Strategy for the selection and investigation of deaths of women of reproductive age

Estratégia para seleção e investigação de óbitos de mulheres em idade fértil

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The present study was part of the broader research project entitled "*Investigação dos óbitos por causas mal definidas e de mulheres em idade fértil na região metropolitana do Estado do Rio de Janeiro*" (Investigation of deaths from ill-defined causes and deaths of women of reproductive age in the metropolitan region of the state of Rio de Janeiro), funded by the *Universidade Federal do Rio de Janeiro* – UFRJ.
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Abstract

Introduction: Different approaches have been developed in order to deal with maternal mortality. In 2008 the Brazilian Ministry of Health made mandatory the investigation of all deaths of women of reproductive age. So far, completeness of investigation has not been thoroughly accomplished in the State of Rio de Janeiro (RJ) due to the constrained capacity of public health services to investigate the large number of eligible deaths. Our aim was to develop a strategy to improve the selection of deaths of women of reproductive age for investigation under maternal death surveillance. **Methods:** The study population comprised all deaths of women of reproductive age that occurred in the counties of Belford Roxo and Niterói, RJ, between May and September of 2008. Deaths were classified according to priority for investigation, based on data regarding its underlying cause and relation to either pregnancy, delivery or puerperium, as registered in deaths certificate's fields 43 and 44 (related to maternal deaths). **Results:** Data related to fields 43 and 44 was missing in around 47% of death certificates; following investigation it was recovered for approximately 74% of such deaths. Of the 132 deaths investigated, four occurred either during pregnancy, delivery or puerperium and were classified as priority for investigation, among which three were classified as maternal deaths. The strategy developed to improve the selection of deaths of women of reproductive age for investigation under maternal death surveillance was considered appropriate.

Keywords: Maternal mortality. Death certificate. Fertile period. Vital statistics. Epidemiologic surveillance.

Resumo

Introdução: Diversas estratégias vêm sendo desenvolvidas para o enfretamento da mortalidade materna. Em 2008, o Ministério da Saúde tornou obrigatória a investigação de todos os óbitos de mulheres em idade fértil, medida de difícil cumprimento no Estado do Rio de Janeiro devido ao grande volume de óbitos ocorridos e dificuldades operacionais dos serviços de saúde. O objetivo deste trabalho foi desenvolver uma estratégia de seleção dos óbitos de mulheres em idade fértil a serem investigados prioritariamente pelos serviços de saúde. **Método:** Foram selecionados para investigação todos os óbitos de mulheres em idade fértil ocorridos entre maio e setembro de 2008 nos municípios de Belford Roxo e Niterói e classificados segundo prioridade de investigação, considerando-se as informações da causa básica e os campos 43 e 44 da declaração de óbito. **Resultados:** Em Belford Roxo e Niterói respectivamente 46,7% e 47,1% das declarações de óbitos analisadas apresentaram incompletudes de preenchimento, e os percentuais de recuperação da informação dos campos 43 e 44 foram de 73,3% e 74,5% nestes municípios. Em 132 investigações realizadas foram identificados quatro óbitos ocorridos durante o ciclo gravídico-puerperal, todos classificados como prioritários para a investigação, e três deles foram recertificados como óbitos maternos. A metodologia de definição de prioridade de investigação desenvolvida mostrou-se adequada.

Palavras-chave: Mortalidade materna. Declaração de óbito. Período fértil. Estatísticas vitais. Vigilância epidemiológica.

Introduction

Brazil was among the 189 United Nations member states that agreed to achieve the eight Millennium Goals to improve the living conditions of populations. Among these goals is the reduction in maternal mortality by 75% between 1990 and 2015, which can be achieved by promoting the health of women of reproductive age[1].

Several strategies have been developed to decrease maternal mortality[2,3]. The development of actions and policies aimed at its reduction presupposes awareness of the problem through reliable data.[4]

Maternal causes were considered to be the worst causes of death reported among the deaths of women of reproductive age in the city of São Paulo in 1990[5]. The underreporting of maternal deaths after the investigation of deaths of women aged between ten and 49 years was 17.6% in Recife (2000)[6] and 25% in Belém (2004)[7]. The incorrect reporting of the cause of death by doctors, the incorrect completion of death certificates, the errors made by codifiers when selecting the underlying cause of death (underreporting) and the absence of death certificates (under-recording) are the main factors that contribute to the low quality of information about maternal mortality[8,9].

