among IDCD initially recorded in the MIS; 2) type of form used in the investigations; 3) professionals participating

in the investigations; 4) completion of selected variables in the forms; 5) forms' location of the underlying cause-of-death after investigation. The effectiveness of the performed investigations, measured by the reclassified CoD proportion, was considered as an adequacy indicator of the intervention result.

The activities assessed in this study are based on the MoH Manual for the Investigation of Ill-Defined Causes of Death. According to the Manual, the MoH form should be the first one to be used, and its completion is a synthesis of all data sources used to clarify the IDCD. So, this form enables to collect information in outpatient health services, such as the basic health units of the Family Health Program (FHP), as well as in specialized outpatient clinics, hospital institutions, the Death Investigation Service (SVO is the Portuguese acronym) and forensic institutes. Besides the aforementioned data, it is also possible to collect data by linking the MIS with other information systems, such as the Hospital Information System and also registering whether VA was performed. The investigation should be concluded after collecting all health service related data, and after inserting in the MIS the new cause of death in the case that the IDCD was reclassified into a defined one. The Manual does not specify the type of professional responsible for this procedure.

The VA form should be used in home interviews in the case that the MoH form did not allow the identification of the cause of death. This questionnaire aims to obtain information on signs, and symptoms presented by the deceased prior to death, and observed by caregivers or relatives. The questions are sorted as an anamnesis, and favor the clinical reasoning and the cause of death definition. There are four types of VA forms: VA1 for children less than one year old; VA2 from one year old to 9 years old; VA3 for for ten year olds or over; and VA3.1 for women of reproductive age. The underlying cause of death should be assigned by a physician, preferably a general practitioner, who concludes the sequence of causes leading to death and fills out the part of cause of death conclusion on the VA form, here in presented in the same way as the DC form.

The field research was carried out in a probabilistic sample of municipalities of the State of Alagoas, collecting data and interviewing key-informants about the process of investigating these deaths. The open questions of the interviews approached specific aspects of the functioning of the MIS in each municipality, assessed by qualitative analysis methodology, which will be the subject of further publication.

In 2010, the resident population of Alagoas was geographically dispersed into 102 municipalities as follows: 28 municipalities with fewer than 10,000 inhabitants; 34 between 10,000 and 19,999 inhabitants; 31 between 20,000 and 49,999; 7 between 50,000 and 99,999; and 2 municipalities with 100,000 inhabitants or more. A uniform stratified sample was defined according to population size taking into account lower variability in health surveillance service management, and that the difficulties and deficiencies in the use of resources and instruments tend to be more frequent in smaller municipalities[14]. Four municipalities were randomly selected in each of the five strata, except for the last one which had only two municipalities. The total sample consisted of 18 municipalities.

Data collection was conducted in the last two weeks of October and in the first week of November, 2011, by qualified graduated interviewers. All municipalities in the sample were contacted in advance in order to provide the DC and other forms which had been used in the IDCD investigations. The identification of a key informant for the interviews was requested. Standardized data collection forms were used, and those forms had been previously tested in two small and large municipalities that were not part of the study sample.

For each death due to ill-defined causes, basic information was collected (number of DC, name of the deceased, date of birth, date of death and original underlying cause), and whether or not the case was investigated. The investigated death was defined as the one which had had an investigation form filled out. All forms used by the municipal team in the investigation were photocopied for posterior typing and analysis.

For the analysis of the completeness of variables in the investigation forms, the proportion of missing records in relation to the total number of cases to be registered was measured. Due to the high number of variables in the forms, especially in VA, the most important ones were selected and used as control variables (e.g., type of respondent), or for being important to define the underlying cause of death (e.g. signs and symptoms of the terminal disease), or also for its epidemiological importance (for example, use of health services):

1. Control variables a) DC completion related variables (for MoH-IDCD and VA forms); b) if there was an investigation conducted by teams of the FHP, hospital and other health services; c) if VA was necessary (for MoH-IDCD form only); d) type of respondent, and e) place of interview (for VA only);
2. Diseases and previous conditions (for VA only);
3. Health services and care/treatment used during terminal disease, such as assistance at the FHP, if the deceased was previously admitted to hospital, assistance from other health services, and also if there was information about the terminal disease;
4. Signs and symptoms of terminal disease (for VA only).

