


# Brasilian List of Avidable Causes of Death that can be avoided by National Health System interventions, and its applicability for analysis of perinatal deaths in municipalities in the states of Rio de Janeiro and São Paulo, Brazil, 2011\*

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Fernanda Morena dos Santos Barbeiro Vieira<sup>1</sup> -  [orcid.org/0000-0002-2010-761X](https://orcid.org/0000-0002-2010-761X)

Pauline Lorena Kale<sup>1</sup> -  [orcid.org/0000-0001-5439-9158](https://orcid.org/0000-0001-5439-9158)

Sandra Costa Fonseca<sup>2</sup> -  [orcid.org/0000-0001-5493-494X](https://orcid.org/0000-0001-5493-494X)

<sup>1</sup>Universidade Federal do Rio de Janeiro, Instituto de Estudos em Saúde Coletiva, Rio de Janeiro, RJ, Brazil

<sup>2</sup>Universidade Federal Fluminense, Instituto de Saúde Coletiva, Niterói, RJ, Brazil

## Abstract

**Objective:** to assess the applicability of the Brazilian List of Avoidable Causes of Death (BAL) to perinatal mortality in public maternity hospitals in the states of Rio de Janeiro (RJ) and São Paulo (SP) in 2011. **Methods:** this was a descriptive case series study of perinatal deaths using primary data from the Mortality Information System; the BAL was applied, with adaptations (codes P20.9 and P70-74) and, in addition in Rio de Janeiro the Extended Wigglesworth (EW) Classification was also used. **Results:** according to the BAL, 61.2% of the 98 perinatal deaths were avoidable, mainly by providing adequate attention to women in pregnancy; 'Ill-defined causes of death' accounted for 26.6% of cases, mainly fetal deaths; use of EW in RJ indicated that the 'Antepartum Fetal Death' category was predominant and was related to inadequate prenatal care; this was in line with the BAL. **Conclusions:** after reallocating some codes, the BAL can improve fetal death evaluation, whereby studies with a larger number of participants are needed.

**Keywords:** Perinatal Mortality; Fetal Death; Early Neonatal Death; Cause of Death; International Classification of Diseases.

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## Correspondence:

Fernanda Morena dos Santos Barbeiro Vieira – Rua Antônio Silva, nº 34, apto. 502, Fonseca, Niterói, RJ, Brazil. Postcode: 24130-175

E-mail: nurse\_fe@hotmail.com

## Introduction

Worldwide there are some 4 to 5 million perinatal deaths each year, of which 2 to 2.5 million are fetal deaths and 2.6 million are neonatal deaths.<sup>1,2</sup> The main causes of these early deaths are avoidable, provided there is timely access to health services and quality care during the prenatal period, at childbirth and for the newborn.<sup>3</sup>

Investigation of perinatal deaths and enlightenment of possible shortcomings at any stage of health care, by means of avoidability classifications, can contribute to informing health service managers when defining health actions.<sup>4</sup> Furthermore, monitoring avoidability indicators enables evaluation of both the profile and the trend of health service effectiveness.<sup>4</sup>

Throughout the world, different approaches to assessing death avoidability have been proposed.<sup>4-6</sup> The abundance and diversity of these classifications is justified by the quest for greater accuracy and efforts to reduce records with ill-defined causes.<sup>5</sup> Some classifications are aligned with the International Statistical Classification of Diseases and Related Health Problems, 10<sup>th</sup> Revision (ICD-10),<sup>7</sup> while others use different assumptions, thus hindering comparability between them.<sup>5,6</sup>

*Investigation of perinatal deaths and enlightenment of possible shortcomings at any stage of health care, by means of avoidability classifications, can contribute to informing health service managers when defining health actions.*

