Quality of the Live Birth Information System in the State of Paraná, from 2000 to 2005*

QUALIDADE DO SISTEMA DE INFORMAÇÕES DE NASCIDOS VIVOS NO ESTADO DO PARANÁ, 2000 A 2005

CALIDAD DEL SISTEMA DE INFORMACIONES DE NACIDOS VIVOS EN EL ESTADO DE PARANÁ, 2000 A 2005

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ABSTRACT

This study analyzed the quality of the Live Birth Information System in the State of (SINAC) Paraná, Brazil, from 2000 to 2005, through the percentage of *undeclared* variables, using a database provided by the State Health Department. Quality was analyzed using the following scale: excellent, undeclared percentage < 1%; good between 1% and 2.99%; regular between 3% and 6.99%; and poor ≥ 7%. The quality in completing the SINAC in Paraná was excellent, especially as of year 2003. The mothers' *occupation*, classified as regular and poor, was the variable with the lowest quality in all Regional Health Departments. Live births, stillbirths, and race/color varied between poor and excellent quality. There is a need to improve the quality of the variables marital status and stillbirths in all Regional Health Departments. The excellence of the SINAC demonstrated its potential as a source of health information in Paraná.

KEY WORDS
Information Systems.
Live birth.
Public health nursing.
Health evaluation.

RESUMO

Analisou-se a qualidade do Sistema de Informações de Nascidos Vivos no Estado do Paraná, de 2000 a 2005, por meio do percentual de *não declaração* das variáveis, utilizando banco de dados cedido pela Secretaria de Saúde de Estado. Utilizou-se a seguinte escala: excelente, percentual de não declaração < 1%; boa de 1% a 2,99%; regular de 3% a 6,99% e ruim ≥ 7%. A qualidade do preenchimento do SINASC no Paraná foi excelente, principalmente a partir de 2003. A ocupação da mãe, classificada como regular e ruim, foi a variável de menor qualidade em todas as Macro-Regionais de Saúde. Filhos nascidos vivos, nascidos mortos e raça/cor, oscilaram de ruim a excelente qualidade. É necessário melhorar a qualidade das variáveis estado civil e número de filhos nascidos mortos em todas as Macro-Regionais de Saúde. A excelência do SINASC demonstrou a sua potencialidade como fonte de informação da saúde no Paraná.

DESCRITORES
Sistemas de Informação.
Nascimento vivo.
Enfermagem em saúde pública.
Avaliação em saúde.

RESUMEN

Se analizó la calidad del Sistema de Informaciones de Nacidos Vivos en el Estado de Paraná, de 2000 a 2005, a través del porcentual de *no declaración* de las variables, utilizando banco de datos cedido por la Secretaría de Salud del Estado. Fue utilizada la siguiente escala: excelente, porcentual de datos de no declaración < 1%; buena, de 1% a 2,99%; regular, de 3% a 6,99%, y mala ≥7%. La calidad de rellenado del SINASC en Paraná fue excelente, principalmente a partir de 2003. La ocupación de la madre, clasificada como regular y mala, fue la variable de menor calidad en todas las Macro-Regionales de Salud. Hijos nacidos vivos, nacidos muertos y raza/color, oscilaron de mala a excelente calidad. Es necesario mejorar la calidad de las variables Estado Civil y Número de Hijos Nacidos Muertos en todas las Macro-Regionales de Salud. La excelencia del SINASC demostró su potencialidad como fuente de información de salud en Paraná.

DESCRIPTORES
Sistemas de Información.
Nacimiento vivo.
Enfermería en salud pública.
Evaluación en salud.

INTRODUCTION

The Brazilian Information System on Live Births (SINASC) was implemented in 1990 by the Ministry of Health in response to the need for a continuous system of data collection to obtain, in addition to a count of births, information on the characteristics of mothers, pregnancy, delivery, and newborns[1]. The creation and use of SINASC and other Health Information Systems (HIS) is a Brazilian National Health System (SUS) strategy to decentralize actions and enable the planning and evaluation of care according to local needs.

To develop indicators related to the cities' commitment to management, the SINASC is an important source for computing the proportion of low-weight live births, of mothers with four or more and seven or more prenatal visits, C-sections, the coefficient of infant mortality, neonatal, infant mortality due to diarrhea, pneumonia, and maternal mortality rate[2]. Analysis of the SINASC data permits identifying health situations in a disaggregated manner, that is, by cities or places where delivery occurred. For that, it is necessary to have good coverage and also efficient completion, coding, correcting and typing of data[3].

