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# Infant deaths investigated by the Prevention Committee of Infant Mortality in region of Paraná State

ÓBITOS INFANTIS INVESTIGADOS PELO COMITÊ DE PREVENÇÃO DA MORTALIDADE INFANTIL EM REGIÃO DO ESTADO DO PARANÁ

MUERTES DE INFANTES INVESTIGADAS POR EL COMITÉ DE PREVENCIÓN EN MORTALIDAD INFANTIL DEL ESTADO DE PARANÁ

Thais Aida de Freitas Mathias<sup>1</sup>, Amanda Nolasco de Assunção<sup>2</sup>, Gisele Ferreira da Silva<sup>3</sup>

## ABSTRACT

This study had the purpose to analyze infant deaths in the 15<sup>th</sup> Regional Health Center of Paraná State, using the result of the investigations of the Committee for the Prevention of Infant Mortality. It is a descriptive exploratory study based on the System of Investigation of Infant Mortality and on the Information System of Live Births in the period of 2000-2006. The infant mortality coefficient decreased from 13.2% to 11.6%. Of the 799 deaths, the Committee investigated 74.5%; 56.5% of which were in the early neonatal period. The diseases originated in the perinatal period and the congenital malformations were the main causes of death. Among them, 70.1% were considered reducible. The reducibility of death was greater among adolescent mothers' babies, newborns of  $\geq 2500$ g, normal childbirth, black, mulatto and indigenous races, and on mothers without prenatal care. The analyses of the deaths should be performed together with the family health teams, who know the pregnant women best, in order to improve the work and the quality of the analyses from the Committee.

## KEY WORDS

Infant mortality.  
Professional staff committees.  
Information systems.  
Epidemiologic surveillance.

## RESUMO

Este estudo teve como objetivo analisar óbitos infantis na 15<sup>a</sup> Regional de Saúde do Paraná utilizando o resultado das investigações do Comitê de Prevenção da Mortalidade Infantil. Trata-se de um estudo descritivo exploratório, a partir do Sistema de Investigação de Mortalidade Infantil e Sistema de Informações sobre Nascidos Vivos no período de 2000 a 2006. O coeficiente de mortalidade infantil diminuiu de 13,2% para 11,6%. Dos 799 óbitos, o Comitê investigou 74,5%; destes, 56,5% no período neonatal precoce. As afecções originadas no período perinatal e as malformações congênicas foram causas principais de óbito. Foram considerados redutíveis 70,1% dos óbitos. A redutibilidade foi maior para óbitos de mães adolescentes, recém-nascidos  $\geq 2500$ g, parto normal, raça/cor preta, parda e indígena e mães sem consulta de pré-natal. As análises dos óbitos devem ser efetuadas mais próximas das equipes de saúde da família, que conhecem as gestantes para aprimoramento do trabalho e qualidade nas análises do Comitê.

## DESCRIPTORES

Mortalidade infantil.  
Comitê de profissionais.  
Sistemas de informação.  
Vigilância epidemiológica.

## RESUMEN

Estudio que tuvo como objetivo analizar las muertes infantiles en la 15<sup>a</sup> Región de Salud de Paraná basadas en los resultados de investigaciones del Comité de Prevención en Mortalidad Infantil. Se trata de un estudio descriptivo exploratorio utilizando para ello el Sistema de Investigación de Mortalidad Infantil y el Sistema de Informaciones sobre los Nacidos Vivos durante el período de 2000 a 2006. El coeficiente de mortalidad infantil disminuyó de 13,2% para 11,6%. Del total de muertes encontradas (799), el comité investigó 74,5%, de las cuales 56,5% fueron durante el período neonatal precoz. Las afecciones durante el período perinatal y las malformaciones congénitas fueron las principales causas de muerte. El 70,1% de las muertes fueron consideradas como deducibles. De la misma forma, se dedujo que la mayor proporción de muertes fueron las de niños de madres adolescentes, recién nacidos  $\geq 2500$ g de peso, parto normal, raza/color negra, parda e indígena, así como aquellas madres que no tuvieron consulta prenatal. Análisis como estos, deben ser realizados de forma más visible para los equipos de salud de la familia, quienes conocen a las gestantes, de esta forma será posible mejorar la forma del trabajo y la calidad en las discusiones dentro del Comité.

