

Revista de Saúde Pública Print version ISSN 0034-89100n-line version ISSN 1518-8787	Services on Demand		
Print version ISSN 0034-8910On-line version ISSN 1518-8787 Rev. Saúde Pública vol.39 no.3 São Paulo June 2005 http://dx.doi.org/10.1590/S0034-89102005000300006 ORIGINAL ARTICLES Accidental home deliveries in southern São Paulo,	Journal Journal SciELO Analytics Google Scholar H5M5 (2017) Article text in Portuguese Portuguese (pdf)		
Brazil Márcia Furquim de Almeida ^I ; Gizelton Pereira Alencar ^I ; Maria Hillegonda Dutilh Novaes ^{II} ; Ivan França Jr ^{III} ; Arnaldo Augusto Sigueira ^{III} : Dapiela Schoeps ^I : Oppa Campbell ^{IV} : Laura Pedrigues ^{IV}	 Portuguese (epdf) Article in xml format Article references How to cite this article SciELO Analytics 		
^I Departamento de Epidemiologia. Faculdade de Saúde Pública. Universidade de São Paulo (USP). São Paulo, SP, Brasil ^{II} Departamento de Medicina Preventiva. Faculdade de Medicina. USP. São Paulo, SP, Brasil ^{III} Departamento de Saúde Materno Infantil. Faculdade de Saúde Pública. USP. São Paulo, SP, Brasil ^{IV} Department of Epidemiology. London School of Hygiene and Tropical Medicine. London, Inglaterra <u>Correspondence</u>	 Curriculum ScienTI Automatic translation Indicators Related links Share Share More More Permalink 		

ABSTRACT

OBJECTIVE: To identify the frequency, risks of fetal and early neonatal mortality and the determinants of accidental home deliveries.

METHODS: A population-based case control study of fetal and early neonatal deaths was carried out in the southern area of São Paulo, Brazil. Data were collected through home interviews and hospital record reviews. The reasons reported by the mothers were obtained from interviews and risk factors for home delivery were obtained comparing home to hospital deliveries. Data were analyzed separately for fetal and early neonatal deaths and survivors. Odds ratios, 95% confidence intervals and Fisher's exact test were used in estimating risk factors and mortality risk.

RESULTS: The 0.2% frequency of home deliveries was underestimated in the live births information system. After adjustment, it reached 0.4%, comparable to other urban areas in Europe. All home deliveries identified were accidental and were associated to an increased fetal and early neonatal mortality. Mothers' social conditions and pregnancy characteristics were associated to accidental home deliveries and these factors are different outcomes studied (fetal losses, early neonatal deaths and survivors). In 30%, mothers reported lack of available transportation to the hospital as a reason for home delivery. Failure of health services in identifying labor women

and non-availability of emergency care contributed to accidental home deliveries. **CONCLUSIONS:** Though rare events in urban areas, accidental home deliveries should be of special concern to health services because they seem to be avoidable and imply in increased risk of death.

Keywords: Accidental home deliveries. Fetal mortality. Neonatal mortality. Socio-economic factors. Health service access.

INTRODUCTION

For a few decades already, births in Brazil have been occurring predominantly in hospitals, as part of the processes of urbanization, expansion of medical care, and change in social values and behaviors. Thus home deliveries are becoming progressively rarer, and are concentrated nowadays in the rural areas of the North and Northeast Regions.² Notwithstanding, it was only after the implementation of the Live-Birth Information System (*Sistema de Informação sobre Nascidos Vivos –* SINASC) in the early 1990's that it became possible to produce population-wide information on the place of delivery of live births, through the 'place of birth' field (*home* or *others*), included in the live birth declaration. This information could formerly be obtained only for stillbirths, since it was available in death certificates only.