In Brazil the classification recommended by the Ministry of Health for perinatal deaths (fetal and early neonatal deaths) is the Extended Wigglesworth (EW) classification, which takes into consideration pathophysiological conditions and the time of death in order to classify avoidability in categories related to health service actions.<sup>3</sup> In the case of infant deaths, including neonatal deaths, the recommended classification is the Brazilian List of Deaths that can be avoided by National Health System (SUS) intervention,<sup>8</sup> also referred to as the Brazilian List of Avoidable Causes of Death (BAL). The BAL is used when filling in the

investigation module of the Mortality Information System (SIM), although it does not cover fetal deaths. Some Brazilian studies have, however, applied the BAL to perinatal or fetal deaths in isolation.<sup>9-12</sup>

With the aim of contributing to adapting the BAL to fetal deaths, providing them with greater visibility and targeting intervention measures to prevent them, in addition to taking into consideration that early neonatal and fetal deaths have pathophysiological mechanisms and underlying causes in common, in this study we evaluated the applicability of the BAL to perinatal mortality, especially to fetal deaths, in public maternity hospitals in the states of Rio de Janeiro (RJ) and São Paulo (SP) in 2011.

## Methods

A descriptive case series study was conducted. Perinatal deaths were identified by following up on a hospital-based birth cohort (follow-up time for stillbirths equal to zero; follow-up time for live births equal to age at death), conducted in six SUS maternity hospitals with the highest frequency of live births – one in Niterói-RJ and one in the city of Rio de Janeiro (RJ Center); and four in São Paulo (SP Center) –, between September and November 2011. The underlying cause of perinatal deaths was checked in parallel by experienced researchers, so as to provide the information<sup>13</sup> and BAL application with greater reliability.

The maternity hospital in the city of Rio de Janeiro, belonging to Metropolitan Region I, provides services to the population resident in the Planning Area where it is located. The maternity hospital in the city of Niterói is a reference service for low and high risk pregnancy in Metropolitan Region II of the state of Rio de Janeiro. In São Paulo, the maternity hospitals selected have diverse characteristics: one is a charity hospital, one is a national reference hospital for women and neonates, one is part of a university hospital and the fourth is a reference hospital for at-risk pregnant women and newborn infants in the metropolitan region.

The selection strategy comprising 25% of annual births was similar to that used by the WHO global survey to monitor maternal and perinatal health,<sup>14</sup> rather than being a random sample. All women admitted to hospital to give birth in the period covered by the study (September to November 2011) were invited to comprise the birth cohort (n=7,426). Hospital deaths occurring during pregnancy, during childbirth and up to discharge from hospital were identified during the field work, since the research

teams were present daily at the maternity hospitals. Subsequently, follow-up was done by means of linking the study databases with the Mortality Information System (SIM): initially linkage was deterministic, using the Live Birth Certificate number which can be found on both the Live Birth Information System (SINASC) and on SIM. When the number was missing on SIM, the probabilistic form was used. Linkage was done by the respective Health Departments: in the municipality of São Paulo it was done via the Mortality Information Enhancement Program (PRO-AIM), while in the municipalities of Rio de Janeiro and Niterói, it was done directly by the State Health Department. The objective of this procedure carried out by the Health Departments was to monitor occurrence of neonatal deaths after discharge from hospital and, to this end, the RecLink3 computer program was used.<sup>15</sup> Losses, due to unavailability of parturient women at the time of the interview or due to medical records not being located, and refusals, were under 5%.

Data collection was done by interviewing all parturient women 12 hours following childbirth in the hospital wards. The interview questionnaire was assessed by means of a pilot study before being administered. Data was also collected from prenatal cards, medical records and Delivery Room Book records. Death certificate data was complemented by checking underlying cause of death through the information collected.<sup>13</sup> The main questionnaire and the operational stages of the study were the same at the RJ Center and at the SP Center.