## DESCRIPTORES

Mortalidad infantil.  
Comité de profesionales.  
Sistemas de información.  
Vigilancia epidemiológica.

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## INTRODUCTION

The infant mortality rates have presented a continuous decline in Brazil, mainly due to basic sanitation actions, increased access and better pre-natal and labor quality<sup>(1)</sup>. Besides being admittedly a classic health status indicator, since it reflects the socioeconomic and environmental conditions of the population, infant mortality is also considered an event indicating easy access and service quality<sup>(2)</sup>.

The reduction of the number of deaths in children younger than 1 year old still represents a challenge and one of the highest-priority public healthcare problems, mainly because a large part of these deaths are considered to be avoidable.

Infant mortality presents itself in variable magnitudes, being inversely proportional to the each region's degree of development. In 2005, in Brazil, the southern region represented the lower rates of infant mortality, with 14.5% per thousand born alive in relation to the other Brazilian regions: Southeast Region 14.8%, Central-West 16.3%, Northeast 20.4% and North 19.6%. In 2005, the state of Paraná was the state, which presented the higher infant mortality rate in the South Region, with 14.5%, with Santa Catarina at 12.6% and Rio Grande do Sul at 13.7%<sup>(3)</sup>. These values could still be reduced, considering the possibility of avoiding death especially during the perinatal and neonatal periods, which are critical to infant death.

According to each period, a difference in the internal distribution of the deaths related to the infant mortality components can be observed. In the neonatal period, a large share of the deaths occurs in the first days of the children's life, and about 40% occur in the first day of life<sup>(4)</sup>. The deaths in the neonatal period have declined slowly, indicating deaths that may possibly be decreased due to their close relation with the difficulty of access and use of healthcare services<sup>(2)</sup>, besides the quality of prenatal, delivery and newborn healthcare, with mortality being higher in the lower-income social groups<sup>(5)</sup>. The public interventions to improve access and quality of prenatal, labor and newborn healthcare have been considered complex and expensive<sup>(2)</sup> which contributes to delays and difficulties that the cities and healthcare services have found in decreasing the death rate in the neonatal period.

Literature has emphasized the necessity of constantly stimulating and monitoring deaths occurring in the first year of life, because most of them can be avoided. These avoidable deaths are considered sentinel events to evaluate the quality of assistance<sup>(6)</sup> and are called *unnecessary* deaths<sup>(7)</sup> or even *consensual* deaths<sup>(8)</sup>. Avoidable infant deaths can be classified as those that should not occur, if the science and technology available nowadays is considered<sup>(9)</sup>. Therefore, failure in the services or healthcare attention in the case of infant deaths should be observed.

Among the strategies adopted to monitor and decrease infant mortality, the Ministry of Health (MS) created the Committees for Prevention of Infant and Fetus Mortality, implanted by resolution nº 1399 of the MS<sup>(4)</sup>. The organization and work of the Committees for Prevention of Infant and Fetus Mortality have collaborated in the improvement of information about mortality and made possible the improvement of the organization of healthcare assistance for reduction of preventable deaths<sup>(4)</sup>. The Committee for prevention of infant mortality in the State of Paraná was implanted in 1994 with the nomination of members and the elaboration of internal regulations, and was legalized through state resolution in 1999<sup>(9)</sup>.

The Committees have the purpose of elucidating the circumstances of infant deaths, identifying the risk factors and propose measures to improve of health assistance quality to reduce mortality<sup>(4)</sup>. The regional and municipal Committees analyze the infant death in detail, looking at the mother's and the child's documents, as well as hospital and ambulatory records, home interview data, Birth Certificate (DN) and death certificate (DO).

Recently, in March/2004, the Ministry of Health presented the National Pact for the Reduction of Maternal and Neonatal Mortality, with the objective of articulating the social actions to improve the quality of life of women and children, with a policy of granting high priority privileges to health services<sup>(10)</sup>. The federal government, the government of the state of Paraná and the State Health Department (SESA) have undertaken efforts with fortifying proposals and policies for monitoring basic healthcare actions with the purpose of incorporating and evaluating processes in the organizations and routine of the health services.