In 1995, Brazil began to follow the World Health Organization recommendation of including specific questions about current pregnancy or that occurring in the year prior to death (fields 43 and 44) in death certificates (DC), these fields must be completed in the case of deaths of women aged between ten and 49 years. Two years after this recommendation was adopted in Brazil, the percentage of ignored or blank information in these two fields was very high, above 87.0%[10]. In the following decade, there was an improvement in their completion, when the percentage of ignored or blank information was lower than 10%, totaling 7% in Belém (2004)[7] and 9.6% in Paraná (2005)[11].

The investigation of deaths of women of reproductive age, an important strategy to

qualify data on maternal mortality, became mandatory in Brazil in 2008[12].

Adjustment factors to correct maternal mortality ratios were calculated for a sample of deaths in Brazilian capitals using the *Sistema de Informações sobre Mortalidade* (SIM – Mortality Information System) database corrected by the Maternal Mortality Committees. These adjustment factors were subsequently compared with the adjustment factors obtained from the "*Estudo da Mortalidade de Mulheres em Idade Fértil*" (Study on the Mortality of Women of Reproductive Age)[13]. It could be concluded that the work of these committees was an important strategy to determine the quality of the information about maternal mortality of all Brazilian regions, as it could reduce the adjustment factor in this country from 1.27 to 1.19.

Despite the increase in the percentage of deaths of women of reproductive age, which are annually investigated in the state of Rio de Janeiro, from 48.7% in 2007 to 68.3% in 2009[14], it is not operationally feasible to perform all investigations and strategies should be developed to define priorities of investigation.

The present study aimed to develop a strategy to select the deaths of women of reproductive age that should be primarily investigated by health services.

Methods

A case-series study of deaths of women of reproductive age was conducted. This study was part of a broader research project entitled "*Investigação dos óbitos por causas mal definidas e de mulheres em idade fértil na região metropolitana do Estado do Rio de Janeiro*" (Investigation of deaths from ill-defined causes and of deaths of women of reproductive age in the metropolitan region of the state of Rio de Janeiro), developed by the Institute of Public Health Studies of the *Universidade Federal do Rio de Janeiro*, in partnership with the School of Public Health of the *Universidade de São Paulo*, the State of Rio de Janeiro Department of Health and Civil Defense, the City of Belford Roxo Department of Health, and the City of Niterói Health Foundation. The selection of cities was made based on the number of inhabitants (between 100,000 and 1,000,000), on a coefficient of general mortality higher than 5.0 per 1,000 inhabitants and on the proportional mortality from ill-defined causes (24.5% in Belford Roxo and 6.1% in Niterói, considered to be the worst and the best situations among the cities of the state of Rio de Janeiro, respectively) in 2004.

All deaths of women of reproductive age (ten to 49 years) that occurred between May 15th and September 30th 2008 in these cities were selected for investigation, emphasizing the completion of information about the pregnancy-puerperium status found in the DC. This information corresponds to fields 43 (death during pregnancy, delivery or abortion) and 44 (death during puerperium, which includes two categories of positive responses: death up to 42 days or between 43 days and one year after the end of pregnancy) of the DC.

Postgraduate students of public health and professionals of this area were selected and trained to perform the investigations. In the city of Niterói, where investigations had already been made by local health services, professionals of these services participated in the training courses. A pilot study was conducted to test the instrument and improve the field work activities and stages.

Investigations were performed blind to the information present in the original DC, except for data that identified the deceased women.

The RAMOS (*Reproductive Age Mortality Survey*) methodology[15] was used in the investigations. Hospital investigations based on medical records and/or home investigations (in-person or by telephone) were conducted, the latter when the deceased lived in one of the cities, preferably accompanied by a professional from the local health service. When necessary, the investigations continued in places other than the place of death, including different health services.

The "Models of Instruments to Report

Deaths of Women of Reproductive Age and of Confidential Investigation of Maternal Death" were used as instruments of investigation. The objective of "part A" of this investigation file is to report the death of women of reproductive age. When the information about the pregnancy-puerperium status at the moment of death was negative, the investigation was closed; when it was positive, the investigation continued to identify the cause of maternal death; and when it was ignored, the investigation continued if the underlying cause of death belonged to the list of presumable causes of maternal death, defined by maternal mortality committees[8].

