

**EVOLUTION OF THE COMPLETENESS OF INFORMATION ON NEONATAL MORTALITY IN MINAS GERAIS****EVOLUÇÃO DA COMPLETUDE DAS INFORMAÇÕES SOBRE MORTALIDADE NEONATAL EM MINAS GERAIS****EVOLUCIÓN DE LA COMPLETUD DE LAS INFORMACIONES SOBRE MORTALIDAD NEONATAL EN MINAS GENERALES**

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**ABSTRACT**

**Objective:** To analyze the evolution and the quality of information on neonatal mortality in Minas Gerais. **Method:** ecological study of time trends and using information related to death certificates neonatal available in electronic system of public domain in the period from 1996 to 2014. They considered aspects maternal and pregnancy, the birth and the newborn characteristics and aspects related to neonatal death for the completeness classification and definition of the polynomial model to evaluate the trend for coefficient of determination and Pearson correlation. **Results:** Variables sex of the newborn (mean = 0.6, CI95% 0.5-0.7), age at death (mean = 0.3, CI95% 0.1-0.5) and local of death (mean = 0.3, CI95% 0.1-0.4) showed excellent completeness. polynomial model of the first order was crucial to explaining incompleteness downward trend in most of the variables (82%). **Conclusion:** Despite the incompleteness downward trend, it is important to stimulate discussion on the issue, with a view to better monitoring of neonatal deaths.

**Descriptors:** Infant Mortality; Health Information Systems; Newborn Infant.

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## RESUMO

**Objetivo:** analisar a evolução temporal e a qualidade das informações sobre a mortalidade neonatal em Minas Gerais. **Métodos:** estudo ecológico e de tendência temporal, utilizando informações relacionadas as Declaração de Óbito neonatal disponibilizadas em sistema eletrônico de domínio público no período de 1996 a 2014. Foram considerados aspectos maternos e da gestação, características do parto, do recém-nascido e aspectos relacionados ao óbito neonatal para a classificação da completude e, definição do modelo polinomial para avaliação da tendência por coeficiente de determinação e correlação de Pearson. **Resultados:** variáveis sexo do recém-nascido (média=0,6; IC 95% 0,5-0,7), idade do óbito (média=0,3; IC 95% 0,1-0,5) e local do óbito (média=0,3; IC 95% 0,1-0,4) apresentaram excelente completude. Modelo polinomial de primeira ordem foi determinante para explicação de tendência de redução da incompletude na maioria das variáveis (82%). **Conclusão:** apesar da tendência de redução da incompletude, é relevante fomentar a discussão sobre o tema, tendo em vista a melhor vigilância dos óbitos neonatais.

**Descritores:** Mortalidade infantil; Sistemas de Informação em Saúde; Recém-nascido.

## RESUMEN

**Objetivo:** Analizar la evolución temporal y la calidad de las informaciones sobre la mortalidad neonatal en Minas Gerais. **Métodos:** Estudio ecológico y de tendencia temporal, utilizando informaciones relacionadas a la Declaración de Óbito neonatal disponibilizadas en sistema electrónico de dominio público en el período de 1996 a 2014. Se consideraron aspectos maternos y de gestación, características del parto, del recién nacido y aspectos relacionados al óbito neonatal para la clasificación de la completitud y, definición del modelo polinomial para la evaluación de la tendencia por coeficiente de determinación y correlación de Pearson. **Resultados:** Variables sexo: del recién nacido (promedio = 0,6, IC 95% 0,5-0,7), edad del óbito (media = 0,3, IC 95% 0,1-0,5) y lugar de la muerte = 0,3, IC 95% 0,1-0,4) presentaron excelente completitud. El modelo polinomial de primer orden fue determinante para explicar la tendencia de reducción de la incompletud en la mayoría de las variables (82%). **Conclusión:** A pesar de la tendencia de reducción de la incompletud, es relevante fomentar la discusión sobre el tema, con vistas a la mejor vigilancia las muertes neonatales.