The reduction of maternal, neonatal and infant mortality are among the essential priority objectives of the Single Health System (SUS), developed in basic healthcare and the Family Health Program (FHP). In this perspective, the *National Pact for the Reduction of Maternal and Neonatal Mortality in Paraná*, which predicts a 10%-reduction in the maternal and infant mortality indicators until 2007<sup>(10)</sup>, the knowledge of morbidity and mortality profiles becomes necessary, consequently improvement of existing health service database in used as the basis for this description. Therefore, it is essential to know the infant mortality in order to evaluate healthcare actions related to infant health that will be developed in the cities. Due to the social relevancy of infant mortality, mainly in the neonatal period, and to the constant necessity of keeping the visibility of the problem, is why this study was proposed. The purpose was to analyze the infant deaths, having the results of investigations accomplished by Committees for the Prevention of Infant Mortality (CRPMI) of 15th RS as its source.

Avoidable infant deaths can be classified as those that should not occur, if the science and technology available nowadays is considered

## METHOD

It is an exploratory descriptive study, which analyzes all infant deaths of residents in the cities of the 15<sup>th</sup> RS, investigated by the CRPMI of 15<sup>th</sup> RS of the state of Paraná, which occurred from January 1<sup>st</sup>, 2000 to December 31<sup>st</sup>, 2006. The state of Paraná is divided in 22 Regional Health Units (RS). Maringá houses the headquarters of the 15<sup>th</sup> RS, which is constituted by 30 cities in the Northwestern region of the state.

Until 2004, the CRPMI of 15<sup>th</sup> RS investigated the deaths in liveborn children with weight equal or superior to 1000g. From 2005 on, all deaths were investigated, regardless of the baby's weight at birth. The cities are requested to send the documents about infant death of its residents to the 15<sup>th</sup> RS for analysis, besides the home visit report – the moment when data is collected with the family, including: prenatal and birth data, life history and the circumstances of death, according to the information from the interview. The work of the CRPMI consists in analyzing all documents available, the investigation file and home interview; discussing cases; establishing an itinerary from the prenatal exams to delivery; reconstituting the history, by analyzing the complications that led to death, determining the reducibility, the reducibility criteria, the casual determinants of death, the preventive measures; and also, establishing the basic cause, which may or may not coincide with the death certificate. With this detailed analysis, it is possible to improve the knowledge of the circumstances of death and identifying the risk factors. After analysis and conclusion of the case, the data were transferred to the Infant Mortality Investigation System (SIMI).

SIMI is a data and information storage system developed by SESA in 2000 to store the main conclusions of the analysis of infant deaths through Regional Committees, which allows the of data to be obtained quickly through an intranet web at SESA<sup>(9)</sup>. For this study, data was researched through SIMI, and infant deaths were analyzed according to the periods: early neonatal (deaths occurred in the first 7 days from birth), late neonatal (deaths occurred from the 8<sup>th</sup> to the 27<sup>th</sup> day of life) and post-neonatal (from the 28<sup>th</sup> day to 11 months of life), according to basic cause, death reducibility, reducibility criteria and casual determinants.

In 2005 and 2006 a SINASC database was used for the reducibility analysis after *linkage* with SIMI, based on the DN number. The research project was analyzed and approved by the Ethics Committee at State University of Maringá, following the regulations present in the Resolution 196/96 of the National Commission of Ethics (Report 130/2006).

## RESULTS

The infant mortality coefficient of the 15<sup>th</sup> RS decreased from 13.2% deaths in 2000 to 11.6% deaths in a thousand liveborns in 2006. Of the 799 infant deaths from 2000 to 2006 occurred in residents of the 15<sup>th</sup> RS, CRPMI investigated 595, of which 336 (56.5%) occurred in the early neonatal period, 82 (13.8%) in the late neonatal and 177 (29.7%) in the post-neonatal period (Table 1).

Most deaths occurred due to conditions originated in the perinatal period, representing 54.8%, and the congenital malformation, 21.8% (Table 1). These two basic causes were

**Table 1** – Investigated infant deaths according to basic cause and period, 15<sup>th</sup> RS of Paraná - 2000 to 2006