Besides the completion analysis, the frequency distribution of variables was also analyzed in order to better understand the process of investigation. Concerning the professionals who participated in the investigation of IDCD, the analysis identified which types of professionals were responsible for the conduction of interviews and analysis/conclusion of the investigation. This information is important to assess the quality of interviews, and if a physician was in charge for assigning the cause of death.

In order to identify if the investigation of IDCD was effective, that is, if the CoD was reclassified after the investigation, the form location of the final post-investigation CoD was identified, being it in the MoH- form or VA, or in the copy of the DC. The completion rate of the MoH form and VA was calculated using the number of deaths with specific causes assigned among investigated deaths. The identification of the reclassified CoD was made

when the cause was written in different handwriting and/or underlined, and located in the DC copy or investigation forms.

Besides data collection in the field research, an analysis of the final MoH database was carried out concerning the 18 municipalities sampled. The objective was to verify the concordance between data available on the internet and fieldwork findings. Data linkage was performed on deaths available in databases from the Ministry of Health and from the fieldwork, using key-variables, such as number of DC, name, date of birth, date of death, age at death and name of the mother.

Data were analyzed in the Excel software, version 2007, and Stata 9.0 (Stata Corp. College Station, TX, United States). The project was approved by the Research Ethics Committee of the *Universidade Federal de Minas Gerais*, according to report ETIC n. 71302. Authors declare that they have no competing interests.

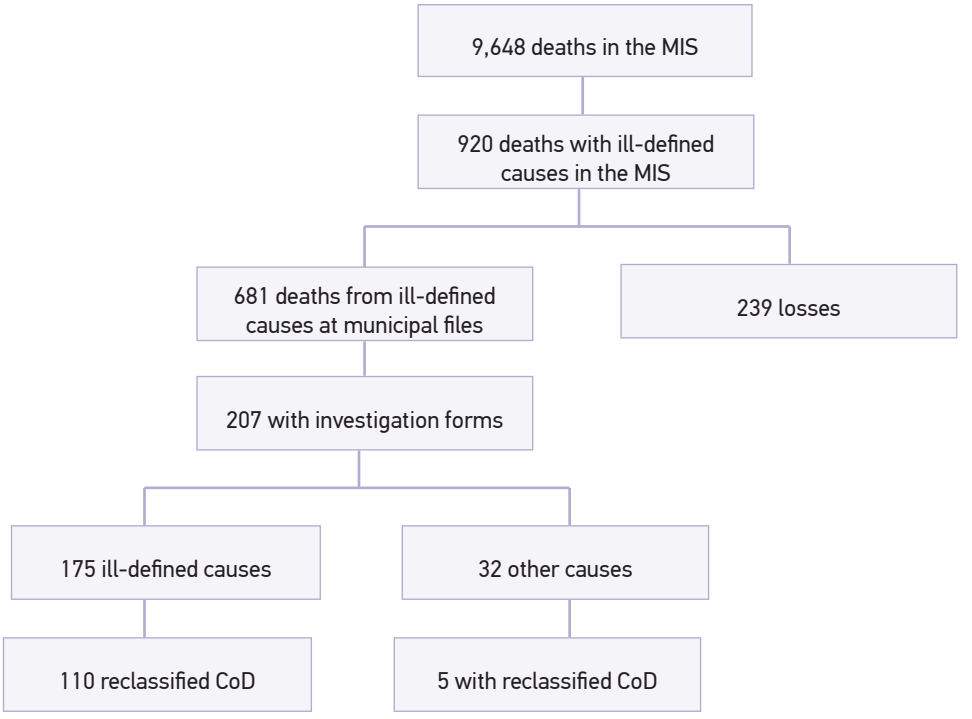
RESULTS

According to the MoH data, there were 9,648 registered deaths in the MIS in 2010, out of which 9.5% (n = 920) were due to an ill-defined cause (Figure 1). The distribution of causes in the study sample and in the State as a whole was similar (data not presented), which indicates that the sample had good representativeness.