In view of the objective of the research project of which this study is a part, deaths from ill-defined or unknown causes (chapter XVIII – ICD10) or residual causes (consequences or complications of underlying cause of death)[16] were investigated to retrieve the underlying cause. With the information collected from the investigations and without knowledge of data on the original DC, two doctors completed a new DC. When there was agreement at 3-digit level of the ICD-10, the new underlying cause was codified; if there was disagreement, the investigation file was evaluated by a doctor with recognized experience in reporting causes of death. The investigation of deaths from residual causes was only performed in the city of Niterói. The investigation file of deaths from ill-defined and residual causes developed by this research project was used.

The completion of fields 43 and 44 was analyzed according to incompleteness (blank and/or ignored fields) and inconsistencies (a positive response in one of the fields and a blank or ignored response in another, or two positive responses in both fields). Although the situation in which positive responses to both fields is possible, cases of women being in late puerperium and in a new pregnancy/delivery/abortion simultaneously were considered to be inconsistencies due to the low probability of this event occurring.

Researchers developed and tested a method that categorizes the deaths of women of reproductive age by combining the completion of fields 43 and 44 with the underlying cause of death, so that priority cases of death are identified and selected for investigation. This method orders deaths into categories, according to priorities for investigation (Figure 1).

Although deaths from maternal causes occurring more than 42 days after delivery are not considered to be maternal deaths[17], they were included in this classification as they belonged to a category that must be prioritized in investigations, in view of the higher probability of their being maternal in nature and having been erroneously recorded as non-maternal deaths from maternal causes (O96 and O97).

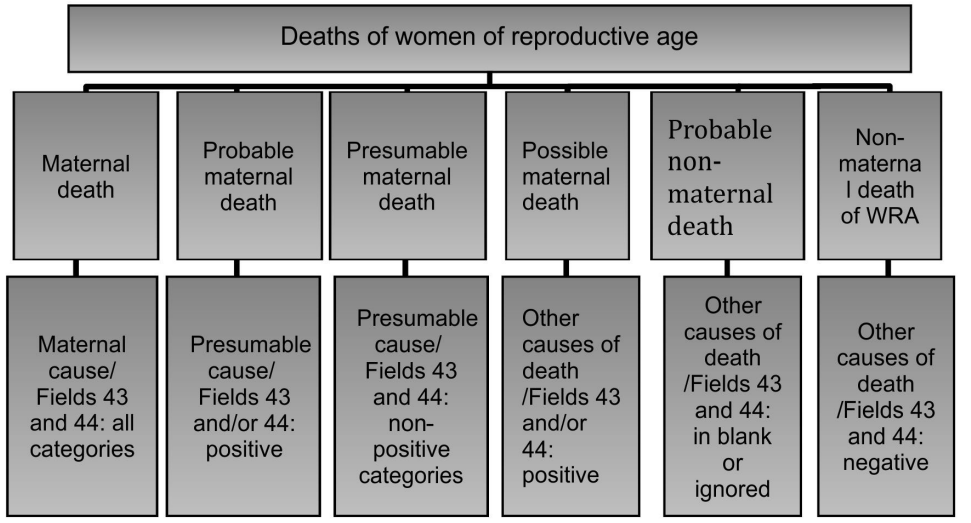
The deaths investigated were analyzed according to type of investigation (hospital, home, by telephone or in other health services) and the number of investigations required to retrieve the information.

Researchers conducted an analysis of the place of residence of women of reproductive age whose deaths occurred in cities included in this study, aiming to identify whether the place where deaths occurred was the same as where women lived. The present study was approved by the Research Ethics Committee of the Institute of Public Health Studies of the *Universidade Federal do Rio de Janeiro* (Official Opinion 117/2007). Authors declared there were no conflicts of interest.

Results

A total of 34 deaths of women of reproductive age were recorded and selected for investigation in the city of Belford Roxo and 114 in Niterói between May and September 2008, where 30 (88.2%) and 102 (89.5%) investigations were performed, respectively.

