Trends in perinatal health in France from 1995 to 2010. Results from the French National Perinatal Surveys.

Béatrice Blondel, Nathalie Lelong, Morgane Kermarrec, François Goffinet

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Results from the French National Perinatal Surveys

B. BLONDEL[a,b], N. LELONG[a,b], M. KERMARREC[a,b], F. GOFFINET[a,b] for the National Coordination Group of the National Perinatal Surveys[1]

[a] INSERM, U953, Research Unit in perinatal health and women's and children's health, Maternité Port-Royal, 53 avenue de l'Observatoire, 75014 Paris, France

[b] Université Pierre et Marie Curie-Paris6, 75012 Paris, France

Correspondence:

Béatrice Blondel

Tel: 01 45 59 50 96; 01 42 34 55 85; Fax: 01 43 26 89 79;

E-mail: beatrice.blondel@inserm.fr

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[1] National coordination Group of the National Perinatal Surveys: *INSERM*: Béatrice Blondel, Gérard Bréart, Morgane Kermarrec, Nathalie Lelong; *DGS*: Nicole Matet ; *DREES*: Lucie Gonzalez, Annick Vilain.

ABSTRACT:

Objective: To study trends in the main indicators of health, medical practices and risk factors in France.

Population and method: We collected data from samples of all births in France during one week in 1995 (N=13 318), 1998 (N=13 718), 2003 (N=14 737) and 2010 (N=14 903) and have compared them.

Results: Between 1995 and 2010, maternal age and body mass index increased steadily, but tobacco use decreased. In 2010, 39.4% of pregnant women had a visit with a midwife in a maternity unit, versus 26.6% in 2003. Deliveries occurred in large public hospitals more and more frequently. The increase in caesarean sections was no longer significant between 2003 and 2010. In general, medical decisions during pregnancy and delivery were closer to professional recommendations in 2010 than in earlier years. Live births before 37 weeks increased steadily from 5.4% in 1995 to 6.6% in 2010, but the proportion of birth weights below 2500 g or the 10^{th} percentile stopped increasing after 2003.

Conclusion: Routine national perinatal surveys highlight major trends in maternal characteristics, obstetric practices, organisation of services, and perinatal health.

Key words: perinatal health, antenatal care, delivery, maternal characteristics

INTRODUCTION

Practices in the perinatal field change constantly as mothers' characteristics evolve, scientific knowledge improves, and both clinical practice guidelines and the organisation of care are modified. In such a setting, it is important to have reliable perinatal data, regularly updated, available at the national level, to monitor health trends, guide prevention policies, and assess medical practices.

The national perinatal surveys were designed to meet these needs. They are based on the principle of a collection of information about health status and perinatal care from a representative sample of births. Three surveys were previously conducted and reported, in 1995, 1998 and 2003 [1]. This protocol was chosen after a pilot survey conducted in 1988-89 in several volunteer regions [2].

The objectives of these surveys are to:

- measure the principal indicators of health status, medical practices during pregnancy and delivery, and perinatal risk factors; their changes from earlier national perinatal surveys, including similar surveys before 1995 [3], can thus be followed;
- provide a reference national sample to enable comparisons with data from other sources;
- contribute information to guide decision making in public health and assess health actions in the perinatal domain, based on specific questions in each survey.

The objective of this article is to describe the perinatal situation in 2010 in metropolitan France (oversea territories excluded) and put it into perspective by looking at results from earlier surveys for the principal indicators of health, medical practices and risk levels.

DATA AND METHODS

Protocol

All four surveys followed the same protocol. Data collection covered all births during one week, that is, all live born or stillborn children, in public and private maternity units – as well as children born outside these institutions and subsequently transferred to one – at a gestational age of at least 22 weeks or weighing at least 500 g at birth. In 2010, maternity units with more than 2000 annual deliveries were allowed to spread data collection out over two weeks, by collecting data for all births every other day [4]. The information came from three sources: an interview with women in the postpartum ward, to obtain information about their social and demographic characteristics and prenatal care, data from the medical files about complications of pregnancy and delivery and the child's health status at birth, and another form completed by the head of the maternity unit describing its principal institutional characteristics.