Perinatal deaths were defined as: fetal deaths, at 22 weeks of pregnancy or more (and/or weight  $\geq 500$ g); while early neonatal deaths were those with 0 to 6 complete days of life.<sup>7</sup>

The approaches to avoidability included the Brazilian List of Avoidable Causes of Death<sup>8</sup> – BAL – and the Extended Wigglesworth classification – EW.<sup>3</sup> The Brazilian List organizes deaths by groups of underlying causes of death, as per ICD-10. Deaths are divided into three main groups: avoidable causes; ill-defined causes; and other causes (not clearly avoidable).

The ‘Avoidable causes of death’ group is subdivided into categories, according to the intervention that could have avoided death:

- a) reducible by immunoprevention actions;
- b) reducible by adequate care of women during pregnancy, at childbirth and adequate care of

the newborn infant (this category is subdivided into three subcategories: pregnancy; childbirth; and newborn);

- c) reducible by adequate diagnosis and treatment; and

- d) reducible by adequate health promotion.

The Wigglesworth classification was originally organized into five groups, based on: pathophysiology, weight at birth, gestational age, time of death, fetal characteristics (macerated or not) and possibility of detecting health care failures, namely:

- a) antepartum fetal death;
- b) severe congenital malformations;
- c) prematurity/immaturity;
- d) death from asphyxia during labor; and
- e) specific perinatal conditions (perinatal infection and others).<sup>16</sup>

Some years later, the classification was modified and gave rise to the Extended Wigglesworth classification – EW, the abbreviation used in this report –, applicable to infant deaths, modifying the specific conditions category to include these deaths, as well as creating the separate infection category – ‘Perinatal and other’ –, covering a further three categories: external causes; sudden death; and unexplained deaths.<sup>3</sup> The objective of both classifications is to identify, using different strategies, at what time during pregnancy, labor or birth health services could have avoided the death under analysis. Despite this study having been conducted eight years ago, the approach used by the classifications is up-to-date.

The BAL was used at both the RJ Center and the SP Center, while EW was only used at the RJ Center. Although the study logistics were common to both Centers, it was possible to add questions of interest to each Center. At the RJ Center, using EW was complementary to the project and served to compare the two classifications in relation to the same population of deaths. EW was administered independently by two of the researchers and any disagreements were settled by consensus.

The description of death classification was done taking the frequency per category comprising perinatal death (total, neonatal and fetal), for each Center.

The perinatal mortality rate was estimated using this formula: perinatal deaths/total number of births (live births + fetal deaths  $\geq 22$  weeks), whereby the result of this division was multiplied by one thousand. The fetal/neonatal ratio was estimated as follows: number of fetal deaths/number of neonatal deaths.

When using the BAL in this study, two alterations were proposed for fetal deaths:

- i) causes related to maternal diabetes (P70-P74) were considered to be 'Deaths reducible by adequate care of women during pregnancy', originally classified as 'Deaths reducible by adequate care of the fetus and the newborn infant'; and
- ii) code P20.9 was classified as 'Ill-defined cause of death'. The latter code would originally have been allocated as 'Deaths reducible by adequate care during childbirth'.

The first alteration (i) is based on the fact that some ICD-10 codes are linked to pathologies or times of illness that do not cover stillborn babies and are specific to newborn infants. In the case of a child of a diabetic mother, evaluation of inadequate care of the newborn infant can only take place with live born babies. If death was intrauterine, it should be attributed to inadequate care during pregnancy. The second alteration (ii) attempts to correct the indiscriminate interpretation of code P20.9, in the case of fetal deaths, as being attributable to inadequate care during childbirth; if the time at which hypoxia occurred is not specified, it will be 'Ill-defined cause of death'.

With regard to ethical aspects, the study was approved by the Research Ethics Committees of the three institutions involved: Federal University of Rio de Janeiro Public Health Studies Institute (CEP-IESC/UFRJ) on April 6<sup>th</sup> 2011 (Process No. 15/2010); Rio de Janeiro City Health and Civil Defense Department, on June 20<sup>th</sup> 2011 (Process No. 87/2011); and University of São Paulo Faculty of Public Health (CEP-FSP/USP), on February 24<sup>th</sup> 2011 (Protocol No. 2188/11). All pregnant women taking part and those responsible for pregnant women under 18 years old read and signed an informed consent form.