Causes*	Neonatal						Post-neonatal		Total	
	Early		Late		Total					
	n	%	n	%	n	%	n	%	n	%
Cond. originated in the perinatal period	245	72.9	53	64.6	298	71.3	28	15.8	326	54.8
Congenital Malformation	75	22.3	21	25.6	96	23.0	34	19.2	130	21.8
External Causes	4	1.2	2	2.4	6	1.4	38	21.5	44	7.4
Badly-defined	10	3.0	3	3.7	13	3.1	16	9.0	29	4.9
Respiratory System Diseases	1	0.3	-	-	1	0.2	24	13.6	25	4.2
Infectious and parasitic diseases	-	-	1	1.2	1	0.2	20	11.3	21	3.5
Nervous System Diseases	1	0.3	1	1.2	2	0.5	8	4.5	10	1.7
Neoplasias	-	-	1	1.2	1	0.2	3	1.7	4	0.7
Circulatory System Diseases	-	-	-	-	-	-	3	1.7	3	0.5
Endocrine and Nutritional Diseases	-	-	-	-	-	-	3	1.7	3	0.5
<b>Total</b>	336	56.5	82	13.8	418	100	177	29.7	595	100

\* Chapters of International Classification Diseases, 10<sup>th</sup> Review (OMS, 1998).

also the most important causes of death in the early neonatal period (72.9% and 22.3%, respectively) and the late neonatal period (64.6% and 25.6%, respectively). After the 28<sup>th</sup> day of life, external causes were the highest-rated, with 21.5%; after those, congenital malformation, 19.2%; conditions originated in the perinatal period, 15.8%, dis-

eases in the respiratory system, 13.6%; and infectious and parasitic diseases, with 11.3% of the total deaths in the period. Of the total deaths investigated in the 7 years of study, it was not possible to establish a definite basic cause in 29 cases (4.9%), even after investigation by the committee (Table 1).

Still, considering the whole period, the most of the investigated infant deaths was considered to be reducible, with percentages between 60% and 70% (Table 2). Reducible deaths stood out by adequate attention to gestation, birth and to the newborn (52.4%), and death that could be reduced by diagnosis, early treatment and healthcare education (9.2%) (Table 3), including sepsis and respiratory

infections, according to the classification used by the Committees of Paraná. It was not possible to establish criterion of avoidability to 4.9%; 22.7% of these deaths were considered difficult to reduce (Table 3). For deaths considered reducible, the main determinants pointed out by the Committees were: hospital assistance, medical and ambulatory assistance.

**Table 2** – Infant deaths investigated according to its reducibility, 15<sup>th</sup> RS of Paraná - 2000 to 2006

Year	Reducible		Non-reducible		Inconclusive		Total
	n	%	n	%	n	%	
2000	43	60.6	16	22.5	12	16.9	71
2001	53	63.1	22	26.2	9	10.7	84
2002	54	65.9	24	29.3	4	4.9	82
2003	61	77.2	16	20.2	2	2.5	79
2004	52	70.3	20	27.0	2	2.7	74
2005	80	77.7	23	22.3	-	-	103
2006	74	72.5	25	24.5	3	2.9	102
<b>Total</b>	<b>417</b>	<b>70.1</b>	<b>146</b>	<b>24.5</b>	<b>32</b>	<b>5.4</b>	<b>595</b>

**Table 3** – Infant deaths investigated according to reducibility criteria, 15<sup>th</sup> RS of Paraná - 2000 to 2006

Reducible criteria	Total	
	n	%
Adequate attention to gestation, birth and the newborn infant.	312	52.44
Difficult to reduce	135	22.69
Diagnosis and early treatment and healthcare education.	55	9.24
Adequate attention to trauma and urgencies.	47	7.90
Badly-defined causes.	29	4.87
Sanitation, oral rehydration therapy and breastfeeding.	11	1.85
Other death causes	5	0.84
Battling malnutrition, breastfeeding encouragement	1	0.17
<b>Total</b>	<b>595</b>	<b>100.00</b>

The reducibility analyzed in 2005 and 2006 was higher for infant deaths of adolescent mothers (84%) and mothers over 35 years old (80.9%). According to the number of prenatal consultations, the reducibility was inversely proportional, reaching 100% for infant deaths of mothers that did not have any consultation. The deaths in babies who

were born with more than 2500g, in a normal delivery, with Apgar in the 5<sup>th</sup> minute out of 8-10, and black/mulatto/indian race/color were those considered most frequently reducible by the Committee, resulting in 81.8%; 82.9%; 82.3%; 84.2%, respectively (Table 4).