The quality of information systems of vital statistics can be evaluated from the point of data collection, looking at the percentage of blank or underreported information and the accuracy and consistency of data[4]. Hence, proposals to improve the quality of data in the SINASC should be implemented because an absence of information compromises the establishment of specific indicators, hindering the monitoring process[5].

Since the implementation of SINASC in 1990, health services, hospitals and maternity hospitals are responsible for filling in the Birth Certificate form (BC), which is a basic and mandatory document necessary to enter into the system and that can be filled out by any trained person[6]. It was verified in Ribeirão Preto that pediatricians and clerks filled out the BC, though the nursing staff, mainly nursing auxiliaries and attendants, were responsible for this task[7]. The quality of information was evaluated in this city in 1996 and revealed an agreement up to (above) 90% for 13 of the 18 variables when compared to those filled in by the researchers (BC-control) based on the information provided in the newborns' and mothers' medical files.

Acknowledging the potential of SINASC, measuring the quality of information contained in this system is a necessary step to identify its limitations and deficiencies[8] and also contribute to correcting potential failures so that planning and monitoring are based on minimally distorted and underestimated data[9]. Coupled with this fact is the need for new studies to evaluate the quality of SINASC in the state of Paraná, Brazil, mainly considering the Macro Health Districts.

> The quality of information systems of vital statistics can be evaluated from the point of data collection, looking at the percentage of blank or underreported information and the accuracy and consistency of data.

OBJECTIVE

This study evaluated the quality of SINASC in the state of Paraná, Brazil from 2000 to 2005 according to underreporting of mothers' and newborns' data, pregnancy and delivery.

METHOD

This descriptive exploratory study analyzed underreporting of SINASC variables in the state of Paraná, Brazil from 2000 to 2005 according to Macro health districts and regional health districts (SESA-PR: www.saude.pr.gov.br).

The state of Paraná has 399 cities grouped in 22 health regions and six macro regions that compose intermediate administrative levels of the State Department of Health and the Institute of Health and Epidemiology of Paraná (SESA/ISEP). The regional health districts and macro health districts are responsible for developing strategies to support the municipalities, influence management on regional issues fomenting a continuous search for quality efficiency and also for directing the planning of health actions.

The SINASC database used in this study was supplied by SESA, PR and enabled to identify data by regions and, consequently, by macro regions concerning the occurrence of births, which represent this study's units of analysis. The period analyzed was from 2000 to 2005 because at the time of the study, the last year available with consolidated data from the entire state was 2005. The analyzed variables were: mothers' variables (*age, marital status, schooling, occupation, live births* and *stillbirths*), variables of pregnancy and delivery (*duration of pregnancy, type of pregnancy, number of prenatal care visits, type of delivery* and *place where delivery occurred*) and newborns' variables (*gender, Apgar index at the 1st* and *5th minutes, race, weight at birth* and *congenital malformation*).

Underreporting was verified by the sum of data registered in the system as *ignored* plus those left blank. There are two scales to classify the quality of SINASC data. These were developed to analyze data from Brazil in 1993[4] and 2002[10], and data from Minas Gerais[11]. These scales present different values according to the quality of the analyzed database. One of them[10] (2007) classified it as **excellent** up to when the percentage of ignored data reached 5%, as **good** when it was between 5% and 9%, as **regular** when the percentage was from 10% to 19% and as **poor** when it reached 20% or more. Other scales[4-5] classified the quality

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as **excellent** when the percentage of ignored data did not pass 9.9%, as **good** when it remained between 10% and 29.9%, and as **poor** when the percentage of ignored data was equal to or above 30%. For this study, the scale was adapted to the quality situation of SINASC in Paraná, to a situation of satisfactory quality: **excellent** quality when percentage of underreporting was below 1%; **good** quality when between 1% and 2.99%; **regular** when from 3% to 6.99%; and **poor** quality when it was equal to or above 7%.

The quality of SINASC in Paraná was analyzed at first for the set of macro health regions through the relative frequency of underreporting for each year and each variable. Afterwards, the variables that presented, at some point, percentages of underreporting classified as **regular** or **poor** were selected: *mothers' schooling* and *occupation*, *live births* and *stillbirths*, *race* and *congenital malformation*. These variables were stratified according to the six macro health regions in the state.

The research project was submitted to and approved by the Standing Committee on Ethics in Research Involving Human Beings at the State University of Maringá according to Resolution nº 196/96, National Health Council[12] (protocol nº 040/2007).