## Results

In the study period there were 98 perinatal deaths (65 fetal and 33 neonatal deaths) at the six maternity hospitals, corresponding to a total perinatal mortality rate (per 1000 births) of 13.24: 19.97 at the RJ Center and 11.08 at the SP Center. The fetal/early neonatal ratio was 1.9:1, considering all the maternity hospitals selected.

Perinatal death distribution according to the BAL groups (Table 1) provided evidence of 61.2% avoidable causes of death, concentrated in the categories of deaths reducible by adequate care of women in pregnancy (38 of the 60 avoidable deaths) and during childbirth (18 deaths).

The most frequent category – 'Deaths reducible by adequate care of women in pregnancy' – accounted for 19 out of 36 deaths at the RJ Center and 19 out of the 62 deaths at the SP Center. At the RJ Center, codes P00.0 (Fetus and newborn affected by maternal hypertensive disorders [n=6]), A50.0 (Early congenital syphilis [n=5]), P07.0 (Extremely low birth weight newborn [n=3]) and P02.1 (Fetus and newborn affected by placental separation [n=3]) were the most frequent; at the SP Center, codes P02.1 (Fetus and newborn affected by placental separation [n=8]), P00.0 (Fetus and newborn affected by maternal hypertensive disorders [n=6]) and P70.1 (Syndrome of infant of a diabetic mother [n=4]) were the most prevalent.

Moreover, the 'Deaths reducible by adequate care of women during childbirth' subcategory was found to stand out more at the SP Center, accounting for 15 cases out of the 38 avoidable deaths, while at the RJ Center it accounted for only three cases out of 22. It is noteworthy that no neonatal death in RJ was classified with this cause, whereas in SP there were eight fetal deaths and seven neonatal deaths classified with this cause.

'Ill-defined causes of death' accounted for 26.6% of the total, in particular fetal deaths, represented mainly by code P95 (Fetal death of unspecified cause).

In the 'Other causes' group (not clearly avoidable), there were 12 deaths (12.2% of the total), all due to congenital malformations, mainly anencephaly, the majority of which were early neonatal deaths (7 out of 12 deaths).

Applying EW in RJ (Table 2) showed that the majority of the perinatal deaths would have been potentially avoidable (only excluding malformations), and were mostly Group 2 deaths (Antepartum fetal death), half of which were coded as P95 (Fetal death of unspecified cause). 'Prematurity' came in second place. When analyzing by component, 'Antepartum fetal death' accounted for the majority of fetal deaths; while 'Prematurity' accounted for the majority of early neonatal deaths.

**Table 1- Brazilian List of Avoidable Causes of Death: perinatal death categories in six public maternity hospitals in Rio de Janeiro (RJ Center) and São Paulo (SP Center), 2011**