Several institutions were involved in these surveys. The general organisation and development of the questionnaire were provided by the French national institute for health and medical research (Institut national de la santé et de la recherche médicale) (INSERM U953), and the Ministry of Health (the Directorate-General of Health (Direction générale de la santé) and the Direction of Research, Studies, Evaluation and Statistics (Direction de la recherche, des études, de l'évaluation et des statistiques, DREES)), as well as a scientific committee including representatives from district level Maternal and Child Health Services (physicians or midwives), directorates responsible for health care services and social services in the Ministry of Health, the French Institute for Public Health Surveillance (Institut de Veille Sanitaire), the regional and district social and health service bureaus (DRASS and

DDASS), the regional health observatories (ORS), professional societies (anesthetists, midwives, obstetricians and pediatricians), and consumer groups. INSERM coordinated the study at the national level, and the Maternal and Child Health Services of most districts at the district level. INSERM produced the report that served as the basis of this article [4]; in addition, for the 2010 survey, the DREES drafted a report describing the characteristics and practices of the maternity units [5].

The National Council on Statistical Information (Comité du Label) and the French Commission on Information Technology and Liberties (CNIL) approved these surveys.

Data collected

An earlier publication described the samples studied in 1995, 1998 and 2003 [1]. In principle, the surveys take place in the autumn to ensure some stability in the comparisons. Nonetheless, the last survey, which was initially planned for October 2009, was postponed until the spring of 2010 because of the A(H1N1) influenza pandemic. Data collection took place from 15 to 21 March 2010, or, in the largest units, from 15 to 28 March. The sample included 14 681 women and 14 903 children, including 440 twins and 3 triplets. The corresponding figures were 13 147 women and 13 318 children in 1995, 13 478 women and 13 718 children in 1998, and 14 482 women and 14 737 children in 2003.

Of 535 maternity units operating in metropolitan France in 2010, one refused to participate, and another had no delivery during the study period. Interviews for 602 women either did not take place or were incomplete because the mother refused to participate or was discharged before the investigator saw her, or because of a language problem or the mother's or child's health status. In the absence of an

interview, the minimal information was obtained from the first health certificate, required by law to be filed within eight days after the birth.

Analysis

The analysis, performed with SAS software, compared the results for each of the four surveys for each indicator. We used Pearson's Chi2 test to compare percentages and Student's t test to compare means. Trend tests were performed in cases where small but regular changes were observed between surveys. Because the large number of tests performed and the sample size create a risk of erroneously concluding that several indicators have significantly increased or decreased, we defined differences in the global comparisons as significant only if the p value was less than 1%. To make the tables clearer, we have indicated that tests were not significant (NS) below this threshold. A threshold of 5% was used to define significance for the comparisons in population subgroups, because of their smaller size.

RESULTS

Between 1995 and 2010, the mean maternal age increased continuously, from 28.6 to 29.7 years, that is, an increase of 26.4 (± 4.6) to 27.6 years (± 5.1) for nulliparas and from 30.1 (± 4.7) to 31.2 years (± 4.9) for multiparous women; this trend was significant between each survey for both groups (Table 1). Finally, the proportion of women 35 years or older rose from 12.5% to 19.2%. Parity changed very little. The proportion of births to mothers living alone remained stable over the entire period, and the proportion of women of foreign nationality has increased since 1998. Educational level has risen very markedly; currently 51.8% of mothers have gone beyond high school, compared with 32.6% in 1995; the percentage of women who

worked during pregnancy also increased. At the same time, the percentage of households supported solely by their earnings from their work increased slightly through 2003. In 2010, 4.4% of women said they had not had antenatal visits or examinations for financial reasons.

For this pregnancy, 2.3% of the women had had in vitro fertilisation and 2.3% ovarian induction alone (Table 2). The mean prepregnancy weight of women increased continuously over the study period, and the percentage with moderate to severe obesity rose from 6.0% in 1998 to 9.9% in 2010.

The proportion of women who smoked during the third trimester of their pregnancy fell from 24.8% in 1998 to 17.1% in 2010. In 1995, 64.7% of the nulliparas attended antenatal classes, and in 2010, 73.2%, but this trend was not regular over the study period. Moreover 21.4% of the women had the recently recommended '4^{th} month appointment'. This appointment is intended to allow each woman to meet at a relatively early stage with a midwife or doctor, who would identify any problems she has or is likely to encounter and provide her with important prevention information to optimise her health and the baby's.

The mean number of antenatal visits was 9.9 ($\pm$ 3.7) in 2010. Although this number was higher than for the preceding survey, the question in 2010 specified "including visits to the emergency department" (Table 3). Almost all the women had seen medical staff at their maternity unit or the obstetrician who delivered their baby at least once before labour.

The rate of late filing of the medical pregnancy certificates (which should be submitted to the health insurance fund) increased over time, and this difference was substantial and significant between 2003 and 2010. The healthcare provider seen for the certification and for the rest of antenatal care was most often an obstetrician.

Nonetheless, compared with 2003, women saw midwives much more often in 2010, either at the maternity ward or in private practice.