RESULTS

Table 1 shows the percentage of underreporting of variables of SINASC analyzed for the set of macro health districts regions. In general, it was concluded that the quality of completion improved for all the variables of SINASC in Paraná between 2000 and 2005. For the set of regions, the quality of the variable *mother's occupation* varied from **regular** to **poor** with percentage of underreporting of 9.38% in 2000 and 6.60% in 2005 (Table 1). The quality for information concerning *live births*, *stillbirths* and *congenital malformation* was considered **regular** in 2000 with 3.20%, 6.46% and 4.63% of underreporting, respectively. The variable *stillbirth* displayed **excellent** quality from 2003 on, while the quality of information concerning *live births* was **excellent** from 2002 on. In 2005, except for *mother's occupation*, all the other variables were considered excellent with the percentage of underreporting below 1% (Table 1).
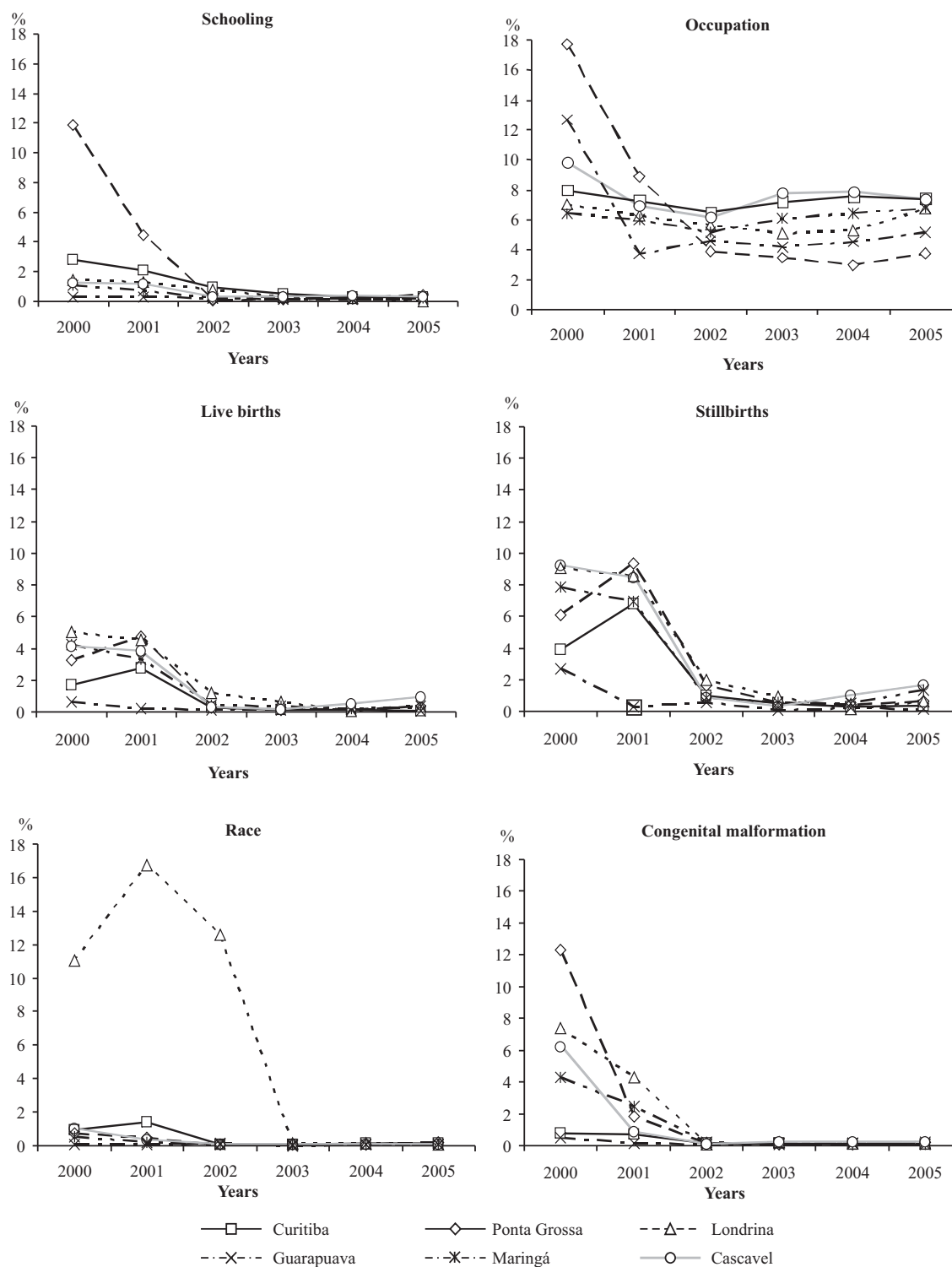
Table 1 - Relative frequency of underreporting on the variables under *mother*, *pregnancy and delivery*, and *newborn* – Paraná, Brazil - 2000 to 2005