Cause groups/categories and ICD-10 codes <sup>a</sup>	RJ Center (36 deaths: 25 F and 11 EN)			SP Center (62 deaths: 40 F and 22 EN)			Total (98 deaths: 65 F and 33 EN)		
	Fetal	Early neonatal	Total	Fetal	Early neonatal	Total	Fetal	Early neonatal	Total
	n	n	n	n	n	n	n	n	n (%)
<b>1. Causes of avoidable deaths</b>	13	9	22	21	17	38	34	26	60 (61.2)
<b>1.2.1. Deaths reducible by adequate care of women during pregnancy</b>	10	9	19	13	6	19	23	15	38
Early congenital syphilis (A50.0)	5	–	5	–	–	–	5	–	5
Fetus and newborn affected by maternal hypertensive disorders (P00.0)	4	2	6	3	3	6	7	5	12
Fetus and newborn affected maternal infectious diseases (P00.2)	–	–	–	2	–	2	2	–	2
Fetus and newborn affected by other maternal circulatory and respiratory diseases (P00.3)	–	–	–	1	–	1	1	–	1
Fetus and newborn affected by other maternal conditions (P00.8)	–	1	1	–	–	–	–	1	1
Fetus and newborn affected by premature rupture of membranes (P01.1)	–	1	1	1	2	3	1	3	4
Fetus and newborn affected by chorioamnionitis (P02.7)	–	1	1	2	–	2	2	1	3
Extremely low birth weight newborn (P07.0)	–	3	3	–	–	–	–	3	3
Unspecified pulmonary hemorrhage (P26.9)	–	–	–	–	1	1	–	1	1
Other low birth weight newborn (P07.1)	–	1	1	–	–	–	–	1	1
Syndrome of infant of diabetic mother (P70.1)	1	–	1	4	–	4	5	–	5
<b>1.2.2. Deaths reducible by adequate care of women at childbirth</b>	3	–	3	8	7	15	11	7	18
Fetus and newborn affected by placenta previa (P02.0)	–	–	–	1	–	1	1	–	1
Fetus and newborn affected by placental separation (P02.1)	3	–	3	5	3	8	8	3	11
Late newborn (P08.2)	–	–	–	1	–	1	1	–	1
Birth injury, unspecified (P15.9)	–	–	–	–	1	1	–	1	1
Intrauterine hypoxia during labor and delivery (P20.1)	–	–	–	1	–	1	1	–	1
Birth asphyxia (P21.9)	–	–	–	–	1	1	–	1	1
Meconium aspiration syndrome (P24.0)	–	–	–	–	1	1	–	1	1
Neonatal aspiration syndrome, unspecified (P24.9)	–	–	–	–	1	1	–	1	1
<b>1.2.3. Deaths reducible by adequate care of fetus and newborn</b>	–	–	–	–	3	3	–	3	3
Respiratory failure of newborn (P28.5)	–	–	–	–	1	1	–	1	1
Bacterial sepsis of newborn, unspecified (P36.9)	–	–	–	–	1	1	–	1	1
Other specified perinatal digestive system disorders (P78.8)	–	–	–	–	1	1	–	1	1

<b>1.4. Deaths reducible by adequate health promotion actions, linked to adequate health care actions</b>	–	–	–	–	1	1	–	1	1
Other slipping, tripping and stumbling and falls (W18)	–	–	–	–	1	1	–	1	1
<b>2. Ill-defined causes of death</b>	10	–	10	16	–	16	26	–	26 (26.6)
Fetal death of unspecified cause (P95)	10	–	10	16	–	16	26	–	26
<b>3. Other causes (not clearly avoidable)</b>	2	2	4	3	5	8	5	7	12 (12.2)
Anencephaly and similar malformations (Q00)	1	1	2	–	2	2	1	3	4
Congenital hydrocephalus (Q03)	–	–	–	–	1	1	–	1	1
Other congenital malformations of heart (Q24)	–	1	1	1	–	1	1	1	2
Congenital malformations of lung (Q33)	–	–	–	–	1	1	–	1	1
Renal agenesis, bilateral (Q60.1)	–	–	–	–	1	1	–	1	1
Other congenital malformations (Q80-Q89)	1	–	1	2	–	2	3	–	3

a) ICD-10: International Statistical Classification of Diseases and Related Health Problems – 10th Revision.

Legend:

F: fetal death.

EN: early neonatal death.

**Table 2 – Extended Wigglesworth classification: perinatal death categories (fetal and early neonatal) in two public maternity hospitals in the Rio de Janeiro Center, 2011**

Categories	Fetal	Early neonatal	TOTAL
	n	n	n
Group 1 – Malformation	2	2	4
Group 2 – Antepartum fetal death	16	–	16
Group 3 – Intrapartum death	2	1	3
Group 4 – Prematurity	–	8	8
Group 5 – Perinatal/maternal infection	5	–	5

## Discussion

The study showed that ‘Deaths reducible by adequate care of women during pregnancy’ was the main avoidability category of the avoidable perinatal deaths that occurred in the maternity hospitals comprising the study. This category remained the most frequent, both for neonatal and fetal deaths.