**Table 4** – Infant deaths according to reducibility and variations of the mother, gestation, delivery and newborns, 15<sup>th</sup> RS of the state of Paraná - 2005 to 2006

Variable	Reducible		Non-reducible		Total	
	n	%	n	%	n	%
<b>Mother's age</b>						
10 to 19	42	84.0	8	16.0	50	25.1
20 to 34	93	72.7	35	27.3	128	64.3
35 and over	17	80.9	04	19.1	21	10.6
<b>Mother's education</b>						
Up to 7 years	60	80.0	15	20.0	75	37.7
8 and more	92	74.2	32	25.8	124	62.3
<b>Marital Status</b>						
Without partner	96	78.0	27	22.0	123	62.4
With partner	55	74.3	19	25.7	74	37.6
<b>Dead Children</b>						
None	128	76.2	40	23.8	168	84.8
1	19	82.6	4	17.4	23	11.6
2 or more	4	57.1	3	42.9	7	3.5
<b>Prenatal Consultations</b>						
None	13	100.0	-	-	3	6.6
1 to 3	24	80.0	6	20.0	30	15.2
4 to 6	57	78.1	16	21.9	73	37.1
7 and more	56	69.1	25	30.9	81	41.1
<b>Gestation length</b>						
Up to 27	49	74.2	17	25.8	66	33.3
28 to 31	23	88.5	3	11.5	26	13.1
32 and more	79	74.5	27	25.5	106	53.5
<b>Type of Delivery</b>						
Normal	87	82.9	18	17.1	105	52.8
Cesarean	65	69.1	29	30.9	94	47.2
<b>Weight at birth</b>						
< 1499 g	70	75.3	23	24.7	93	46.7
1500 to 2499	28	70.0	12	30.0	40	20.1
2500 and more	54	81.8	12	18.2	66	33.2
<b>Apgar 5<sup>th</sup> minute</b>						
0-3	29	64.4	16	35.6	45	22.8
4-7	42	75.0	14	25.0	56	28.4
8-10	79	82.3	17	17.7	96	48.7
<b>Congenital Anomaly</b>						
Yes	3	14.3	18	85.7	21	10.6
No	149	83.7	29	16.3	178	89.4
<b>Race/color</b>						
White, yellow	120	74.5	41	25.5	161	80.9
Black, mulatto, Indian	32	84.2	06	15.8	38	19.1

Note: All the percentages disregard the ignored subjects.

## DISCUSSION

The results of the present study point to a reality in agreement with what has been found in other regions of the country: a decreasing infant death rate coefficient, a higher percentage of infant death rates in the neonatal period with conditions started during the perinatal period as the main cause of death<sup>(2,5,11-12)</sup>. In the RS studied, most deaths were considered reducible, with reducibility criteria focusing on the correct healthcare attention from gestation to birth, and also to the newborn.

Also in the national scene of declining infant mortality, it can be observed an increased percentage of deaths occurred in the neonatal period, with perinatal causes ranked highest. Although desirable, and considering that this fact occurs due to the decreasing of deaths occurred in the

post-neonatal period, which in turn are associated to life conditions, almost two thirds of death causes in the neonatal period in the 15<sup>th</sup> RS occurred by conditions originated in the perinatal period, differently from what usually occurs in developed countries where the main cause of death in this period is the congenital malformation<sup>(13)</sup>.

The high proportion of death from perinatal conditions constitute a warning sign, because these deaths are associated to the early pregnancy interruption or the intrauterine growth retardation signaled to a deficitary prenatal assistance<sup>(14)</sup>. Still, birth hypoxia or asphyxia indicates inadequate assistance at the hospitals at the moment of delivery<sup>(5)</sup>.

Deaths due to conditions originated in the perinatal period still present a high percentage in the post-neonatal period show the survival of these babies, which often are hospitalized since their birth. The persistence of this group of death causes in the post-natal period was also identified in a study performed in Rio de Janeiro from 1999 to 2001, when it was suggested that there may be deficiencies in the specialized assistance in hospitals that would prolong newborn's lives, but not avoiding death<sup>(15)</sup>.

It was also observed that the congenital malformations were the second highest death cause in the neonatal period and were more frequent after the 7th day of life. Improvements on the attention given to healthcare may be exemplified by this increase of congenital malformations, which are related to the development of the country<sup>(13)</sup>.