Deliveries taken place outside healthcare services (hospitals and other healthcare facilities) show a decreasing trend. This type of delivery accounted for 1.6% of all live births in 1994 and for 1.4% in 2000. Home deliveries account for roughly 90% of non-institutional births in Brazil.¹⁰ However, these figures me be underestimated, since the coverage of SIM and SINASC is still an issue in the rural areas of the North and Northeast Regions, exactly where home births are more frequent. In urban areas such as the Municipality of Sao Paulo the proportion of non-institutional deliveries was lower, representing 0.7% of live births in 1994 and 0.3% in 2000.¹⁰ The under-reporting of home deliveries is acknowledged in developed countries as well. In the United Kingdom, 14% of women with planned hospital deliveries but who accidentally gave birth at home were registered as hospital deliveries.⁷

Analyses of the literature assume that care must be taken when identifying the classifications adopted, since the term 'home delivery' includes two distinct groups, namely planned and unplanned – or accidental – home births. Certain countries have programs for planned home delivery. The distinction between planned and unplanned delivery is important, since during planned deliveries the home temporarily becomes an extension of the healthcare facility.^{3,5,11,13}

Recently, the importance of home deliveries classified as 'accidental' or 'unplanned' to public health, as well as the need to study such deliveries separately from planned ones, are being acknowledged. Unplanned relate to populations with distinct epidemiological and healthcare-related characteristics, associated with a much higher risk of adverse outcomes for both mother and child.^{7-9,14}

In countries such as Brazil, which lack programs for home delivery, it is essential to establish the proportion of births that took place at home accidentally. There are no prior studies indicating whether home deliveries were planned or accidental. In fact, due to the small proportion of such births in the existing information systems, home deliveries are frequently excluded from studies of perinatal mortality.⁶ Little is known about the risk and conditions associated with delivery outside healthcare facilities and about the characteristics of the women that give birth in these conditions.

Recent studies show frequencies of accidental home deliveries in urban areas of 0.6% in Scotland,⁸ 0.6% in England,⁷ and 0.1% in Finland.¹⁴ It is a consensus in the literature that the risk of perinatal death is increased in accidental home deliveries.^{7,8,9,14}

Factors identified as associated with accidental home delivery include risk situations such as single mothers¹⁴ and low maternal schooling,⁹ high parity,^{8,9} and absence of antenatal care.^{8,14} Greater prevalence of low birthweight and preterm delivery was also found in accidental home births when compared to hospital births.^{8,14}

The aim of the present study was to estimate the risks associated with perinatal death among home births and to identify the reasons for this type of delivery and the main characteristics of the women who gave birth at home.

METHODS

The initial data were obtained from the State System for Data Analysis Foundation (*Fundação Sistema Estadual de Análise de Dados* – Seade), and refer to the live birth (LBD) and death (DD) declarations. We performed a linkage of the two databases, generating a cohort of babies born to mothers living in the southern area of the Municipality of Sao Paulo between 1 January 2000 and 31 January 2001. This cohort comprised 23,717 births, including 335 stillbirths, 205 early neonatal deaths, and 23,177 survivors. The present study is part of a research project^{*} approved by the Research Ethics Committee of Faculdade de Saúde Pública of the Universidade de São Paulo. After tracking events, conducting household interviews, and collecting hospital data, we included in the study 172 stillbirths (51.3%), 146 neonatal deaths (71.2%), 313 random controls representative of the survivals in the cohort, and 74 controls paired by birthweight to the early neonatal deaths.

We considered as accidental home deliveries all births occurred at home and/or in cars, taxis, and ambulances, i.e., all births taken place outside a healthcare facility environment. We considered as hospital/institutional deliveries all births occurred in healthcare facilities, whether taking place in hospitals or in any other type of facility, such as emergency wards and clinics. During the interviews with mothers we identified 21 home births. All mothers received medical care after delivery, and home births were confirmed by hospitalrecords. Information regarding the reasons for and conditions in which the home births occurred were recorded in specific forms during the interview. Interviewers had no prior knowledge of the place of birth registered in the LBD and DD.

We excluded from the study legal interruptions of pregnancies, which resulted in four neonatal deaths, and one stillbirth resulting from an abortion identified as having been initiated by the mother.

Thus, the studied sample included 726 events, of which 705 (97.1%) were hospital deliveries and 21 (2.9%) were home births.

The expansion of the number and proportion of home births, correcting for underenumeration, was performed by applying the proportion of home births found among stillbirths, neonatal deaths, and unmatched controls to the corresponding groups (stillbirths, neonatal deaths, and survivals) from the SIM and SINASC.

