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Out-of-hospital births and the supply of maternity units in France

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Abstract

Maternity unit closures in France have increased distances that women travel to deliver in hospital. We studied how the supply of maternity units influences the rate of out-of-hospital births using birth certificate data. In 2005-6, 4.3 per 1000 births were out-of-hospital. Rates were more than double for women living 30 km or more from their nearest unit and were even higher for women of high parity. These associations persisted in multilevel analyses adjusting for other maternal characteristics. Long distances to maternity units should be a concern to health planners because of the maternal and infant health risks.

Key words: health services, distance, maternity units, supply, out-of-hospital birth, access, social class

Introduction

There is a trend in many countries towards fewer maternity units and the centralisation of births in larger units (Neto, 2006; Pilkington et al., 2008; Zeitlin and Mohangoo, 2008). Several interrelated reasons underlie this trend, such as medical safety, financial pressures and the need to efficiently use equipment and medical staff. The decreasing number of units can lead to a loss of services in certain areas and increase travel distances to hospital for delivery (Nesbitt et al., 1997; Sutherns and Bourgeault, 2008; Tucker et al., 2005). Studies have shown that long travel time to the maternity unit (Ravelli et al., 2011) and poor access to obstetric care (Nesbitt et al., 1997) are associated with higher neonatal mortality and morbidity.

Childbirth has particular features which accentuate the importance of the geographical accessibility of health services for deliveries planned in hospital and at home. The onset of labour is unpredictable and it can progress quickly, leading to unexpected delivery at home or en route to hospital. Accidental out-of-hospital births often occur without medical assistance and are more common before term, leading to a higher risk of mortality (Jones et al., 2011; Sheiner et al., 2002). In Finland, the perinatal mortality was 2.5 times higher for babies born accidentally out-of-hospital than for babies born in hospital (Viisainen et al., 1999). For planned home births, the accessibility of maternity units is essential to ensure timely emergency transfer for complications during labour or delivery; these transfers occur in 15 to 30% of cases (Evers et al., 2010; Hutton et al., 2009).

In France, the number of maternity units declined dramatically from 1128 in 1981 to 816 in 1995 and 585 in 2006. Studies have assessed the impact of these closures on

women's choices of maternity unit (Combier et al., 2004) and on the distance that women must travel to deliver (Pilkington et al., 2008). There have been no studies, however, on difficulties women face getting to maternity units or on out-of-hospital deliveries.

Our objectives were to calculate the incidence of out-of-hospital births and to determine whether this incidence varied according to distance to the closest maternity unit and recent maternity closures. A secondary objective was to assess whether specific sociodemographic groups of women were more vulnerable to the effects of distance and at greater risk for out-of-hospital delivery.

Population and method

Data were obtained from vital statistics. Birth certificates record information about whether delivery occurred in or out of hospital, but do not distinguish between accidental out-of-hospital births and planned home births. Certificates also provide data on maternal age, parity, maternal and paternal occupation, municipality of residence and of birth. The municipality is the smallest administrative division in France.

Analyses were done on singleton live births in 2005–6 in metropolitan France (N=1,517,599). The birth certificate was revised in 1998, including the coding of the question on place of delivery. By 2006, the new coding rules had not yet been fully implemented in some municipalities. We therefore developed rules to exclude births in these areas. We first excluded municipalities if more than 8% of birth certificates had missing data about place of delivery and if the total number of births was greater than 10. We then excluded municipalities which had unrealistically high out-of-

hospital birth rates (higher than 2% and more than 40 births). This rate is four times higher than the known rates before the introduction of the new coding rules (Faur and Court, 1988). The 40 delivery cut-off corresponds to approximately two and half times the average annual number of home births carried out by a midwife who performs home deliveries (unpublished data). Finally we excluded all departments (the next administrative level up from the municipality), where more than 20% of births were excluded in the previous stages, in order to carry out our analyses as much as possible on geographically complete areas. In all, 11.1% of births were excluded and the final analysis sample included 1,349,751 births. We carried out a sensitivity analysis to test the impact of these exclusions by comparing included and excluded births using an alternative indicator of out-of-hospital births, defined as the proportion of births occurring in municipalities without a maternity unit.

The location of maternity units was available from Ministry of Health annual statistics. We computed distances between places of residence and maternity units after placing each hospital and each residence on the map at the centre of the municipality. Distances were calculated using the road network with geographic information system software ArcView 9.3.1 (ESRI, Redlands, CA, USA). Supply characteristics were the mother's distance to her closest maternity unit, whether a maternity unit had closed between 2003 and 2006 within a 15-km radius of her home, and urban, peri-urban or rural residence. We chose a 15-km radius because three-quarters of French women give birth within 15 km of their home (Doisneau, 2003).