We found 681 deaths due to IDCD in the municipal files i.e., 74% of the number of IDCD in the MIS database. Among those, 207 had investigation forms, out of which 175 were IDCD, i.e., 26% of the 681 localized ill-defined causes. Another 32 deaths from other causes were also investigated, but only five of them were reclassified (Figure 1). It is worth mentioning that, among these 32 cases, only 2 were women of reproductive ages, and the other two cases were infant deaths.

The investigation of IDCD was not conducted in eight municipalities. In 3 of them, there were no deaths registered in 2010 due to ill-defined causes. According to reports from interviews from key informants, in seven municipalities only resident deaths were investigated. In three municipalities, nonresident deaths were also investigated, and two of which reported the findings of the investigation to the municipality in which the deceased resided. Even though DCs were stored according to date of death, in some municipalities a relative disorganization of DC files was observed by the interviewers.

The investigations according to type of form, professionals in charge of and reclassification of the cause of death are shown in Table 1. Deaths due to IDCD were investigated by using only the MoH form in 85 cases, and only the VA3 form in 25 cases; 65 investigations used both forms. Therefore, 150 IDCD forms were identified, as well as 90 VA3 forms. Even though the investigations were signed in 75% of the MoH forms (n = 112), in less than half of them the investigation conclusion had mentioned one or more causes.



MIS: Mortality Information System; MoH: Ministry of Health; CoD: cause of death.

Figure 1. Death investigation flow chart. Sample of municipalities, State of Alagoas, 2010.

The professionals responsible for revision and finalization of the MoH form investigation were mainly nurses (46%), who were also the main professionals in charge of conducting VA interviews (53%). In more than half of the VA3 forms, the case conclusion had been filled out with one or more causes, and one physician was identified as being in charge of 30% of the cases (n = 27). According to reports of the interviews with key informants, in 12 municipalities the CoD was certified by a pysician, and in 4 municipalities this task was assigned to a multiprofessional technical group with physician participation.

The reclassification of CoD was observed in 62.9% (n = 110) of the total number of investigated deaths. When only the MoH form was used in the investigation (n = 85), 44.7% (n = 38) of cases were reclassified. When the VA3 form was used together with the MoH form (n = 65), 80.0% were reclassified. When only the VA3 form was used (n = 25), it was also possible to observe a higher proportion of definition of CoD (80.0%), according to municipal files (data not presented).

In Table 2, information related to CoD was filled out in all 150 MoH forms, and more than 90% of them were properly filled out. Approximately 80% of deaths had been previously attended in the FHP; however, the most recent date available, 2010, was only reported in

Table 1. Use of the Brazilian Ministry of Health form and Verbal Autopsy form in the investigation of deaths due to ill-defined causes. Sample of municipalities, Alagoas, 2010.

Variables	n	%
Forms used in the investigation (n = 175)		
Only MoH	85	48.6
Only VA3	25	14.3
MoH + VA3	65	37.1
Case conclusion using the MoH form (n = 150)		
Yes, one cause reported in the DC	23	15.3
Yes, more than one cause reported in the DC	38	25.3
Missing	89	59.4
Conclusion of of the MoH form-Professional in charge (n = 150)		
Nurse	69	46.0
Physician	14	9.3
Other professional	18	12.0
Surveillance coordinator	7	4.7
Blank/Ignored Missing	42	28.0
Conclusion of MoH form with signature (n = 150)		
Yes	112	74.7
Missing	38	25.4
Case Conclusion using the VA3 form (n = 90)		
Yes, one cause reported in the DC	7	7.8
Yes, more than one cause reported in the DC	40	44.4
Missing	43	47.8
Professional in charge of the interview (n = 90)		
Physician	5	5.6
Nurse	48	53.3
Nurse and CHA	7	7.8
CHA/other	2	2.2
Missing	28	31.1
Professional in charge of the analysis of VA3 (n = 90)		
Physician	27	30.0
Nurse	1	1.1
Technical group	3	3.3
Missing	59	65.6
Reclassification of the CoD (n = 175)		
Yes	110	62.9
No	65	37.1
Form location of the reclassified CoD (n = 110)		
DC – non-specific field	8	7.3
DC + MoH/VA3- non-specific field	19	17.3
VA3 – non-specific field	36	32.7
MoH – non-specific field	46	41.8
Missing	1	0.9
Reclassified CoD identification (n = 110)		
Different handwriting	14	12.7
Different and underlined handwriting	70	63.7
Other	26	23.6

MoH: Ministry of Health form for the investigation of ill-defined cause of death; VA3: verbal autopsy, form 3; DC: death certificate; CoD: cause of death; CHA: Community Health Agent.