For descriptive analysis we used the unmatched controls, who reflect the characteristics of the survivor population. In the analysis of risk factors for home birth we used birthweight-matched controls due to the higher frequency of accidental home births among these events.

Exposure variables were obtained through household interviews, which included a general questionnaire used for all deliveries and a second questionnaire specific for home births. Hospital records charts were the preferential source for birthweight and duration of pregnancy, due to their expected greater accuracy. These information were complemented by home interviews. Nonetheless, we were not able to obtain birthweight for two home births resulting in stillbirths.

Due to the small number of events, exposure variables were dichotomized. We described the reason why delivery took place outside the hospital, the persons who aided in the process, the duration of labor, and the means of transportation to the hospital after delivery. We calculated odds ratios and their respective 95% confidence intervals for the risk of stillbirth and early neonatal death associated with home birth. In order to identify risk factors, we used odds ratios and 95% confidence intervals (Fisher's exact test), initially for perinatal deaths and controls matchedby birthweight, and subsequently for early neonatal deaths and stillbirths.

RESULTS

<u>Table 1</u> presents the distribution, according to place of delivery, of the birth cohort from which our study sample was taken. Data on survivors are from the SINASC information system and those on stillbirths are from the SIM system. Home births were less frequent among survivors than among early neonatal deaths and stillbirths.

There was a higher proportion of home births among stillbirths (6,5%) than among neonatal deaths (2,7%) and survivors (1,3%). Of these 21 births, four occurred on the way to the hospital (19,0%), and all mothers received hospital care after delivery.

Information on the place of delivery in the SIM and SINASC systems indicated that, in the sample, only five deliveries had occurred at home or on the way to the hospital, whereas the household interviews identified 21 deliveries taken place outside healthcare facilities. After expanding the value found considering the cohort that originated the sample, the frequency of home births was 0.4%, whereas according to the information systems, this proportion was 0.2%. The underenumeration of home events was more frequent among stillbirths, followed by early neonatal deaths, controls (survivors) matched by birthweight, and finally by random controls.

Home births showed a statistically significant association with the perinatal death (OR=3.2; 1.1-11.1). This association is stronger with stillbirths, (OR=4.4; 1.4-16.0), but no association was found with early neonatal death (OR=1.7; 0.3-8.1).

Table 2 shows the reasons reported by mothers for delivering outside healthcare facilities. None of the mothers had chosen to give birth at home. The reasons indicated by mothers were difficulty obtaining transportation to the healthcare facility (33.3%) and the delivery having occurred too fast for the mother to reach the healthcare facility (28.6%). Four women (19.1%) had sought healthcare facilities for delivery but had been sent back home. Two of these four women had recently been admitted to the hospital, and delivery took place soon after their discharge. Some mothers (14.3%) reported not having realized that delivery was imminent.

At the moment of delivery, most of the women (57.1%) had the help of family or neighbors. Six women (28.5%) gave birth alone, and four of these deliveries resulted in stillbirths. The police aided in the delivery of two women, one of which resulted in death of the baby soon after delivery. Rescue or healthcare emergency teams performed only one delivery, in which the baby survived (<u>Table 2</u>).

The means of transportation most frequently used by these women to reach the hospital, where they received post-delivery care were the cars of relatives or neighbors (42.9%). Rescue teams were responsible for transporting 33.3% of mothers to healthcare facilities after delivery. There was also a participation of police cars (14.3%) in transporting these women (<u>Table 2</u>).

Labor lasted less than 30 minutes for six women (which is coherent with the reason indicated above and mentioned by six women for the home birth, namely that labor was too fast for them to reach the healthcare facility). Labor lasted between 30 and 60 minutes for four women and over two hours for five women; six women were not able to recall the duration of labor. Of these six deliveries, five were stillbirths (<u>Table 2</u>).