We studied the association between out-of-hospital births and maternal and supply characteristics using a multilevel model with the population average option, in order

to estimate the impact of individual and municipal level determinants. The descriptive analyses were done with SAS (SAS Institute Inc., Cary, NC, USA) and the multilevel analyses with HLM version 6 (Scientific Software International Inc, Lincolnwood, IL, USA).

Results

In 2005–6, 5740 women delivered out of hospital (4.3 per 1000 births). During this period, 2.8 per 1000 births took place in municipalities without a maternity unit; the rate was similar, 2.7 per 1000, for births excluded from the analysis sample.

The out-of-hospital birth rate was lowest among women aged 25–29 years (Table 1). The rate rose steeply with parity from 2.8 per 1000 among primiparas to 14.3 per 1000 for women who had at least five deliveries. The relation with social class had a J shape with a minimum rate in the shop assistant and service worker group. Out-of-hospital births occurred more often in rural areas and were strongly associated with distance to the closest maternity unit. Out-of-hospital births were not more frequent when a maternity unit had been closed within a 15-km radius.

The association between distance to the closest maternity unit and out-of-hospital births varied according to parity (Figure 1). Among primiparas, rates increased from 2.3 per 1000 when the minimum distance was under five km to 7.5 per 1000 when the minimum was 45 km or more; these rates were 5.4 and 26.2 per 1000, respectively, among women of parity four or higher.

In the multivariate analysis, this interaction between parity and distance was significant ($p<0.001$). The odds ratio for out-of-hospital births for women who lived at least 45 km from the closest maternity unit was 2.47 among women of parity one or two and 6.46 among women of parity three or higher, when the reference group was women of parity one or two living at less than five km from the closest maternity unit (Table 2). The risk of out-of-hospital birth was also higher among older women, women of the higher and lower social classes, and among those who lived in rural areas. The association with the recent closure of a maternity unit near-by was not significant.

Discussion

Our study showed that the risk of out-of-hospital delivery was strongly associated with parity and the distance to the closest maternity unit. Closure of a unit near to a woman's home in the recent past did not increase this risk, however.

Our study has several limitations. First, we had to exclude 11% of births to ensure good data quality. Our sensitivity analysis of births that occurred in municipalities without a maternity unit suggests, however, that the exclusions did not affect our estimate of national incidence. Secondly, the data available for analysis were limited. French birth certificates do not include medical data, so we could not study the medical complications associated with out-of-hospital births. The certificate also does not document whether the delivery was initially planned at home or in hospital. Finally, distance was computed from the centre of each municipality and not from each mother's home and hospital address; while this adds imprecision to our measures, there is no reason to expect a systematic bias favouring hospital or out-of-hospital births.

Rates of out-of-hospital births in France are low, similar to those in European countries where planned home births are not common (Zeitlin and Mohangoo, 2008). Rates are between 1 and 2 percent in other countries where home delivery is accepted as a part of maternity care provision, such as the USA (0.9%), Canada (1.2%) or the United Kingdom (2.3% in England and 1.2% in Scotland) (MacDorman et al., 2010; Statistics Canada, 2007; Zeitlin and Mohangoo, 2008). The highest rate in Europe is in the Netherlands (30%) where home deliveries are an integral component of maternity care.

Our results on the role of maternal characteristics corroborate those from previous studies. Parity has been consistently associated with the incidence of out-of-hospital births (Declercq et al., 2010; MacDorman et al., 2010; Viisainen et al., 1999). The progression of labour is faster in multiparas, especially in the first stage (Vahratian et al., 2006), which may increase the risk of accidental out-of-hospital delivery. Planned deliveries at home are also more common among multiparas (Anthony et al., 2005; Declercq et al., 2010), primarily because previous low-risk delivery is a key criterion for selecting eligible women for home birth. Moreover, transfers to hospital are less frequent for multiparas planning home births (Hutton et al., 2009).

Accidental out-of-hospital births are more frequent among women of lower social class (Viisainen et al., 1999), which may reflect difficulties in use of healthcare services during pregnancy (Declercq et al., 2010; Viisainen et al., 1999). In contrast, the slightly higher rates of out-of-hospital births in the higher social classes in our study may be due to planned home births. Home births – and other alternative

approaches to childbirth – are more frequently chosen by more educated and affluent women (De Jonge et al., 2009; Declercq et al., 2010).