**Descriptorios:** Mortalidad Infantil; Sistemas de Información en Salud; Recién Nacido.

## INTRODUCTION

The infant mortality rate is the death of children in the first year of life, recognized as a sensitive indicator of living conditions and health of a population.<sup>1</sup> neonatal mortality (0 to 27 days of life) is the principal component of infant mortality (UN, 2015), being that in 2016 there were 20,176 deaths in the early neonatal period in Brazil.<sup>2</sup>

Information regarding neonatal death can be obtained through the Mortality

Information System (SIM), available on the internet and very accessible.<sup>3</sup> This tool allows for greater ease for the monitoring of neonatal mortality, however, is need to increasingly invest in studies that use this Health Information System (SIS) as data base, being the current literature points to significant weaknesses regarding quality of information contained in databases.<sup>2-3</sup>.

Studies on the risk factors involved in the causal chain of neonatal mortality and the recognition of the behavior of deaths

over time are fundamental to the definition of priority actions appropriate for containment of these deaths. With this, have qualified SIS for completeness and comprehensiveness of the vital statistics, easy access, promotes greater viability for the effectuation of surveillance actions of these deaths.<sup>3</sup>

The Organization of the United Nations - UN to analyze the major world problems, established eight Millennium Development Goals, being the eighth the reduction of infant mortality, which aims to reduce by 2/3 the overall rate of infant mortality.<sup>1</sup> Among the initiatives for the reduction of infant mortality is important to promote the correct record of the declaration of death (OF), as well as improve the record of the underlying cause, strengthening the national systems of health information, allowing for improvement in future estimates of infant mortality.<sup>3,4</sup> This way, shows the importance of understanding the existing gaps for the realization of the quality of information available in the SIS, in view of the impact that reflects to the achievement of the millennium development goals.

In this context, the reduction of neonatal deaths is a challenge when related to socioeconomic inequalities existing in developing countries.<sup>4</sup> these inequalities, which ultimately affect the quality of the records of vital statistics of the neonate.

Therefore, a relevant aspect to the development of this research relates to the little existing literature on this phenomenon in specific territories.<sup>5-6</sup>

With regard to epidemiological studies using secondary data is undeniable their contribution. However, it is important to highlight some limitations, as a source of data. The SIM is national in scope, developed by the Department of Informatics of the Unified Health System, by, which consolidated all. These records considered the sources more agile in the enumeration and quantification of deaths in Brazil.<sup>7</sup>

Observed in the literature few studies related to the evaluation of the quality of information for neonatal mortality in Brazil. Facing this reality, the present study questions: *What is the completeness of the information related to neonatal death in Minas Gerais? The quality of this completeness improves with the passing years.* For both, the objective is to analyze the temporal evolution and the completeness of the information on neonatal mortality in the state of Minas Gerais.

## **METHOD**

This is an epidemiological study, ecological and temporal trend. We used information available in the SIM, referring to the International Classification of

Diseases in its tenth revision (ICD-10). We included all the records of neonatal deaths for the period 1996 to 2014, mothers living in Minas Gerais. The proposed period presented by the availability of information in electronic site in the period of collection.

All the information considered, including those that presented a blank field or ignored, to be variable of interest for the analysis of the completeness of records. The extraction of data occurred between 25 May and 17 June 2016, was performed by pairs of independently and then checked and adjusted inadequacies.

The study variables were composed by: maternal and gestational aspects (maternal age; maternal schooling; gestational duration; type of pregnancy), characteristics of childbirth and newborns (type of delivery; birth weight; gender; skin color/race) and aspects related to neonatal death (age of death of the neonate; place of occurrence of death; causes of death), in accordance with the classifications available in SIM/DATASUS. It is noteworthy that for analysis of the completeness of the causes of death, it has adapted the field for the proportion of ill-defined causes of death.

The analysis of the completeness is based on the criteria proposed by the Economic Commission for Latin America and the Caribbean (ECLAC), which considers the proportion of information

ignored, the blank fields and codes assigned as specified information ignored, characterized as incompleteness of information.<sup>8</sup> was a ratio between the total number of analyzed variables and the variables that are fulfilled as skipped or blank fields, according to the following expression: *No. of variables in white or ignored / n° total of variables x 100*.

Presented descriptive exploratory analysis behavior of this proportion over years by absolute frequency, average (for the period of 19 years) and 95% confidence interval (95% CI). These data were presented as three-year average (1996-1998, 1999/2001, 2002/2004, 2005/2007, 2008/2010) and an average of four years (2011/2014).