Table 3 presents the characteristics of the women who gave birth at home and in the hospital. Considering that these deliveries have different outcomes, we also analyzed births resulting in perinatal deaths and survivals in separate. We included the survivors that had been selected as birthweight-paired controls in the sample mentioned above (74), since accidental home births were more frequent in this group (4) than among random controls (1). As a whole, mothers who gave birth at home showed less favorable sociodemographic characteristics than those who gave birth in hospitals. The proportion of mothers with up to three years of schooling was 23.8% among home births and 15.5% among hospital births; the frequency of adolescent mothers was 33.3% among home births and 24.2% among hospital births; and the percentage of mothers without partner was 47.6% among home births and 28.1% among hospital births.

Variables associated with the occurrence of home births were: mother reporting poor or regular health status prior to delivery, negative or indifferent reaction to the pregnancy by the father, and absence of antenatal care, the latter two showing odds ratios higher than four. However, negative reactions to the pregnancy by the mother or family also showed odds ratios close to two, but without reaching statistical significance.

The biological characteristics of the fetus, including low birthweight and preterm delivery were more frequent among home births, but this difference was not significant.

When analyzing perinatal deaths and survivals in separate, poor or regular maternal health status prior to delivery was associated with home births, as were the absence of antenatal care and negative reactions to the pregnancy by the father, even though with lower odds ratios. No statistically significant results were obtained for survivors. Among the home-birth mothers whose deliveries resulted in perinatal deaths 28.6% had not attended antenatal care, which contributed to the occurrence of home births, whereas all home-birth mothers who gave birth to survivors attended antenatal care.

Variables associated with the occurrence of home births resulting in stillbirths were poor or regular health prior to pregnancy and absence of antenatal care (<u>Table 4</u>). The odds ratios for these two conditions were much higher than those obtained for all neonatal deaths (<u>Table 3</u>). The number of home deliveries resulting in early neonatal deaths was small (4), and consequently no statistically significant odds ratios could be obtained. All home deliveries resulting in early neonatal deaths were of low birthweight and preterm babies (<u>Table 5</u>). Similar results were obtained for negative reaction to pregnancy by the family.

Table 4 - Number of stillbirths and odds ratio, according to place of delivery and risk factors. Southern area of the Municipality of Sao Paulo, Brazil, 2000/2001.

Variables	Stillbirths			
	Home	Hospital	OR	95% CI
Mother's schooling				
Up to 3 years	4	31	2.27	0.47-9.11
4 years or more	8	141		
Mother's age				
<20	5	30	3.38	0.78-13.24
20 +	7	142		
Marital status				
Single	6	55	2.13	0.55-8.32
Married	6	117		
Parity				
Ńulliparous	4	62	0.89	0.19-3.48
Multiparous	8	110		
Mother's health status				
Regular/poor	6	28	5.14	1.34-19.78
Excellent/good	6	144		
Abortion				
Considered/tried	1	26	0.51	0.01-3.81
No	11	146		
Mother's reaction				
Indifferent/unhappy/does not know	4	59	0.96	0.20-3.76
Glad	8	113		
Father's reaction				
Indifferent/unhappy/does not know	6	50	2.44	0.62-9.56
Glad	6	122		
Family's reaction				
Indifferent/unhappy/does not know	7	70	2.04	0.53-8.47
Glad	5	102		
Antenatal care	_			
No	5	10	11.57	2.38-50.63
Yes	7	162		
Duration of pregnancy				
<37 weeks	9	120	1.30	0.34-5.02
≥37 weeks	3	52		
Birthweight				
<2,500 g	9	129	3.00	0.39-134.50
>2,500 g	1	43		

 Table 5 - Number of early neonatal deaths and odds ratio, according to place of delivery and risk factors. Southern area of the Municipality of Sao Paulo, Brazil, 2000/2001.

 Variables
 Early neonatal deaths

variables	Home Hospital		OR	95%CI
Mother's schooling				
Up to 3 years	0	18	0	
4 years or more	4	128		
Mother's age				
<20	1	43	0.80	0.02-10.28
20 +	3	103		
Marital status				
Single	2	34	3.29	0.23-46.57
Married	2	112		
Parity				
Nulliparous	2	53	1.75	0.12-24.76
Multiparous	2	93		
Mother's health status				
Regular/poor	2	28	4.21	0.52-59.69
Excellent/good	2	118		
Abortion				
Considered/tried	1	18	2.07	0.04-27.32
No	3	112		
Mother's reaction	-			
Indifferent/unhappy/does not know	3	51	5.59	0.46-296.37
Glad	1	95		
Father's reaction				
Indifferent/unhappy/does not know	3	37	8.84	0.67-468.06
Glad	1	109		
Family's reaction				
Indifferent/unhappy/does not know	4	64	0	
Glad	0	82		
Antenatal care				
No	1	21	1.98	0.04-25.94
Yes	3	125		
Duration of gestation				
<37 weeks	4	116	0	
≥37 weeks	0	30		
Birthweight				
<2,500 g	4	119	0	
>2,500 g	0	27		