Variables	2000	2001	2002	2003	2004	2005
Mother						
Age	0.16	0.10	0.02	0.02	0.02	0.02
Marital status	0.75	0.58	0.20	0.16	0.57	0.50
Schooling	2.91	1.73	0.54	0.32	0.26	0.30
Occupation	**9.38**	**6.82**	**5.68**	**6.20**	**6.35**	**6.60**
Live births	3.20	3.36	0.43	0.25	0.20	0.36
Stillbirths	**6.46**	**7.21**	1.14	0.50	0.43	0.77
Pregnancy and delivery						
Duration of pregnancy	0.40	0.31	0.08	0.07	0.05	0.06
Type of pregnancy	0.07	0.05	0.01	0.01	0.01	0.01
Type of delivery	0.16	0.09	0.05	0.01	0.01	0.01
Nº of prenatal care visits	1.42	1.16	0.44	0.32	0.40	0.30
Newborn						
Gender	0.03	0.02	-	0 .01	-	0.01
Apgar 1st minute	0.84	0.72	0.64	0.42	0.48	0.35
Apgar 5th minute	0.82	0.71	0.61	0.38	0.47	0.33
Race	2.37	3.14	1.94	0.08	0.09	0.10
Weight at birth	0.36	0.23	0.12	0.08	0.05	0.05
Congenital malformation	4.63	1.61	0.12	0.16	0.11	0.15

excellent = < 1%; **good** = 1% to 2.99%; **regular** = 3% to 6.99%; **poor** = > 7%

Figure 1 presents the trends of the percentage of underreporting from 2000 to 2005 for the selected variables, stratified by macro health regions. The macro regions, especially in the beginning of the period, influenced the quality of SINASC in the state. The macro region of Ponta Grossa stood out with the highest percentages of underreporting for *schooling*, *mother's schooling* and *congenital malformation* at the beginning of the period with 11.8%, 17.7% and 12.3%, respectively. In 2001, the figures draw attention to 16.7% of underreporting of the variable *race* in the macro region of Londrina. From 2003 on, except for the variable *mother's occupation*, which still presents **regular** or **poor** quality, all the other variables for all macro regions had already achieved **good** or **excellent** quality. Underreporting was below 3%. Practically no difference was found in the percentages of underreporting for the set of macro heath districts and among the macro regions in the last studied year, 2005 (Table 1).

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Figure 1 - Tendency of relative frequency of underreporting of the mother's variables, pregnancy and delivery, and newborn according to the macro health districts - Parana, Brazil - 2000 to 2005

DISCUSSION

First, this study's results show that from 2000 to 2005, the percentage of underreporting of variables in the SINASC diminished for all the variables, which reach **excellent** quality especially after 2003, though only the variable *mother's occupation* was considered regular, since it was only underreported 6.6% of the time (Table 1).

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On the other hand, when the completion of variables in SINASC is analyzed by macro health regions, some regions are highlighted because these influenced the quality of the SINASC for the entire state of Paraná. For the two initially studied years, 2000 and 2001, Ponta Grossa showed high levels of underreporting, which influenced the quality of the following variables: *schooling*, *mother's occupation* and *congenital malformation*, while the quality of the variable *race* was strongly affected by underreporting in Londrina (Figure 1).

Other studies have shown SINASC data have been efficiently completed in some cities. In Campinas, SP, the quality of completeness was above 99%[13] in 2001. In 2005, underreporting of the variable *mother's age* in Parana had a percentage close to 0.2%, which was the percentage found in Brazil in 2002[10] and close to the 0.4% found in Rio de Janeiro from 1999 to 2001[14], and well below 3.4%, the percentage found in São Luis, MA between 1997 and 1998[15].

In assessing the quality of SINASC for Brazil[1], the variable *congenital malformation*, included in the BCF in 1999, displayed underreporting above 10% in some Brazilian states in 2003. *Mother's occupation* was another variable the completion of which was considered low for the country, especially for the Federal District with 68.1% underreporting in 2003[1]. On the other hand, *weight at birth*, *number of prenatal consultations*, and *duration of pregnancy* were variables considered of good quality with underreporting below 6%[1].