In the 15<sup>th</sup> RS of the state of Paraná, in the post-neonatal period, deaths by respiratory system diseases and infectious and parasitic diseases were still observed in 24.9% of the total deaths and only 0.5% in the other periods. The higher concentration of deaths by infectious parasitic diseases in Brazil from 1996 to 1999 was 50.7% in children under five years old. Among the infectious and parasitic diseases, acute diarrhea represents 53% of deaths in children younger than 1 year old<sup>(12)</sup>. This decrease was due to several factors, such as: immunization programs made effective by the Ministry of Health, basic sanitation improvements with reduction of deaths by infectious intestinal disease and educative actions focused on the population mainly for the use of homemade saline solutions to treat dehydration<sup>(1)</sup>. The respiratory system diseases represent about 6% of the deaths in children younger than 1 year old. From 1996 to 2004, there was a reduction of approximately 30% in the country, with the southern region standing out due to reducing deaths by this cause in 48%<sup>(12)</sup>.

The main external cause of death is in the post-natal period, which was surprising. Of the 44 deaths occurred by external causes from 2000 to 2006, six occurred until the 28<sup>th</sup> day of life, and the other 38 occurred in the post-neonatal period, mostly by other accidental respiratory risks or by inhalation of the gastric contents. The orientation to mother and family about preventive measures related to gastric content aspiration are coherent with the reducibility criteria attributed by the Committee. Almost 8% of the reducible criteria were related to adequate attention to trauma and urgency.

Concerning the deaths investigated by CRPMI in the 15<sup>th</sup> RS from 2000 to 2006, only 4.9% were due to badly defined causes, being more frequent in the post-natal period. Analyzing the badly defined causes of death, a decrease can be observed, because in 2000 there were 12.7% cases and in 2006 they decreased to 3% (data not shown). This decrease can be due to the work of the Committee, besides the gradual improvement of the material received and analyzed in the investigations. Over the years, an improvement of the information collected through the health-

care workers in home interviews has been seen, along with better comprehension and adherence to the work of the Committee, more complete documents being sent, prenatal attendance medical records, mother's hospitalization for delivery and also the child's hospitalization medical record. However, there is still a resistance for the presentation of documents and medical records of pregnant and children by doctors in clinics and hospitals in prenatal cases and deliveries financed by healthcare plans and insurance companies. When that occurs, there is a lack of information, mainly of the clinical prenatal evolution. In these situations, the Committee concludes that the investigation material was not satisfactory. This lack of information can also influence the amount of badly defined causes of death and in the attributions of reducibility.

The CRPMI has intensified the visits to cities belonging to the 15<sup>th</sup> RS with the objective of sensitizing the healthcare teams about the importance of quality assistance to pregnant woman in the prenatal and delivery periods, besides the quality of information notes in the medical records. The percentage of badly-defined causes that still persists could be reduced if the cities adopted a working process similar to the one adopted at Instituto Materno Infantil de Pernambuco (IMIP) located in the city of Recife, where all the DOs undergo a systematic review process, having the *gold standard* medical record, reducing the chance of badly-defined basic causes of death to nearly zero<sup>(2)</sup>.

In the 15<sup>th</sup> RS, from 2000 to 2006, almost two-thirds of infant deaths were considered reducible. This result is similar to what was obtained in a study performed in São Luis – MA, from 1979 to 1996, which accomplished a reducibility of 70% in neonatal infant deaths, reducible by diagnosis and early treatment and partially reducible by adequate pregnancy control<sup>(11)</sup>. Most deaths considered avoidable could be prevented with the improvement of prenatal, delivery and newborn assistance – not only by its clinical resolution, but also to the organization of healthcare assistance in hierarchical and regional systems, assuring that the pregnant woman and the newborn can have access to quality services in time<sup>(5)</sup>.

The reducible analysis for the last two years of the period (2005 to 2006) showed some variables indicate inequality in healthcare, vulnerability, risk or disadvantages for the population regarding morbidity and mortality. Therefore, the Committee for Mortality Prevention of the 15<sup>th</sup> RS of Paraná attributed a higher reducibility percentage to infant deaths of adolescent mothers, mothers who did not do the prenatal routines, mothers with up to 7 years of education and of race/color black and mulatto.