In addition, the study indicated that the BAL is also applicable for fetal deaths, provided that certain adaptations are made for specific causes of death by avoidability groups and subgroups. Both the BAL and EW are recommended by the Ministry of Health;<sup>3</sup> however, few studies have considered the applicability of the BAL and they have generally focused on infant deaths.<sup>17</sup> In this sense, it should be emphasized that the BAL was initially designed only for deaths of children under five years old and individuals aged 5 to 75 years old, and did not cover fetal deaths.<sup>18</sup>

Analysis using the BAL made evident some differences between the SP Center and the RJ Center. Predominance of ‘Deaths reducible by adequate care of women during pregnancy’ was greater in RJ, suggesting the need to enhance and/or provide greater care in the prenatal period. At the SP Center, the frequency of the ‘Deaths reducible by adequate care of women at childbirth’ category was very close to that of the ‘Deaths reducible by adequate care of women during pregnancy’ category; as well as being proportionately lower in comparison with that found in RJ, in addition to equally affecting fetal deaths and early neonatal deaths. These findings suggest that the SP Center had greater shortcomings in obstetric management during labor, compared to the RJ Center. The most frequent specific cause in this category in SP was the ‘Fetus and newborn affected by placental separation’, both for fetal and neonatal deaths.

At the RJ Center, applying EW confirmed the BAL analysis, demonstrating that the majority of deaths were ‘Deaths reducible by adequate care of women during pregnancy’.

Although this study’s sample was small, its results corroborate the results of other studies conducted in SP and RJ, using both the BAL and EW, in similar periods. The study conducted by Ortiz<sup>9</sup> showed that in 2010 in RJ, 39% of perinatal deaths could have been avoided by adequate care of women during pregnancy, while in SP 34% of perinatal deaths could have been avoided by adequate care of women at childbirth.<sup>9</sup> Also in São Paulo, perinatal asphyxia was the fourth leading cause of infant deaths in 2012.<sup>19</sup> Analysis of the municipality of Rio de Janeiro using the BAL from 2008 onwards, has provided evidence that 35% of infant deaths could be avoided by adequate care for women during pregnancy.<sup>20</sup> Intrauterine hypoxia has been the leading cause of fetal deaths, followed by maternal conditions (in particular hypertension).<sup>20</sup>

EW was more sensitive in finding fetal deaths with shortcomings in prenatal care, with the majority of deaths falling into the ‘Antepartum fetal death’ category. Whereas when using the BAL, less than half the fetal deaths were classified as being reducible by adequate care in pregnancy; the remaining fetal deaths were allocated to the ‘Ill-defined causes of deaths’ group. Another point that stands out in relation to EW is the specific category of ‘Prematurity’, which accounted for the majority of neonatal deaths. This analysis is pertinent, considering the increased prevalence of premature babies in Brazil between 1995 and 2015.<sup>21</sup>

There is no consensus about the best classification of perinatal deaths,<sup>6</sup> since both the BAL and EW have potentialities and weaknesses. It is the complementarity between them that can provide greater consistency to analysis of avoidability. EW requires medical record data about the circumstances of death, which makes it limited when this information is not available. In turn, the BAL requires the Death Certificate to be filled in correctly in order for certain causes not to be underestimated or overestimated. In the case of fetal deaths, the high use of code P20.9 – unspecified intrauterine hypoxia – contributed to the ‘Ill-defined causes of death’ group. Moreover, some ICD-10 categories involving the fetus and newborn, need to be assessed with caution before being applied to fetal deaths; in particular this is the case of maternal diabetes, which under the

current version of the BAL, falls into the subcategory of ‘Deaths reducible by adequate care for the fetus and the newborn’.