DISCUSSION

A comparison of data from our sample with data from the information system shows that the latter underestimate the frequency of births occurred outside healthcare services, especially among stillbirths. The adjusted estimate for the frequency of home births in the present study was 0.4% (twice the original 0.2%). None of the women gave birth at home by choice; all home births were either accidental or took place on the way to healthcare facilities, and all mothers subsequently received hospital care.

Underestimation may be a consequence of all women having received hospital care following delivery, and of most of these cases being counted as hospital births. Similar distortions are also found in other countries.⁷ The frequency of accidental home births in this urban area is comparable with estimates made for urban areas in England and Scotland, and higher than in that found in Finland.^{7,8,14}

Fetal mortality was four times more frequent among home births, a statistically significant difference. The risk of neonatal mortality was also increased (almost twofold), but this increase was not significant. Since only four neonatal deaths were observed among home births, the lack of significance may be due to the small sample size. These results are similar to those reported by studies carried out in developed countries^{1,7,8,14} for accidental home births. Most studies do not discriminate between stillbirths and neonatal deaths; the present survey suggests that the risk may be greater for the former. This is consistent with results obtained in a study of home births conducted in Australia, even though this study did not consider only accidental deliveries.¹

The reasons behind home births and the conditions in which they occur, as reported by the mothers, may contribute towards a better understanding and prevention of this phenomenon. One-third of women reported that labor lasted for less than 30 minutes, and indicated this as a reason for giving birth at home. Another one-third reported difficulties in obtaining transportation to the hospital, and the remaining women failed to identify the signs of labor. Some of the women (20%) did go to the hospital after feeling signs of labor, but were sent back home. Most women (80%) had the support of family or neighbors, or were alone. About one-half of the women were taken to the hospital after delivery by family or neighbors or by taxi, and one-third were taken by rescue services.

Home births would have been difficult to avoid in women whose labor lasted for less than 30 minutes; this is a medical emergency typical of pregnancy, and is not always predictable. Rodie et al⁸ also found briefer labor in women with accidental home births. In Glasgow,⁸ Scotland, 28.4% of accidental home births were aided by emergency services during delivery, whereas in the southern area of the Municipality of Sao Paulo, only one out of 21 events received such aid. On the other hand, one-third of women received help from rescue services after delivery, suggesting a delay in the response of emergency services.

The fact that 20% of women were in contact with the hospital and were turned down – two of the 21 having been discharged after admission to the hospital – suggests the need for better training of hospital admission staff so as to improve the identification and provide adequate counseling of mothers with signs of incipient labor, especially in cases of preterm delivery.

The total number of home births is small and provides unstable measures of frequency, potentially compromising statistical significance. Thus the amplitude of confidence intervals is quite wide, especially for early neonatal deaths and survivals. Certain risk factors associated to accidental home birth were common to the three outcomes: stillbirth, early neonatal death, and survival (paired subjects), but were not always significant. These factors included low birthweight, preterm delivery, indifferent or negative reaction to the pregnancy by mother, father, or family, and unplanned pregnancy (none of the mothers with accidental home births planned their pregnancies). Two risk factors for home delivery were identified among stillbirths: absence of antenatal care and mother's perception of less favorable health status prior to pregnancy.

The greater frequency of low birthweight and preterm babies among accidental home births is in agreement with

results obtained in the United States³ and Glasgow.⁸ No difference in median mother age was found among accidental home births in Glasgow.⁸ A study carried out in Finland¹⁴ found greater frequency of accidental home births among women aged 35 years and older, as was seen in the USA,³ although no distinction was made in these studies between accidental and planned home births. In the present study, a greater proportion of adolescent mothers was found among accidental home births when compared to hospital births, but this difference was not statistically significant.