However, the objective of this study was not to contemplate the race/color variable as category of analysis. It was possible to verify a higher vulnerability in black children related to reducible infant death. A similar result was found in the analysis of infant mortality by race/color according to avoidable deaths<sup>(16)</sup>. In Brazil, in 2000, 84% of

infant deaths of race/color black were considered avoidable against 81% of deaths in race/color white. The inequality analysis in healthcare according to race/color is possible when birth, Sinasc and death data is used by the SIM. From these analyses, the social exclusion experienced by the black population puts its members in a highly disadvantageous position<sup>(16)</sup>, in vulnerable conditions and exposed to major risks due to the accumulation of inequalities. It is necessary to sensitize the healthcare managers in order to perform actions that promote equity in healthcare and transform the studies and research into public policies<sup>(17)</sup>.

Another result of this study was a greater reduction of newborn deaths in conditions that should represent a minor risk and higher survival probability for normal delivery newborns, weighing over 2500g, with Apgar in the fifth minute of 8 to 10 and without congenital anomalies. In this study, these variables were analyzed in an isolated way, but it is known that they must be observed under a determinate focus and in groups, because they decrease the differences in the social-demographic profile of the population in study.

Despite the scientific progress absorbed by hospitals, which represents real conditions of preventing morbidity and mortality in risky delivery assistance, it is evident that these occurrences are often caused by the indiscriminate use and abuse of the same scientific progress. The climax of intervention abuse is shown in the excessive amount of cesarean deliveries, because it is a profitable instrument for hospitals and doctors for being faster, favoring a higher number of procedures and being stimulated by the type of payment and unit of assistance<sup>(18)</sup>.

In its wider dimension, mortality is determined by the social, economic and cultural conditions of the person and the population group that they belong to. In case of perinatal mortality, the participation of these determinants is still strong. The survival chances of the child are closely related to information access, healthcare services and the quality of prenatal attention that the mother receives. In the same way, the delivery assistance and the available technology for newborn care determinates their future quality of life<sup>(13)</sup>.

The percentage of 24.5% of deaths attributed as non-reducible by the CRPMI of the 15<sup>th</sup> RS is in compliance with the 24% found in a study performed in 2000 in the reference hospital in Pernambuco, according to criteria of basic cause avoidability in infant deaths<sup>(2)</sup>. In another study, comparing the infant mortality observed with the expected mortality, a 20% rate of *non-avoidable* infant mortality was found in two cities of the Brazilian northeast in 1990 and 1991<sup>(8)</sup>.

Considering the precarious information system in developing countries, it was pretentious to discuss the

veracity of the information obtained from the avoidable infant mortality concept. Therefore, the conclusions of the avoidable death rate represent a minimum proportion estimator of deaths that could be avoided without further expenses<sup>(8)</sup>.

With the result of this study, it was reinforced that adequate gestation, delivery and newborn attention are still the top criterion for infant death reducibility. Similar results were also found in Belo Horizonte, where 40% of the perinatal deaths could have been avoided with the organization of the assistance network and the improvement in the clinical service to pregnant women and newborns<sup>(5)</sup>. In São Luis-MA from 1979 to 1996, it was highlighted the need for improvement of the prenatal, delivery and newborn quality programs including the reduction of cesareans and re-adequation of neonatal assistance, which was characterized by an insufficient number of intermediate units and by high-risk service<sup>(11)</sup>.

The main causal determinants, previously named by those who were responsible for the death, identify if the death is linked to family, social, medical, hospital or ambulatory assistance responsibility or without criterion of responsibility in case such death is considered non-reducible.

The survival chances of the child are closely related to information access, healthcare services and the quality of prenatal attention that the mother receives.

Death classification concerning avoidability and responsibility often has subjective aspects. To increase its validity, the Committees must be multiprofessional. The multiplicity of opinions lowers subjectivity and reinforces the necessary decisions to decrease the infant mortality rate. In the study about avoidable infant mortality executed in two Brazilian northeastern cities from

1990 to 1991<sup>(8)</sup>, there was a clear necessity of knowing the profile of causality so as to avoid underestimating the proportion of preventable occurrences. The balance of reducible criteria as approximation of the cost-effectiveness to prevent deaths was shown to be coherent and relevant to strengthen the validity of measure construction.

The identification of avoidable deaths as the result of failures in the healthcare system and differences in the access and quality of assistance, and the recognition of high perinatal mortality rates are closely related to the healthcare performance, which calls the managers to action, in a way that they may provide the population with access to quality services. The regionalization and qualification of assistance and the universalization of access are, therefore, priority actions and effective interventions to lower the rates and the inequality of perinatal and infant mortality in Brazil<sup>(5)</sup>.