The non-conclusion of investigations (losses) was due to the families' refusal to participate in the research, change of residence, an address that could not be located, hospital refusals to allow access to medical records, and medical records that could not be found in health units. Important



*WRA = Women at reproductive age
** Maternal cause – maternal underlying cause of death (Chapter XV – ICD 10) or a maternal cause that is not included in chapter XV (obstetrical tetanus; puerperal osteomalacia and mental and behavioural disorders associated with puerperium not elsewhere classified). The obstetric situation is not considered (fields 43 and 44).
* ** Presumable causes: underlying cause of death from the list of presumable causes of maternal deaths or maternal underlying cause of death not included in chapter XV (necrosis of pituitary gland – postpartum; hydatidiform mole malignant, diseases caused by HIV).
**MIF = Mulheres em idade fértil*
***Causa materna: causa básica de morte materna (cap. XV - CID 10) ou causa materna fora do capítulo XV (tétano obstétrico - cód. A34, Cap. I; osteomalácia puerperal - cód. M83.0, Cap. XII; transtornos mentais e comportamentais associados ao puerpério - cód. F53, Cap. V; independentemente da situação obstétrica durante o ciclo grávido puerperal (campos 43 e 44).*
****Causa presumível: causa de morte materna presumível pelo Comitê de Mortalidade Materna ou causas que estão fora do capítulo XV mas consideradas causas maternas de morte pelo Comitês de Mortalidade Materna após comprovação da relação com o estado gravídico –puerperal (necrose pós-parto da hipófise - cód. E23.0, Cap. IV, mola hidatiforme maligna - cód. D39.2, Cap. II e doenças causadas pelo vírus da imunodeficiência humana - cód. B20 a B24, Cap. I).*

Figure 1 – Developed methodology to classify women of reproductive age's deaths and identify priorities for investigation.
***Figura 1** – Metodologia de classificação de óbitos de mulheres em idade fértil para identificação de prioridades de investigação.*

differences between the deaths investigated and the losses were not observed by age, level of education, ethnicity and underlying cause of death (ICD-10 chapter). The greatest differences were found with regard to the place of deaths. Among the deaths investigated in Belford Roxo, 20 (66.7%) were in hospitals, 4 (13.3%) were at home, 2 (6.7%) were in other health services, 3 (10.0%) were in other places, and 1 (3.3%) was in an ignored place; with regard to losses, 2 (50.0%) were at home and 2 (50.0%) were in hospitals. In Niterói, 97 (95.1%) of the deaths investigated occurred in hospitals, 3 (2.9%) at home, 1 (1.0%) in other health services and 1 (1.0%) on public ways; with regard to losses, 6 (50.0%) deaths occurred in hospitals, 4 (33.0%) at home, 1 (8.3%) on public ways and 1 (8.3%) in other health services.

Researchers did not find situations considered to be inconsistencies in this study in any of the cities studied. There was incomplete information (fields 43 and/or 44 in blank or ignored) in 14 (46.7%) and 48 (47.1%) death certificates, and 16 (53.3%) and 54 (52.9%) showed non-conflicting accurate completion in Belford Roxo and Niterói, respectively.

Table 1 shows the redistribution of deaths after the investigations were performed, according to information from fields 43 and 44 per city of occurrence. Among the deaths whose fields 43 and 44 were in blank or

completed as ignored, information could be retrieved in 10 (76.9%) of 13 cases in Belford Roxo and in 38 (79.1%) of 48 cases in Niterói. When all deaths with a complete investigation were taken into consideration, the percentages of information retrieval were 73.3% and 74.5% in Belford Roxo and Niterói, respectively. When losses were included, these percentages decreased to 64.7% and 66.7% in Belford Roxo and Niterói, respectively. Considering the information in fields 43 and 44 obtained from the investigations as the gold standard, the accuracy of completion of both fields (excluding blank fields) was 61.9% in Belford Roxo and 63.2% in Niterói.

There were 13 deaths from presumable maternal causes in both Belford Roxo and Niterói, which represent 43.3% and 12.7% of deaths of women of reproductive age, respectively. These causes were distributed among septicemia (A41.9), essential hypertension (I10), acute myocardial infarction (I21.9), respiratory arrest (R09.2) and ill-defined and unspecified causes of mortality (R99) in both cities. In Niterói, the following also occurred: unspecified pneumonia (J18.9), acute and subacute hepatic failure (K72.0) and acute renal failure (N17.9). With regard to deaths from ill-defined causes (chapter XVIII), there were three other deaths in addition to nine from presumable causes belonging to this ICD-10 chapter (R99). No association was found between the occurrence of deaths from presumable causes and the age of women.

During the period of study, four deaths of women of reproductive age were identified throughout the pregnancy-puerperium cycle, two during pregnancy and the other two during late puerperium, all of which occurred in Niterói. This information was not present in the original DC in any of these cases (fields 43 and 44).