We did not find an association between the absence of antenatal care and the occurrence of accidental home birth among survivors. However, among stillbirths, the absence of antenatal care was associated with a large and statistically significant increase in risk. We did not find an association between having had less antenatal care appointments or late onset of antenatal care and home birth (results not shown), as reported in studies such as those by Viisainen et al¹⁴ and Declerq et al.⁴ The association with the absence of antenatal care may be due to another association, also present among these events, with negative reactions to pregnancy – especially by the father or family, suggesting a lack of emotional support during pregnancy – as well as with a greater frequency of adolescent mothers – affecting not only the presence of antenatal care but also the outcome of the pregnancy. As is the case with maternal mortality, perinatal mortality is a negative outcome of pregnancy that may be avoided by healthcare services. Thaddeus & Maine,¹² in a broad review of the role of healthcare services in maternal mortality considered three types of delay in providing delivery care that may result in maternal deaths: a) delay in the woman's decision to seek healthcare services; b) delay in arriving at the healthcare facility; and c) delay in the provision of adequate delivery care.

Among the reasons reported by the women in the present study for the occurrence of home or road births, 14.3% of women failed to identify the onset of labor, which may be placed into the first type of delay, i.e., in the decision to seek a healthcare facility for delivery. As indicated by Thaddeus & Maine,¹² this may be due to insufficient information for evaluating the severity of the situation, or may also be associated with negative reactions to pregnancy by the mother herself, to lack of support from father or family, or even to the absence of antenatal care. One-third of women reported difficulty reaching the hospital at the time of delivery, which is included in the second type of delay in delivery care – the delay in reaching the healthcare facility. Accidental home births were not associated with maternal schooling, and the Brazilian Unified Healthcare System (SUS) provides universal access to hospital delivery care. In other words, there is no direct association between these events and the mother's socio-economic status. Unlike the literature reviewed by Thaddeus & Maine,¹² which refers to studies carried out in rural areas, the present study was conducted in a urban area of a large metropolis. Notwithstanding, the woman's social status may compromise her ability to reach the hospital during emergencies, which is also affected by the unfavorable urban conditions of many areas of the southern region of the Municipality.

We found that 20% of women had been to hospitals prior to delivery and that the hospital staff had sent these women back home, which could be included into the third type of delay – the lack of adequate and timely care due to faults of the healthcare system. As mentioned above, many of the studies mentioned by these authors referred to rural areas, where the lack of equipment and personnel in healthcare facilities is more frequent. This is not the case with the hospitals in the Municipality of Sao Paulo. In this case, the most likely explanation is the unsatisfactory training of the admissions staff in identifying labor, since the women did not mention a lack of vacancies in the hospital. We may also include in this item the difficulty of these women in receiving emergency medical care, since we found that rescue teams performed only one of the deliveries, but transported the woman to the hospital after delivery in one-third of cases, suggesting a delay in the arrival of emergency care.

In conclusion, home births occurred predominantly among women with three types of characteristics: a) social (not having a partner and being an adolescent, only for stillbirths); b) behavioral (negative reaction from mother, father, or family to the pregnancy, absence of antenatal care, failure to recognize the onset of labor, negative perception of prior health status); and c) biological (brief labor, preterm and low birthweight pregnancies).

It should be highlighted that healthcare services share responsibility in many of these events, given the evidence of inadequate care including failures in identifying labor and undue discharge in cases of obstetric intercurrences.

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Orrespondence to

Márcia Furquim de Almeida Departamento de Epidemiologia – FSP-USP Av. Dr. Arnaldo, 715 01246-904 São Paulo, SP, Brasil E-mail: <u>marfural@usp.br</u>

Received on 3/4/2004. Approved on 4/11/2004. Supported by *Fundação de Amparo à Pesquisa do Estado de São Paulo* (Fapesp – Grant n. 99/11985-9) and *Conselho Nacional de Desenvolvimento Científico e Tecnológico*(CNPq – Grant n. 479007/2001-2).

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