50% of the cases. The reports on previous hospitalization was less frequent– 27% of the cases (n = 40). There was practically no investigation in other institutions apart from the FHP and hospitals.

Home investigations were carried out in 90 cases, and almost all of them were over 20 years old (n = 89), 51.1% being female (n = 46). Table 3 presents the variables selected in the VA3 form, which was the only type used in data collection in the municipalities. Respondents were typically close relatives, such as children and spouses (49% of the interviewees),

Table 2. Selected variables from the Brazilian Ministry of Health form used in the investigation of ill-defined causes of death. Sample of municipalities, State of Alagoas, 2010.

Variables	n	%
Completion of death certificate variables		
Yes, fully filled out	136	90.7
Yes, not completely filled out	14	9.3
Report on investigation in FHP		
Yes, fully filled out	77	51.3
Yes, not completely filled out	41	27.3
No	27	18.0
Missing	5	3.3
Last appointment at the FHP#		
2010	61	49.6
2009	11	8.9
2008 and before	10	8.1
Missing	41	33.4
Report on investigation on hospitalization		
Yes, fully filled out	22	14.7
Yes, not completely filled out	18	12.0
Missing	110	73.3
Last hospitalization		
2010	27	18.0
2009	1	0.7
2008	1	0.7
Missing	121	80.7
Report on investigation in other health service facilities		
Yes, fully filled out	3	2.0
No	1	0.7
Missing	146	97.3
Report on verbal autopsy investigation		
VA1	3	2.0
VA3	22	14.7
Missing	125	83.3

#Cases that were not attended by the Family Health Program team were excluded (n = 27).
FHP: Family Health Program; VA1: verbal autopsy, form 1; VA3: verbal autopsy, form 3.

but 27% of them were classified as "others", with no specification regarding the relationship with the deceased. Most of VA3 forms had variables concerning the place of interview and CoD variables. Concerning the report of the deceased's terminal disease, the information obtained from 96% of the interviewees was transcribed in the open question. However, the report on the continuous use of medication was not available in 46% of the cases. More than 80% of deaths had had a previous condition, and, for more than half of them, the terminal disease lasted for months or years. The proportion of smokers was higher (43.3%) than the case of alcohol consumption (24.4%) and, in 10% of the cases (n = 9), there were reports of accident or injury, or prior aggression.

Also according to information collected in household interviews, 43% of the deceased had been admitted to hospitals, and 42% had been treated in a different health institution. However, the date of admission / or treatment was not available in most cases. After the linkage of variables, it was observed that only 17% of the deceased (n = 15) had not received any health treatment during the terminal disease (data not presented), principally because they did not want/accept treatment (n = 12 cases). About one third of family members reported having received information relative to the deceased's disease, and also on treatment received, from health professionals, or from the hospital, or other services. Related documentation was described in about 30% of the VA.

DISCUSSION

In this study, it can be observed that about one quarter of the IDCD in Alagoas, in 2010, was investigated in accordance with pre-established guidelines (MoH and/or VA forms). It may be observed that only VA3 forms were used for data collection in home intervieews, which can be justified, because practically all of the cases involved people aged 20 years old or over.

IDCD investigation did not occur in 8 of the 18 municipalities from the study sample generally the ones with difficulties in maintaining an adequate team to investigate these deaths, according to reports from key informants. Even though the IDCD investigation has not been completely implemented (chapter XVIII of ICD-10), there were investigations of other causes, usually vague codes from other chapters, which were in general ineffective. Apparently, the inclusion of these investigations is not standardized, nor properly incorporated and/or clarified in the process to produce information to the MIS.