Figure 1 shows the completion of fields 43 and 44, the underlying causes recorded in the DC before and after the investigation, and final classification of these deaths. Two deaths were categorized after the investigations as maternal deaths, one as death from maternal cause and the other as pregnancy--related death.

In Belford Roxo, 38 investigations were necessary to retrieve information about the pregnancy-puerperium status of women of the moment of death from 30 cases of death. The first investigation was performed in hospitals in 21 (70.0%) cases, at home in four (13.3%) cases, through telephone interviews in two (6.7%) cases, and in other health services in three (10.0%) cases.

A second investigation was performed in eight cases, of which six were hospital investigations that unfolded into three home investigations and three telephone interview investigations; one home investigation unfolded into a hospital investigation; and one investigation in other health services unfolded into a telephone interview investigation.

In Niterói, a total of 106 investigations

Table 1 – Analysis of fields 43 and 44 from womens at reproductive age's deaths certificates after investigations. B
Roxo and Niteroi, may-september, 2008.
Tabela 1 *– Análise da recuperação da informação dos campos 43 e 44 da declaração de óbito após investigações de ó*
mulheres em idade fértil. Belford Roxo e Niterói, RJ, maio a setembro de 2008.

Original information	Belford Roxo				Niterói			
	yes	no	Ignored	Total	yes	no	Ignored	T
Yes	-	-	-	-	-	1	-	
No	-	12	5	17	2	35	16	
In blank	-	7	2	9	1	35	9	
Ignored	-	3	1	4	1	1	1	
Total	-	22	8	30	4	72	26	

Frame 1– Deaths of women of reproductive age occurred during pregnancy, delivery or puerperium before and after investigations, original and final underline causes of death and death classification. Niteroi, may-september, 2008.
Quadro 1 *– Óbitos de mulheres em idade fértil ocorridos durante o ciclo gravídico-puerperal segundo informação dos campos 43 e 44 antes e após investigação, causa básica original e final e classificação das mortes. Niterói, maio a setembro de 2008.*

Number of death	Field 43		Field 44		Underlying cause of death (ICD10Causa Básica (CID-10)*		Classification of death
	Original	After investigation	Original	After investigation	Original	After investigation**	
1	In blank	Yes	In blank	No	Assault*** (X95.5)	Illegible	Pregnancy-related
2	No	No	No	Late puerperium	HIV (B22.7)****	HIV (B22.7)****	Maternal cause
3	Ignored	Yes	Ignored	No	Ill-defined c ause (R99)*****	Obstetric death of unspecified cause (O95)	Maternal death
4	No	No	No	Late puerperium	Ill-defined cause (R99)*****	Late maternal death (O96)	Maternal death

*ICD-10R Classification / **CID-10R Classificação.*
**Ill-defined and residual causes / ***Causas Mal definidas e residuais.*
***Assault by other and unspecified firearm discharge / ****Agressão por meio de disparo de arma de fogo.*
**** HIV disease resulting in multiple diseases / *****Doença provocada pelo HIV, resultando em doenças múltiplas classificadas em outra parte"*.
*****Other ill-defined and unspecified causes of death (R99) / ******Outras causas mal definidas e não especificadas de mortalidade (R99).*

were required to retrieve information about the pregnancy-puerperium status of women of the moment of death from 102 cases of death. The first investigation was performed in hospitals in 96 (94.1%) cases, at home in two (2.0%) cases, through telephone interviews in three (2.9%) cases and in other health services in one (1.0%) case. Four cases from the first hospital investigation required a second investigation, of which two were home investigations and the other two were telephone interview investigations.

A total of 106 investigations were necessary to identify four maternal deaths that had not been reported, i.e. 26 investigations to identify one maternal death. Using the methodology recommended and deciding not to investigate the deaths categorized as non-maternal, 46 investigations would have been required, approximately 11 investigations to identify one maternal death.

Figure 2 shows the distribution of deaths investigated according to the classification of priority investigations in relation to the final result of these investigations.

The "non-maternal deaths of women of reproductive age" category was not considered as a priority investigation and the deaths categorized in this group must be the last ones to be investigated in a priority scale.