The evaluation of the incompleteness followed the considerations of the ECLAC which addresses the following standards: excellent when there is less than 5% of incomplete information, good from 5% to 10%, 10% scheduled to 20%, 20% bad at 50% and very poor 50% or more.<sup>8</sup>

For the analysis of the trend of the incompleteness of the information in the records of neonatal death, we used polynomial regression model of first order, whereas the proportion of incompleteness (*n° of variables in white or ignored / n° total of variables x 100*) for the dependent variable (Y) and the independent variable (X) the years relating to the period of study.

It was used the variable X centered (year minus the midpoint of the time series), with the year 2005 as the mid-point. Dispersion diagrams built between the proportions and the years of study to identify the role that expressed the relationship between them. From this relationship, we estimated polynomial regression models that in addition to the analysis of the statistical power would also be of easy interpretation.<sup>9</sup>

The trend presented as a measure of accuracy the coefficient of determination ( $r^2$ ) and Pearson's linear correlation ( $r$ ) being classified in zero correlation ( $r=0$ ), weak correlation ( $r \ 0 << 0.3$ ), (0.3 regular correlation  $\leq r < 0.6$ ), strong correlation ( $0.6 \leq r < 0.9$ ), very strong correlation ( $0.9 \leq r < 1$ ), and full correlation ( $r = 1$ ), for positive and negative variations. Initially we tested the simple linear regression model ( $Y = \beta_0 + \beta_1 X$ ). It considered significant when the estimated model obtained  $p \leq 0.05$ . If the simple linear regression submit  $r^2 = 70\%$  and  $p \leq 0.05$ , was the model chosen. It was identified the presence of a tendency in the series as ascending or descending as decisive sign of  $\beta_1$  (positive or negative) and direction of the straight.

The data extracted from the electronic site of yes/DATASUS in table format Excel®. For the statistical analysis, the database transposed to *software Statistical Package for Social Sciences* (SPSS) version 21.0.

The study appreciated by Committee of Ethics and exempted from analysis by considering the nature of the research and methodological design exclusive with secondary data from public access through the internet.

## RESULTS

In Minas Gerais, for the review period (1996-2014), there were 62,699 neonatal deaths, according to information from the SIM. These deaths amounted to 9.5% of the total number of deaths from the national territory for the period, which were 663,683 neonatal deaths. It should note that the neonatal mortality rate for Minas Gerais is the third rate in the southeastern region with a value corresponding to 8.2 deaths/1000 live births for the year 2014.

On the completeness of the information, although there are aspects completed *excellent way*, that is, with fewer fields are incomplete as: Place of death (mean = 0.3; 95% CI 0.1 - 0.4), age of death (mean = 0.3; 95% CI 0.1 - 0.5) and sex of the RN (mean = 0.6; 95% CI 0.5 - 0.7), the largest part of the information presents fill with quality classified as *poor* and *very poor* (7 fields of the total of 11 fields analyzed; 63.6%). The field that has the worst filling is maternal schooling, classified as *very bad*, presenting proportion of incompleteness as average for the period of 50.3 (95% CI 35.6 - 54.9) (Table 1).

**Table 1.** Distribution of the proportion of incompleteness of the information in the records of neonatal deaths/SIM as average, confidence interval (95%) and their classification for the period 1996 to 2014. Minas Gerais, Brazil, 2016.

Variables	1996-1998	1999/2001	2002/2004	2005/2007	2008/2010	2011/2014	Average	95% CI	Completeness
<i>Maternal and gestational aspects</i>									
Maternal age	37.0	44.9	36.9	23.9	25.4	17.5	32.5	25.4 - 35.1	Bad
Maternal schooling	84.3	54.4	46.2	34.0	34.1	25.2	50.3	35.6 - 54.9	Too Bad
Gestational Duration	47.8	39.9	29.2	18.1	15.5	19.3	31.0	21.8 - 33.9	Bad
Type of pregnancy	44.7	36.8	26.7	16.7	14.5	12.6	27.9	18.6 - 30.7	Bad
<i>Characteristics of childbirth and infant</i>									
Type of delivery	42.8	37.3	27.4	17.5	15.4	13.1	28.1	19.2 - 30.7	Bad
Birth weight	49.2	41.5	30.8	18.5	16.3	13.4	31.2	20.7 - 34.5	Bad
Sex	0.5	0.7	0.5	0.5	0.5	0.8	0.6	0.5 - 0.7	Excellent
Skin color	69.4	40.0	34.5	25.2	17.8	15.0	37.6	22.5 - 42.8	Bad
<i>Aspects related to death</i>									
Age of death	0.2	0.2	1.0	0.5	0.1	0.0	0.3	0.1 - 0.5	Excellent
Causes of death*	18.8	19.4	15.1	7.0	2.9	1.7	12.3	6.6 - 14.1	Adjust
Place of death	0.5	0.6	0.1	0.1	0.1	0.1	0.3	0.1 - 0.4	Excellent