National studies have applied the BAL to perinatal deaths without making adjustments to it. In Belo Horizonte, MG, between 2008 and 2010, a 65% avoidable fetal death rate was identified.<sup>10</sup> Fetal death due to unspecified causes (P95) was the most frequent (31%) “cause” classified in the ‘Ill-defined causes of death’ group. With regard to avoidable deaths, intrauterine hypoxia (P20) was the most frequent cause among ‘Deaths reducible by adequate care for women at childbirth’.<sup>10</sup> In the state of Pernambuco, between 2008 and 2011, intrauterine hypoxia was the cause of 23% of fetal deaths, 77% of perinatal deaths were avoidable, and ‘Deaths reducible by adequate care for women at childbirth’ was the most frequent subcategory.<sup>11</sup> In Recife, the capital of Pernambuco state, between 2010 and 2014, ‘Deaths reducible by adequate care for women at childbirth’ was the second most frequent avoidability subcategory, in part due to intrauterine hypoxia.<sup>12</sup> The weakness of the current version of the BAL is corroborated by the high number of deaths attributed to cause P20, thus inflating the ‘Deaths reducible by adequate care for women at childbirth’ subcategory.

Use of avoidability classifications can inform decision making as to the best interventions to improve care provided during pregnancy and childbirth. Taking the most frequent groups of avoidable causes, investments should prioritize one or more aspects of health care: prenatal; childbirth and/or care for neonates. However, improved filling in of Death Certificates is also needed, as are greater investments in investigations carried out by the Infant and Fetal Death Prevention Committees. A study in the state of Minas Gerais detected that only 9 of its 33 Committees used avoidability classification, with the BAL being chosen by all of them and, therefore, failing to discriminate between infant deaths and fetal deaths.<sup>22</sup>

The authors of this study consider its limitations to be (i) the small number of cases, as this did not allow analyses by weight ranges at birth to be performed, and (ii) the impossibility of applying EW in SP. The study had a common base questionnaire, enabling the BAL to be applied at both centers, while it was also possible to add other study blocks, as happened in RJ. The SP Center opted not to include the EW block, whereas at the RJ Center, specific alterations to fetal deaths were

made to the BAL for the first time and this was compared to EW, suggesting a new form of avoidability analysis.

A third limitation of the study can be argued to be the fact of the data not being recent and relating to 2011. Notwithstanding, the main objective of the study was to contribute methodologically so that the BAL, which has not been revised since 2010, can be applied more appropriately to fetal deaths, based on accurate underlying cause of death data. It should be noted that when applying avoidability classification, the process can be retrospective, as described in other national articles.<sup>23,24</sup>

The conclusion is reached that the BAL, as well as being adequate for infant deaths, can be used for fetal deaths when adapted as suggested in this study. In this sense, new studies are needed with a greater number of participants. A more in-depth theoretical revision of the Brazilian List of Avoidable

Causes of Death groups and subgroups and their usefulness in classifying fetal deaths is being undertaken by the second and third authors of this study, and new application studies are needed for its validation. Based on the context analyzed, the conclusion is reached that the Extended Wigglesworth classification for perinatal deaths should continue to be a complementary instrument of analysis of the relationship between health care factors and the causes of these deaths.

### Authors' contributions

Vieira FMSB, Kale PL and Fonseca SC contributed to the conception and design of the study, data collection, analysis and interpretation, drafting and reviewing the different versions of the manuscript. All the authors have approved the final version and are responsible for all aspects of this work, including the guarantee of its accuracy and integrity.

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Associate editor: Lucia Rolim Santana de Freitas - [orcid.org/0000-0003-0080-2858](https://orcid.org/0000-0003-0080-2858)  
Vivian Siqueira Santos Gonçalves - [orcid.org/0000-0001-6893-8263](https://orcid.org/0000-0001-6893-8263)