Investigating the mortality causes means studying the society, which produces its own health, disease and death, an extreme example of deprivation of the citizen's quality of life. It means investigating the effects of a developmental model, which produces life conditions, and the work which

exposes, families and persons to risks or protections which may, in turn, either improve or fragilize their health<sup>(13)</sup>. The number of deaths can be controlled, even in communities presenting precarious conditions of socioeconomic development, but this always depends on political decisions, organization of healthcare and social services and the adoption of permanent educational actions.

## FINAL CONSIDERATIONS

The analysis result of the work of the CRPMI of the 15<sup>th</sup> RS of Paraná pointed firstly to the evolution of the percentage of investigated deaths, which gradually increased in the period, considering that until 2004, the Committee analyzed only the deaths in children born with 1000g or more, and from 2005 onwards, all deaths were investigated. This variation in the amount of deaths analyzed in the research period may indicate the oscillation of the amount of deaths in children lighter than 1000g, and also the working capacity of the Committee of 15<sup>th</sup> RS. The causes of this variation in the investigated amount of deaths must be a permanent internal issue of the Committee for constant improvement of the working process, and also the quantity and quality of its analysis.

Due to the relevancy of infant mortality studies, some considerations related to information could be highlighted concerning the importance of its work, developed through the Committees of prevention of infant mortality in the investigation of death and the production of this information. Besides the task of keeping the infant mortality problem constantly visible, the results of the investigations of the Committees have added information and identified factors, which are not possible to analyze with official statistics, such as: establishing avoidability and reducibility of infant death criteria and contributing to adopting actions to promote reduction of avoidable infant mortality. The analysis and case studies of death also help in the improvement of official healthcare statistics, since, after investigation, the Committees often attribute new basic causes of infant death.

Therefore, regarding infant mortality, it was concluded that most deaths are avoidable after investigation by the Committees. Knowing and discriminating each weak spot of the healthcare system with attribution of responsibilities and causal determinants for each infant death analyzed, the adoption of improved working processes in the cities is urgent. There is also an urgent need for investment on capacitating family healthcare teams and workers acting in specialized delivery and birth reference services to revert this situation, which is very common in several cities and regions of the country. It is also necessary capacity. Developing the technical capacity of the whole healthcare team to detect

and assist gestational risks (mother-son); bringing the pregnant woman to initiate prenatal early in the first trimester of gestation; guaranteeing the accomplishment of the predicted laboratorial exams, attention in the results of these exams; monitoring and updating of the tetanus immunization; orientation on breastfeeding; controlling blood pressure and diabetes are some measures which must be started and improved at the local level to improve the service provided to the mother and the baby.

Concerning the organization of the healthcare services, the reference system should be promoted to improve the follow-up of the pregnant woman at a local level. The city managers must conduct dialogues with the State to establish and formalize the policies in the reference and counter-reference networks towards gestation and high-risk newborns.

In relation to the SUS, it is necessary to strengthen the strategies and action of the PSF, its role as the entry door to the healthcare system, as well as its responsibility for sheltering and managing prenatal assistance, the pregnant woman and the newborn who live within its sphere of influence. It is necessary to discriminate and discuss the attribution of the PSF nursing teams with the objective of strengthening the integration among obstetricians, pediatricians, the nursing staff and other professionals of the Basic Healthcare Units.

In the history against infant mortality, it can be observed the inexistence of a single path, but several, which, if seriously adopted, lead to reduction. In this struggle, the role of the community, families, healthcare education professionals is a strategic condition for support and involvement since the children integrate said families and communities. Therefore, considering the close relation between quality of life and infant mortality, while social inequality persists, population groups are still exposed to risks of disease and death, and the responsibility of the healthcare services is more evident for these groups.

It is important to improve the Committees' organization in each hospital to evaluate all infant deaths occurring in hospitals, as well as analyzing the routines and activities developed in the delivery rooms and ICU. Furthermore, extending the multiprofessional participation in the Committees, with a consequent agility in their work, obtaining higher quality of data with a more direct investment in the attributions related to the democratization and decentralization of the studies and the investigation of deaths. This way the analyses can be performed even closer to the family healthcare staff, which really knows the community and the pregnant women, articulating and encouraging actions that improve the health of the population.

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