In 2005, the variable mother's schooling had underreporting of 0.3% in Parana, well below the 3.6% found in eight Brazilian states in 2002[5,10], the 5.2% found in Rio de Janeiro from 1999 to 2001[14], and 19% found in São Luís, MA from 1997 to 1998, a situation that considerably limited the use of data from these places[15].

The variables concerning the mothers' reproductive lives presented high percentages of underreporting in other places, as well. The variables *number of live births* and *stillbirths* were underreported in 13.6% and 26.7% of the cases, respectively, in 2002 for Brazil[10]; 57.5% and 11.7% for Rio de Janeiro from 1999 to 2001[14], and 40.2% and 73.8% for São Luís, MA from 1997 to 1998[15]. The quality of these variables was **excellent** in Parana, except for some health regions such as Francisco Beltrão with 2.10% underreporting for live births and the region of Paranavaí with 4.80% of underreporting for stillbirths (data not presented). Even though the completion of data of births in SINASC was of good quality in Parana when compared to other states, there is a common element with other studies where the percentage of underreporting of stillbirths was above that of live births[10], information that is necessary to analyze the association between perinatal death and multiple births.

The percentage of information that was ignored or left blank in SINASC for *number of prenatal consultations* in Brazil in 2002 was 2.65%[10], in São Luís it was 27.5%[15], and in Rio de Janeiro, from 1999 to 2001 it was 2.7%[14]. These

results diverge from this study, the percentages of which were below 1% of underreporting for most of the period.

The quality of the variable *Apgar* was also **excellent**, except for the macro regions of Foz do Iguaçu, where underreporting was above 1% in 2005. Underreporting of the Apgar index for Brazil in the mid-1990s corresponded to more than 30% and diminished to below 10% by the beginning of 2000s[17]. In Rio de Janeiro from 1999 to 2001, the proportion of underreporting for the Apgar index at the 1st minute and Apgar at the 5th minute was only 0.9% and 0.7%, respectively[14]. The **excellent** quality of the variable *congenital malformation* in this study differed from the percentage of underreporting in Rio de Janeiro, 11.7%, from 1999 to 2001[14]. A study carried out in referral services for patients with cleft lip and palate revealed that only 53.3% of the BC contained information on malformation, and in regard to the description, cleft palate presented the highest number of errors; it was correctly described only in 25% of cases[16].

It is important to stress that difficulties and specificities are faced in the completion of each variable in the BC, the document that is entered into the SINASC in maternity hospitals. In the case of *mother's schooling*, one of the socio-economic indicators of SINASC, the difficulty found may due to the fact this information is not common in hospital files and the mother has to be interviewed[16]. Similarly, the variable *stillbirth* is not always recorded in the patient's file, which hinders reporting it. Addressing death situations when interviewing the mother, or interpreting data in the pregnant woman's file when it is attached to the mother's documents, is a factor that may influence how well this variable is reported.

The mother's marital status is another variable difficult to report, perhaps due to the options available in the BC (single, married, widowed, legally separated and ignored). Hence, mothers who have a partner but are not married would be considered single due to the fact they are not officially married. The classification of this variable was changed in the studied period, and the option 'consented union' was included in the first years of this study, implying there were difficulties filling in the BC. Because this inclusion was recent, it is possible that there were different models of BC available in the cities and regions in Parana during the study's period.

The good quality of data of SINASC found in this study may be a consequence of both the length of existence of the SINASC itself and also clarifications and constant training concerning the completion of BC, and increased awareness of health professionals concerning the system's importance and function. The active search for underreported data and the efforts of technicians and workers in epidemiological sectors of some city health departments in asking hospitals to better fill out the BC are also factors that collaborate in producing the excellent quality found. On the other hand, the requirements of the Ministry of Health through ministerial decrees of the Pact for Health[2] have enabled improved quality of the SUS databases in the cit-

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ies, since all these databases are sources used to construct indicators for monitoring and evaluating primary care. Additionally, educational institutions/universities are working in order to adapt the curricula of undergraduate programs in the health field, emphasizing the SUS Information Systems to better train human resources for the health field.

SINASC is one of the Health Information Systems used in the Management Pact[18] that regulates the implementation of Operational Guidelines of the Pacts for Life and their implications for the process of SUS management, to monitoring indicators and goals. The SINASC data are a source to construct coefficients of birth rates and infant mortality and specificities as how these vital events occur at the regional and local levels.