Before the investigation, no deaths of women of reproductive age were reported as maternal deaths in both cities. In Belford Roxo, there was a certain balance between the "maternal death" groups (46.7%: maternal, probable maternal causes, presumable maternal causes and possible maternal causes) and the "non-maternal death" groups (53.3%: probable non-maternal and non-maternal causes) and these last groups included two more deaths than the first groups. In Niterói, 73.5% of deaths of women of reproductive age were categorized in the "non-maternal death" groups, 56 (75.7%) of which were confirmed as non-maternal. The following were identified after the investigations: one death from obstetric cause occurring more than 42 days but less than one year after delivery (O96), one obstetric death of unspecified cause (O95), one death from maternal cause (B22.7) and one death associated with pregnancy

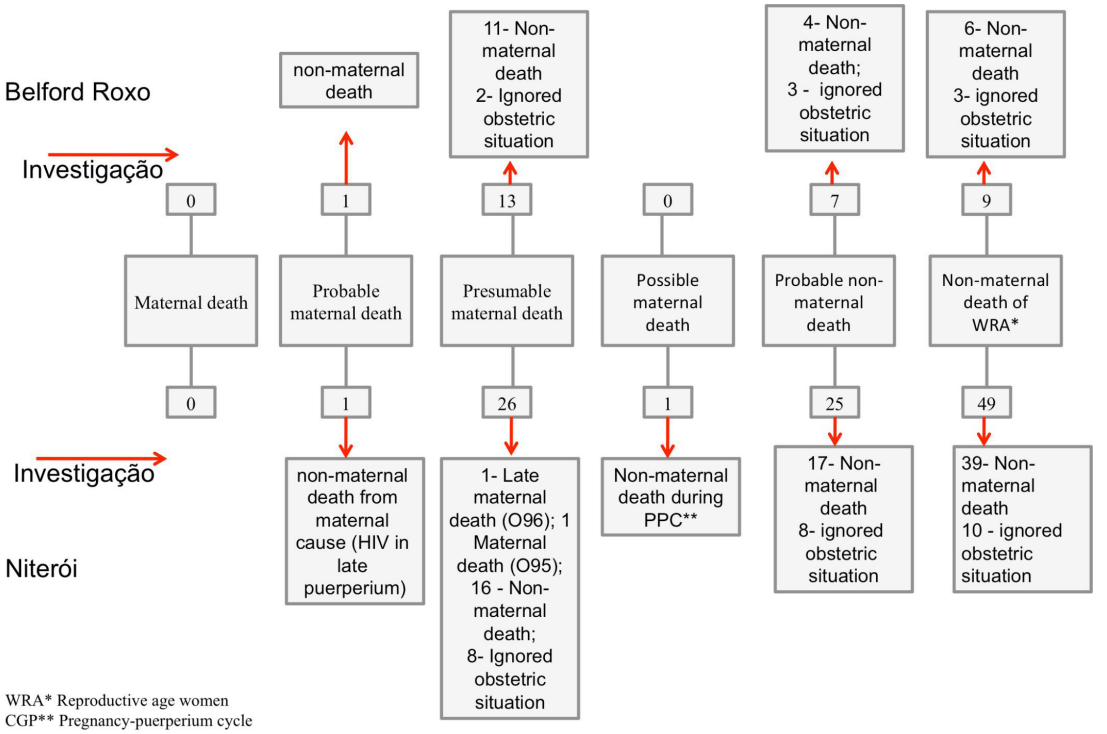


Figure 2 – Distribution of reproductive age women's death, before and after investigations in Belford Roxo and Niteroi, according to the classification of priorites to investigate.

Figura 2 *- Distribuição dos óbitos de mulheres em idade fértil, antes e após as investigações em Belford Roxo e Niterói, segundo classificação de prioridades para a investigação (maio - setembro, 2008).*

(X95.5), all previously categorized into the priority categories for investigation.

Among the losses, three (75.0%) were categorized as probable non-maternal cause in Belford Roxo and one (25.0%) as presumable maternal cause. In Niterói, six (50.0%) losses were categorized as presumable maternal cause, four (33.3%) as probable non-maternal cause and two (16.7%) as non-maternal cause.

Of all deaths occurring and investigated in Niterói, only 45 (44.1%) were residents of this city; in contrast, in Belford Roxo, 29 (96.7%) were residents.

Discussion

The incorrect completion of fields 43 and 44 and the recording of presumable maternal death and ill-defined causes as underlying causes of death are considered as markers of quality of completion of death certificates of women of reproductive age. The results of the present study show the need to improve the correct completion of DC in Niterói and Belford Roxo.