\*considered the proportion of ill-defined causes

<sup>a</sup>Classification ECLAC taking the average as a reference

In relation to the tendency of the completeness of the fields with the temporal evolution, it is observed that the first order polynomial model (linear) represents this relationship for most of the analyzed variables, forward to the results of the coefficient of determination ( $r^2 \geq 70\%$ ), except for the following variables: place of occurrence of death, age at death and sex of the RN ( $r^2 = 55\%$ ,  $10\%$  and  $4\%$ , as appropriate). Regarding the correlation ( $r$ ) between the quality of filling and temporal evolution is strong or very strong in 82% of the variables (Table 2).

It observed that 91% of the variables behave according to the model of

decreasing manner outside the temporal evolution, with statistical significance. Only the variable sex of the RN showed no improvement in the quality of filling with the passing of the years, being the growing trend. However, this variable presents *excellent* quality of filling, and the first-order polynomial model presents low explanatory power of the trend of this variable ( $r^2 = 4\%$ ,  $p = 0.43$ ). Another variable with similar behavior in the analysis of first-order polynomial regression was the age of death that showed *excellent quality of filling*, however decreasing trend ( $R^2 = 10\%$ ,  $p = 0.19$ ) (Table 2).

**Table 2.** The regression model trend analysis of the proportion incompleteness fields of Declaration neonatal death/Yes according to maternal aspects, pregnancy, childbirth, newborn and related to death, for the period 1996 to 2014. Minas Gerais, Brazil, 2016.

Variables	Model <sup>a</sup>	r <sup>2</sup>	pvalue	Rating (r)	Trend
<i>Maternal and gestational aspects</i>					
Maternal age	Y= -1,586x + 3210	78%	<0.001	Forte (0.8)	Descending Order
Maternal schooling	Y= -3,306x + 6674	85%	<0.001	Very strong (-0.9)	Descending Order
Duration of Pregnancy	Y= -2,009x + 4056	80%	<0.001	Very strong (-0.9)	Descending Order
Type of pregnancy	Y = x + 4286 -2,125	90%	<0.001	Very strong (-0.9)	Descending Order
<i>Characteristics of childbirth and infant</i>					
Type of delivery	Y = x + 4102 -2,033	91%	<0.001	Very strong (-0.9)	Descending Order
Birth weight	Y = x + 4868 -2,414	92%	<0.001	Very strong (-0.9)	Descending Order
Sex	Y = 0.008x - 17.10	4%	0.43	Low (0.2)	Growing
Color/Race	Y = x + 6399 -3,175	72%	<0.001	Forte (0.8)	Descending Order
<i>Aspects related to death</i>					
Age of death	Y = x + 47.65 -0,023	10%	0.19	Regular (-0.3)	Descending Order
Causes of death*	Y = x + 2614 -1,299	89%	<0.001	Very strong (-0.9)	Descending Order
Place of occurrence of death	Y = x + 68.06 -0,033	55%	<0.001	Forte (0.7)	Descending Order

<sup>a</sup> The model of 1<sup>o</sup> order: proportion of the incompleteness of the fields = b<sub>0</sub>+b<sub>1</sub> (Year: 2005)

## DISCUSSION

The results of this study indicate a variation in the completeness of the information studied. The variables related to the newborn's sex, age of death and the place of death showed excellent quality of filling. These variables also exhibit excellence in completeness in other Brazilian states, such as Pernambuco<sup>10,11</sup> and the Holy Spirit.<sup>12</sup>

At national level, other variables, such as the socioeconomic and demographic variables, also have low quality in fulfillment. For example, maternal schooling, one of the most relevant variables in studies of social inequality, presents omission in filling out of more than 50% of 11 Brazilian states.<sup>8</sup> alerts you if the quality of the information of the other variables studied in this research, which are classified as bad or very bad, and the cause of death as regular, how this can impact on the indicators for evaluation of health conditions.<sup>13</sup>