The non-location in the municipal files of about one quarter of deaths due to IDCD from the MoH database should be noted, even though most of the deceased had lived and died in the same municipality. This may have occurred due to the relative disorganization of DC files in some municipalities.

A very positive aspect is also worthy of attention, since the investigations defined the cause of death in about two thirds of cases. However, only 45% of deaths had defined causes after the use of the MoH form, even though most cases reported care from health services

Table 3. Selected variables from verbal autopsy forms used in the investigation of ill-defined causes of death. Sample of municipalities, State of Alagoas, 2010.

Variables	n	%
Type of respondent		
Children	32	35.6
Spouse	12	13.3
Parents	9	10.0
Siblings	8	8.9
Other	24	26.7
Missing	5	5.6
Variables of the place of interview – filled out		
Yes	82	91.1
Missing	8	8.9
Death certificate variables – filled out		
Yes	59	65.6
No	13	14.4
Missing	18	20.0
Report on previous disease (open question)		
Yes	86	95.6
Missing	4	4.4
Report on continuous medication use (open question)		
Yes	48	53.3
No	1	1.1
Missing	41	45.6
Previous disease history		
Yes, one disease	29	32.2
Yes, two or more diseases	46	51.1
Missing	15	16.7
Duration of illness		
Years	31	34.4
Months	20	22.2
Days	17	18.9
Missing	22	24.4
Previous accident/injury/aggression		
Yes	9	10.0
No	74	82.2
Missing	7	7.8
Alcohol consumption		
Yes	22	24.4
No	61	67.8
Missing	7	7.8
Smoking		
Yes	39	43.3
No	43	47.8
Missing	8	8.9

Table 3. Continuation.

Variables	n	%
Hospitalization during the disease		
Yes, fully filled out	21	23.3
Yes, not completely filled out	18	20.0
No	36	40.0
Missing	15	16.7
Last hospitalization		
2010	15	16.7
2009 or before	3	3.3
Missing	36	40.0
Not hospitalized	36	40.0
Received information about the disease on hospitalization from a health professional		
Yes	27	30.0
No	6	6.7
Missing	21	23.3
Not hospitalized	36	40.0
Report on information received on hospitalization (open question)		
Yes	28	31.1
Missing	26	28.9
Not hospitalized	36	40.0
Report on treatment (open question)		
Yes	30	33.3
Missing	24	26.7
Does not apply	36	40.0
Assistance in another health institution		
Yes, fully filled out	23	25.6
Yes, not completely filled out	15	16.7
No	28	31.1
Missing	24	26.7
Report on information received on other health facilities (open question)		
Yes	28	31.1
Missing	34	37.8
Not assisted	28	31.1
Non treatment in health facilities, why?		
Not aware of need for treatment	2	2.2
Did not get there on time	8	8.9
Found dead	6	6.7
Did not want it/ accept it	12	13.3
Arrival but no assistance	3	3.3
Other/does not apply	59	65.6
Report of important tests or medical examinations (open question)		
Yes, with report	28	31.1
Missing	62	68.9

during terminal disease. Studies carried out in Brazil indicate that medical records could be an important strategy to clarify the sequence of causes and the definition of the underlying cause of death[15], but sometimes the result of this strategy would have a limited effect in decreasing the proportion of deaths from ill-defined causes[16].

In this study, the use of the VA3 form in home investigations represented an important gain for the definition of the underlying cause of death, since 80% were reclassified (using VA alone or together with the MoH form). Studies from other countries in which VA was used for the definition of cause of death had lower propotions, probably because the definition of CoD was the responsibility of two certifying physicians and, in case of disagreement, of a third one[17].

The proportion of CoD reclassification after investigation was much higher in the federal MIS database when compared to data from municipal field research. In the national base, 90% of deaths with ill-defined causes have been reclassified after the investigation, from a total of 135 investigated deaths notified to the Ministry of Health. Such a high proportion is probably due to the under registration of investigations or because the selection process of the new CoD was posterior to the filling out and analysis of investigation forms. This indicates the need for inserting a specific module concerning the underlying CoD and the final conclusion of the MoH and VA investigation forms to be filled out by a technical group from the death investigation team from the municipalities.