The proportions of incompleteness of fields 43 and 44 of original DC (in blank or ignored) were 36.7% in Belford Roxo and 47.1% in Niterói, between May and September 2008. Although far from reaching the expected values, these cities showed a better situation than that of Brazil in the previous decade, when these values were 87.4% and 90.4% of "ignored" or blank responses for fields 43 and 44, respectively[10]. However, underreporting of maternal deaths is likely to be high yet, as three deaths from causes associated with the pregnancy-puerperium cycle that had not been reported were identified in Niterói during the short period of four months and two weeks of monitoring of women of reproductive age

The problem with inconsistencies in the completion of fields 43 and 44 was not observed in the period studied. Although

not frequent, this possibility ended with the use of the new DC model in which there is only one field asking whether the death occurred during pregnancy, delivery, abortion or puerperium.

Deaths from presumable maternal causes represent a marker of low quality of reporting of the underlying cause of maternal death, because terminal causes or the injury that came at the end of a chain of events that led to death are reported as underlying cause, rather than the true reason for this death, thus avoiding the identification of the maternal death[8]. This was evidenced by the higher proportions of possible deaths found in Belford Roxo, where deaths from ill-defined causes were more frequent, nearly five times (23.3%) those found in Niterói (4.9%) in the same period. In contrast, all maternal deaths identified in the study occurred in Niterói, probably due to the higher number of deaths in this city.

According to Sousa et al.[18], several factors may influence the correct completion of death certificates, such as the medical care provided at the moment of death, the type of service used by women of the moment of death (emergency unit, ICU, obstetrics service, medical clinic) and when the professional who provided care was not the same as the one who completed the death certificate.

Another relevant question is the quality of the investigations performed in the health services. One late maternal death found by the research project investigations, whose underlying cause was "undetermined", which is a presumable cause of maternal death, could not have been identified otherwise. This is because the investigation performed by the local health service pointed to an urinary tract infection as the underlying cause of death and did not mention the pregnancy at the moment of death. In this case, the woman did not live in the city where she died, which would make it difficult for the local health service to continue the investigation. It was possible to continue it only because she lived in a city that participated in this study. In cities to which deaths are transferred, such as Niterói, the need to perform home investigations to complete the information is an aggravating factor, reducing the quality of the investigations and information about mortality.

Professionals responsible for the investigations need to be trained to identify data in the medical records, to be adequately instructed on the importance of investigating information about the obstetric status of women, and to become aware of the relevance of this work.

There were some difficulties related to the access to medical records that negatively interfered with the execution of the investigation process. Refusing authorization for medical records to be consulted is something that should not occur, because the investigation of deaths of women of reproductive age is supported by law and it is performed in some local health services. Refusing access to data required for the investigation is a limiting factor to the improvement of these services and qualification of the Mortality Information System. Another example was the lack of personnel to separate the medical records or even the loss of such records in the hospitals. Other difficulties found in the hospital investigations were illegible writing and lack of information in the medical records, especially about women's pregnancy-puerperium status.

With regard to home investigations, the greatest difficulty of researchers was to locate the homes based on the addresses found in the DC. In addition, although the majority of health services cooperated with and accompanied the team during home visits, especially in high-risk residential areas, the obstacles to access to the homes in these areas may also be a limiting factor for the information retrieval strategy. These circumstances increase the length of time between the occurrence of death and the conclusion of the investigation, which could explain the higher number of deaths occurring at home among the losses. This situation certainly causes a delay in the publication of vital statistics in health services. However, it should be emphasized that information about the pregnancy-puerperium status of women

of the moment of death was retrieved in all cases where there was the need for and the possibility of conducting home interviews.

In operational terms, especially with regard to health services, it is difficult to perform the investigation of all deaths of women of reproductive age as recommended by the Brazilian Ministry of Health. The investigation of reported maternal deaths and of those whose underlying cause is a presumable cause is a strategy used to reduce the number of investigations to be performed, as previously shown in the literature and recommended by the Ministry of Health in 2003[7,19]. In the present study, researchers developed a classification of deaths of women of reproductive age based on the underlying cause and information from fields 43 and 44 to identify the deaths that were most probably maternal and to prioritize their investigation by health services, thus optimizing the process.