Since its implementation, the SINASC has undergone structural changes, which implies the need to continually train those entering data into it. Among the several updated versions of SINASC, the latest version, the SINASC Web version 1.8, which was developed to be used with PCs with or without stable Internet, allowed municipalities to register and follow-up the BC at a local level. Such implementation enabled access to this information in real time and permitted cities to independently assess their situations. In Parana, this version was implemented on 505 PCs and enabled 521 professionals in all the 399 cities in the state[19].

Even though the quality of SINASC in Parana is good, maintenance and quality of data should be improved. First, one has to keep in mind that the analysis of underreporting in this study took into consideration that when the option *ignored* is checked it signifies incomplete information. The option *ignored* does exist for some variables in the Live Birth Certification Form and there is a suggestion that this option should be included in other variables[4,10]. However, there is a possibility, if there is a large amount of *unknown* data, that information used for planning, evaluating, and monitoring actions in health services is compromised, also influencing the active search performed by the cities.

The Health Pact establishes goals for the cities to ensure surveillance of the population's health based on the Health Information System (HIS). In this context, a better quality HIS can ensure the efficacy of the Management Pact and greater efficiency in planning, especially in the case of the SINASC, since it is one of the HIS' most frequently used elements in the construction of indicators.

Another consideration necessary to maintain and improve the quality and reliability of SINASC data is the responsibility people in hospitals and maternity facilities need to have when filling in the BC. In general, the completion of the BC is the responsibility of the nursing team, especially the technicians, under the supervision of a nurse. Considering that most of the births in Parana occur in hospitals, we suggest professionals pay closer attention in order to fully and correctly fill in all the BC variables, especially those with high levels of underreporting such as the variable *mother's occupation*, for instance.

The point of inputting data of the BC into the system should also be supervised. There is no specification of the professional who should be responsible for such an important task and, in general, workers from the municipal health department, especially those from the epidemiological unit or the epidemiological surveillance, complete the task. Oftentimes, though, a nursing professional is involved in the process of inputting data into the system, at least supervising trainees and administrative technicians.

With the decentralization policy of health services nurses have assumed managerial functions and the HIS provides information that is used both in the direct care provided to the population and in the management of care[20]. For that, the quality of HIS should also be transferred to the workers' daily routine, especially that of nurses, responsible for the supervision of records of the nursing team. One step for nurses to take in order to improve the management of the workplace would be to verify the quality with which the HIS records are completed, in addition to providing information so professionals value the information and everyone feels they are participants and responsible for its production and use. Usually the quality of information recorded in medical files reflects the quality of care, but when there is underreported data, one cannot make inferences regarding the quality of care.

Information systems produce a large volume of data, and the system needs to be able to receive, file, and distribute data in a rapid and efficient manner[21]. From this perspective, the collection of data from the BC, the correction of these data up to the point of input into the system should not be seen as a minor or isolated task because SINASC represents data essential for the management of care quality, grounding the planning and monitoring of health programs and services. Hence, nurses should actively participate in the process, paying more attention to the collection, recording, and completing information in the context of health services, improving the activities of supervision and quality control in the collection and processing of SINASC data, redefining variables with methodological problems and encouraging professionals to impute the full information of all the variables contained in the BC.

CONCLUSION

The minimum percentage of underreporting of the SINASC variables that still persists in Parana is evidence of the potential of this system as a source of epidemiological information on births in the state. As discussed earlier, the quality of SINASC in 2005, the last studied year, was classified as **excellent** because the percentages of underreporting were below 1%, with the exception of the variable *mother's occupation*, the quality of which was considered **regular** for most of the macro health regions.

It is expected that the records of events through SINASC in Parana draw increasingly nearer to 100% in the

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coming years given the tendency to improve the completion of data, as observed from 2000 to 2005. The facilities available in the computer's field and their increased supply and enlarged scope have also contributed to the observed tendency. However, it is necessary to encourage the city's managers and sensitize them to the use of data concerning live births in the construction of indicators capable of supporting the appropriate analysis of the maternal and child health situations at a local level. The investigation and monitoring of infant and neonatal mortality for instance, are a responsibility of the nursing team, which guide the child health care of each city. Hence, investing in the quality of information with appropriate completion of the birth and death certificates and correctly entering data into SINASC are essential to improving the quality of health services.

More attention should be paid to information in the context of health services, improving supervision and quality control in the collection and processing of SINASC data, redefining variables with methodological problems and encouraging professionals to correctly and fully fill in the BC.

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