In this study, it can be observed that the physician participation was registered in less than 10% of the finalizations of the MoH form investigations, and only in about one third of the VA form investigations the presence of a physician in charge of certifying the CoD was specified. However, several cities reported that VA3 forms were analyzed by a physician or by a multiprofessional technical group with participation of a physician. The existence of a technical group of death investigation, comprised of graduated professionals from several technical fields is a recommendation by the Ministry of Health, and this group should include a certifying physician[11]. The presence of a general practitioner at local level is also important from the pedagogic aspect, because most patients who died from an ill-defined cause tried to or received some kind of care from health services during the terminal disease. Therefore, it is essential to create conditions for the specific training of FHP physicians in order to enable their adequate participation in the process of investigating ill-defined causes of death. This training can be based on validated material used in other countries[18].

It is important to point out that VA forms were adapted to the most prevalent causes in Brazil, but VA may not be sufficient in identifying all causes of death, since it presents differentials in the sensitivity and specificity for detecting specific causes of death[19]. Therefore, it is crucial to evaluate if the CoD was really defined as a "true" cause. However, this question can only be answered by a study designed to validate the causes of death defined after investigation, which was not the objective of this study.

The data completion on VA3 forms was relatively adequate, or "regular", for the majority of variables. In general, the completion rate is considered "good" when over 90% of the

variable data was completed, "regular" for proportions between 70% and 90%, and "not adequate" when lower than 70%[20]. Most of the respondents of VA forms did not specify their relationship with the deceased. Since there is no specific question in VA3 to know if the respondent had been accompanying the deceased' s terminal disease, it is possible that the number of people included as "Other" can explain part of the proportion of missing variables in the forms.

Concerning the signs and symptoms of the deceased's terminal disease recorded during interviews, some of them such as "any mass in the abdomen" and the second round of questions "suffer from any injury, accident or violence" and "suffer from any animal bite" had a very high proportion of missing data. This was similar for some specific female variables, even considering that approximately half of the interviews interviews concerned female deaths. These variables were often not recorded, probably because it was redundant information in relation to other questions and/or other investigation forms.

Although the main objective of the IDCD investigation was the definition of CoD, in fact there was no standardized location in the forms to register the underlying cause of death after investigation. Even though these forms have a specific location to register the causes of death in the case conclusion field, this part was usually not filled out, and the reclassified CoD after investigation was registered in several different ways. In some cases, we assumed that no record on CoD changes was made. As aforementioned, there was no summary form of the investigations, which could have included the use of more than one form. So, a module summarizing the investigations and including the underlying CoD after investigation should be inserted in the MIS, similarly to the procedures used for investigating infant and maternal deaths.

Problems related to the format of the MoH and VA3 forms for presenting the final result of the investigation were related to the location of registration, which is essential information, and also due to the lack of standardization regarding to which form (DC, MoH, VA3) should be used. In the MoH form, in which the conclusion of investigation was not filled out, it is not possible to know if this occurred because of the incompleteness of the form or because it was necessary to apply the VA to complete the investigation.

In summary, our study findings have highlighted the importance of using standardized forms in the investigation of IDCD, and how much those forms can clarify the causes of death. They also highlight the enormous effort made by the municipal departments and the State health department of Alagoas, in addressing the IDCD investigation. Besides, these findings indicate the existence of some problems and emphasize the importance of implementing investigation teams, standardizing flows, procedures and analysis, and also some changes in the forms to achieve more qualified investigation results. Remodeling protocols seems to be an important goal, and the insertion of a summary form for the IDCD investigation should be a necessary strategy. We should also remember that the training of local or regional physicians in certifying the CoD is extremely important to avoid discontinuity between the process of investigating and assigning causes of death,

facilitating a return to the municipal level and family health teams for revision of their work process and information registration.

Monitoring and assessing the process of producing information should be among the set of attributions of professionals in charge of health surveillance activities. This study is part of this proposal, and the participation and support from federal and state managers enabled us to clarify some issues to be tackled in the process. If there are quantitative and qualitative limitations in the information produced, common to all information systems, only the effective use of the produced information and the performance of periodical evaluation studies can identify existing flaws and propose solutions to ensure better quality information on causes of death.

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