The challenge in achieving the quality of information on mortality of children under one year is not a question specific to Brazil, imposing for different countries, in particular the whole considered in development.<sup>14</sup> similar problems found in Cabinda, Angola. This location is great, the percentage of underreporting of births and deaths, a fact

that is associated with the poor quality of the health care location.<sup>15</sup>

In Belize, Central American country, study, which examines the integration of the mortality information system in 2007, encountered several challenges to the achievement of quality, among them the magnification of the integration of information across territorial extension and training of health professionals in are using and feeding this system properly.<sup>16</sup>

Among the factors related to the maintenance of the quality of data on mortality, gains highlight the fact that the doctors fill out forms from only to fulfill a formality, without concern for the value of information. In general, these professionals to fulfill the assignment - exclusive to this category, demonstrate greater concern to inform the question immediately associated with death, and not the other determinant factors. In this context, it is vital to raise awareness of the class for the impact on the completeness of records.<sup>11</sup>

On the completion of the in case of neonatal death, research showed that even in deaths occurring in the hospital, which have a higher chance of redemption of information for completion of the closeness of family and the chalkboard, the percentage of incompleteness of fields is very high.<sup>11</sup>

Henceforth, the high percentage of variables ignored or blank in the can change the profile of infant mortality, considering that the active search of deaths not reported to Yes you can see these modifications, including the basic cause of death.<sup>10</sup> In particular, the deficit fill the fields of the compromises the quality and relevance of the information available, becoming an obstacle to the adoption of adequate epidemiological surveillance.<sup>11</sup>

Another reason for the incompleteness of the information relates to the weaknesses found in the operationalization of YES. This fact, as studies show, signals the need for changes in the work process, since the filling, feeding the system, friendly ambiance of the system and even the establishment of internal audit process of information.<sup>10,16</sup>

The United States has progressed in the reduction of infant mortality, being on the path to achieving the fourth millennium goal, if you keep the decrease trend of these deaths.<sup>4</sup> However, it is necessary to locally next on the quality of the records, because it is essential investments to expand the quality of completeness of records of neonatal deaths.<sup>17</sup>

Historically, investments in order to improve the quality of information is made in Brazil recently, by the great academic support and the adoption of recommendations of the World Health

Organization for you to review and consolidation of information systems in health.<sup>17</sup> In general, it is possible to identify a positive trend for the completeness of the information when evaluating the SIM in national scope, related to neonatal death<sup>8,10,16-17</sup>, being that the state of Minas Gerais accompanies this trend as points the results of this research.

The state of Minas Gerais presents various challenges to the scope of the quality of information related to neonatal death<sup>18</sup>, fact also confirmed by the results of this research. Being a state of socioeconomic inequalities in regional economic aspects and access to and quality of health services that need to be considered.<sup>19</sup>

In their turn, are necessary investments and public policy statements for the improvement of surveillance of neonatal death, integration of committees for the prevention of maternal death, fetal and infant as well as training for all those involved in the production of information and active search for events.<sup>17,20</sup> These are examples of strategic interventions to contribute to the reduction of the inadequacies of information on infant mortality in the territory of Minas Gerais and, therefore, in other locations which have similar problems.

## CONCLUSION

The data indicate a positive trend for the improvement of quality in fulfilment of the information obtained in the YES on the neonatal death, as its temporal evolution. However, most of the variables studied is with quality of completeness is bad or very bad and cause death with regular quality of filling.

Regarding the limitations of this study, it is important to consider the quality of the information from SIM, that although there may be death underreporting of information, it is still an important source of information in our country. Another issue is related the use of aggregated data, which do not allow analysis of individual risks.

With a view to the territorial extension of Minas Gerais and the social inequalities present in its various regions, it is important that research undertaken to understand the impact of health inequities in the quality of information. In addition to recognizing which factors determine the low completeness of the fields and influence the positive trend with the passing of the years. Qualitative research designs along with the physicians become relevant for the understanding of the interference to the proper completion of the on neonatal mortality. As well, studies for the correction of underreporting and for assessment of the impact of initiatives to improve the quality of information from SIM.

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