In our study, the risk of out-of-hospital delivery for women living 30 km or more from the closest maternity unit was over twice as high as for women living less than five km away. This group accounts for 7% of all pregnant women in France. Unplanned out-of-hospital births have also been associated with living in remote areas in both Finland and Norway (Viisainen et al., 1999; Schmidt et al., 2002). For high risk infants, long distances have also been found to restrict access to tertiary care facilities at delivery (Pilkington et al., 2010; Samuelson et al., 2002). However, we found that recent maternity closures were not associated with more out-of-hospital births. At the beginning of the 2000s, closures took place primarily in areas where supply was relatively abundant and they did not result in increased average travel time for women (Pilkington et al., 2008).

The reduction in the supply of maternity units is a long-term trend observed in many countries. Consequently, the proportion of women living far away from a maternity unit will probably grow, especially in rural areas. Unplanned births out of hospital are a useful indicator for monitoring potentially adverse effects of these closures. Perinatal health information systems should be able to report on the place of delivery and distinguish between planned and unplanned out-of-hospital births, as recommended in England and Wales (Mori et al., 2008) and Sweden (Hildingsson et al., 2006). However, even without this distinction, monitoring out-of-hospital births in geographically remote areas supplies essential information, since planned home births in these areas are not advisable.

Conclusion

Out-of-hospital births are rare in France. However, in underserved areas, rates are higher, especially for women of higher parity. It is important to inform women, especially multiparas living far from their maternity unit, about the risks associated with accidental births out of hospital. Particular attention should be given to the organization of health services in remote areas where women have to travel a long distance for childbirth in order to guarantee a minimum level of safety in emergency situations.

Disclosure of interests

The authors have no conflicts of interest to declare

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Table 1. Out-of-hospital births according to maternal characteristics, supply of medical services and geographical characteristics

	N	Rate per 1000 births (1)
Parity		
1	774,460	2.80
2	377,966	5.18
3	139,265	6.98
4	37,029	9.07
5+	21,031	14.31
Maternal age		
< 20 yrs	26,152	4.05
20–24	188,350	3.87
25–29	427,462	3.58
30–34	442,089	4.37
35–39	213,534	5.06
≥ 40	52,164	6.96
Occupation category (2)		
Professional/managerial	217,045	4.04
Intermediate	325,746	3.81
Administrative, self-employed	266,000	3.53
Shop assistant, service worker	122,727	3.23
Skilled manual	149,201	4.54
Unskilled manual	84,664	5.80
No occupation	184,368	6.07
Distance to closest maternity unit		
<5 km	596,363	3.10
5–14	352,279	3.85
15–29	296,734	5.59
30–44	88,670	7.80
45 +	15,705	11.59
Maternity unit closure within a 15-km radius		
No	1,001,858	4.52
Yes	347,893	3.47
Rurality (3)		
Urban	849,922	3.33
Periurban	286,133	4.61
Rural	213,696	7.44

(1) Chi-square test of association with out-of-hospital births: $p<0.001$ for each variable; (2) Household classification; (3) Classification of the National Institute of Statistics and Economic Studies.

Table 2. Odds ratios for out-of-hospital birth by maternal characteristics, supply of medical services and geographical characteristics

	aOR (1)	95% CI
Maternal age		
< 25 yrs	1.05	0.98,1.13
25–29	1	
30–34	1.13	1.07,1.20
35–39	1.20	1.12,1.29
≥ 40	1.63	1.47,1.81
Occupation category (2)		
Professional/managerial	1.31	1.21, 1.43
Intermediate	1.14	1.06,1.23
Administrative, self-employed	1	
Shop assistant, service workers	0.98	0.89,1.09
Skilled manual	1.29	1.18,1.40
Unskilled manual	1.56	1.42,1.72
No occupation	1.96	1.82, 2.12
Women with parity 1 or 2		
Distance to closest maternity unit (3)		
<5 km	1	
5–14	1.14	1.03,1.27
15–29	1.39	1.24,1.57
30–44	1.78	1.55,2.05
45 +	2.47	2.02,3.02
Women with parity 3 +		
Distance to closest maternity unit (3)		
<5 km	1.73	1.57, 1.90
5–14	2.32	2.04, 2.63
15–29	3.25	2.84, 3.71
30–44	3.71	3.13, 4.41
45 +	6.46	4.92, 8.48
Maternity unit closure in a 15-km radius		
No	1	
Yes	0.91	0.84,1.00
Rurality		
Urban	1	
Periurban	1.09	0.99,1.19
Rural	1.43	1.29,1.58

(1) Multilevel analysis; OR adjusted for all variables included in the table; N=1,349,751.
(2) Household classification.
(3) Reference group: women with parity 1 or 2 living at less than 5 km from a maternity unit.

Fig. 1 Rate of out-of-hospital births by distance to the closest maternity unit and parity