In a study conducted in the city of Belém[7], the deaths of women of reproductive age occurring in 2004 and recorded in the SIM database were categorized as maternal (when the information about causes of death recorded in the DC enabled the association between death and the pregnancy-puerperium cycle), as presumable maternal deaths (when the cause of death was one of the presumable causes of the Maternal Mortality Committees' list or when the cause of death was not a presumable cause, but fields 43 and/or 44 were blank or completed as positive or ignored), and as non-maternal deaths (the remaining deaths of women of reproductive age). After the investigation, 75.0% of deaths categorized as maternal were confirmed, 25.0% of the deaths categorized as presumable maternal cause were re-categorized as maternal and none of the deaths categorized as non-maternal became maternal deaths, indicating the good functionality of this methodology.

In the study conducted by Bonciani (2006)[20] in the city of São Paulo, the original causes of death of reported maternal deaths and of those that became maternal after the investigations were reviewed. Of all maternal deaths diagnosed after the investigations, 57.9% had been reported, 22.8% were presumable maternal deaths and 19.3% were not presumable maternal deaths . The following were among the non-presumable deaths: aortic dissection, bronchial asthma, intestinal volvulus and pulmonary tuberculosis. Although deaths from non-presumable causes were found among those that became maternal, the use of the list of presumable causes continues to be effective as it identifies the majority of maternal deaths.

In the present study, the deaths of women of reproductive age initially categorized as non-maternal were considered to have a lower probability of being re-categorized as maternal after the investigation. As it is not possible to investigate all deaths, they must be the least relevant in the list of priorities.

Using the methodology suggested in this study, which combines the underlying causes of death present in the list of presumable causes of the Maternal Mortality Committee Manuals[8] with the completion of fields 43 and 44 of the DC, approximately 70% of the deaths occurring in Belford Roxo and 64.7% of those in Niterói would be selected for the investigation. Thus, a more specific criterion would be used, instead of that of investigating deaths categorized as non--maternal, recommended by the Ministry of Health. A total of 46.7% and 27.5% of deaths occurring in Belford Roxo and Niterói respectively would be selected, if an even more specific criterion had been used, that of not investigating deaths categorized as probable non-maternal deaths and non--maternal deaths.

Without the investigation of deaths categorized as non-maternal in Niterói, 11 investigations instead of 26 would have been sufficient to identify a maternal death.

A strategy that could be used as control to assess the effectiveness of the methodology when selecting deaths to be prioritized in the investigations would be to routinely investigate random samples of deaths categorized as non-maternal and probable non--maternal causes, searching for unreported

maternal deaths. The identification of maternal deaths in these samples could be used as a supporting tool to routinely review the list of presumable causes of maternal deaths. These measures are efficient to reduce the number of investigations, although the most effective way to reduce them is to invest in the qualification of doctors. Undergraduate medical courses must be capable of teaching their students about the importance of vital records and instructions on how to correctly complete death certificates must be a part of the course syllabus. Another aspect analyzed in this study was the “”number of deaths of women who lived in cities other than Niterói that occurred in this city.. Of all 102 deaths investigated, only 45 (44.1%) were of residents of this city. This situation places a burden on the death surveillance service, as it increases the number of investigations to be performed and as it may become an obstacle to the cases that unfold into home investigations.

Despite this burden, these services are managed locally and their management is responsible for the quality of information. An alternative to solve this problem is for the State of Rio de Janeiro Department of Health to obtain the death certificates of residents out of the city of occurrence after the hospital investigation, with the redistribution of inconclusive investigations to the cities of residence.

Currently, Decree 1119 of the Brazilian Ministry of Health places the responsibility for the conclusion of the epidemiological investigation on the city of residence, with the support of the reference death surveillance team of the city where women received care (prenatal, delivery, abortion or puerperium) or died. The dissemination of this decree promotes the creation of partnerships between the cities of residence and those of occurrence, which will help to speed up the conclusion of investigations.

Conclusions

The strategy of classification of deaths of women of reproductive age prioritized for investigation was adequate to retrieve mandatory information from DC and to identify maternal deaths, as all maternal deaths identified were placed into categories considered to be priorities for investigation, thus requiring a lower number of investigations. However, studies with broader samples must be conducted. The investigation of deaths of women of reproductive age must be considered as a short-term measure to identify maternal deaths. Medical doctors and scholars should be made more aware of the importance of death certificates as an instrument to develop health statistics that will provide resources for actions and programs to prevent avoidable deaths. In this way, it will be possible to know the true magnitude of maternal mortality and its causes and to estimate the reduction goal required to meet pre-established objectives, including the millennium goal of reducing maternal mortality by 75% between 1990 and 2015.

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