The mean number of ultrasound examinations increased regularly from 4.0 (±1.9) in 1995 to 5.0 (± 2.5) in 2010 (Table 4). Changes in the questions about HIV screening over the years make it difficult to analyse changes in practices; nonetheless, we found that the percentage of women who did not know if they had had this examination increased slightly. Compared with 2003, women in 2010 were much more familiar with nuchal translucency measurements and reported less frequently that serum screening for Down syndrome was not offered. Finally the amniocentesis rate was 9.0%; it fell notably between 2003 and 2010, especially for women aged 38 years or older.

After an increase between 1995 and 1998, antenatal hospitalisations dropped slightly between 1998 and 2003, and then remained stable between 2003 and 2010 (Table 5). On the other hand, the duration of hospitalisation decreased regularly for the entire period.

Gestational diabetes required treatment for 6.8% of the women, by insulin for 1.7% and by diet for 5.1%. Threatened preterm delivery was diagnosed and led to hospitalisation in 6.5% of the women. Corticosteroid therapy for fetal lung maturation was prescribed to 5.2% of women, and this percentage has been rising. Of the children born before 34 weeks, 51.8% had corticosteroid therapy in 2003 and 54.3% in 2010 (NS). Repeated corticosteroid courses, on the other hand, became less frequent in 2010; this change affected especially prescription of two courses, since three or more were rare in 2003 as in 2010.

Deliveries took place more often in the public sector and in very large maternity units (Table 6). The proportion of deliveries in maternity units with 2000 or more annual

deliveries rose from 15.9% in 1995 to 48.0% in 2010. The distribution of the different modes of labour onset has changed since 1998: caesareans before labour increased from 1998 to 2003, and inductions of labour from 2003 to 2010. Overall, caesareans increased regularly over time, but this trend was moderate from 2003 to 2010, and not significant if we limit the comparison to overall caesarean rates rather than more detailed mode of delivery. Episiotomies became much less frequent, dropping from 50.9% in 1998 to 26.8% in 2010 among all women with vaginal deliveries. Use of epidural or spinal anaesthesia grew progressively (81.4% of women in 2010); on the other hand, the percentage of general anaesthesia fell from 5.4% in 1995 to 1.2% in 2010.

The distribution of birth weight did not change between 1995 and 2010, but mean weight increased from 3231 g (± 584) in 2003 to 3254 g (± 568) in 2010 (Table 7). Five-minute Apgar scores did not change significantly between 1995 and 2003, but scores below 10 increased slightly in 2010. Between 2003 and 2010, transfers to neonatal unit or monitoring in a special care section of the maternity unit fell slightly, although they had previously been stable. In particular, postnatal transfers to another site have fallen regularly since 1995, from 2.8% to 1.0%. Breast feeding, which had risen strongly from 1998 to 2003, continued to increase; 68.7% of women breast fed their babies either exclusively or partially in 2010.

The rates of preterm deliveries and low-birth-weight and small-for-gestational-age (SGA) newborns varied strongly according to the population in which they were calculated (Table 8). The preterm birth rate in 2010 ranged from 6.6% among all live births to 5.5% among singletons; similarly the rate of neonates weighing less than 2500 grams was 6.4 and 5.1% in these two populations. This is explained by the fact that 19% of preterm infants and 23% of low-birth-weight infants were twins.

The rates of preterm, low-birth-weight and SGA newborns followed different trends. Among all infants, as among the singletons, preterm births increased regularly, slightly but significantly over the entire period ($p<0.001$). Among all infants, as among singletons, the proportion of low-birth-weight and SGA babies increased continuously through 2003 (trend tests $p < 0.001$ for both indicators in both populations) and then fell significantly in most groups.

DISCUSSION

The results of the four surveys show general trends moving in different directions. Some risk factors, including age and obesity, increased. Some preventive behaviour became more frequent, including not smoking and breast feeding. Induction of labour increased recently, but the increase in caesareans between the last two surveys was slight and not significant. Preterm birth has continued to increase since 1995 at a slow but constant rate, although the proportion of growth-restricted babies recently fell.

Data quality

Because the 2010 survey was organised over two weeks in some large hospitals, the number of live births in our sample cannot be directly compared with that recorded in the vital statistics. Nonetheless, the number is very close to the mean number of weekly births in March [4]. The proportion of missing data for items collected from the medical records is extremely low [4]: birth weight was missing for 0.4% of births, and gestational age for 0.5%. This proportion is somewhat higher for the data collected by interviews with the mothers and reached 4%, for example, for educational level.

The representativeness of the sample was tested in 2010, by comparing indicators with those from the vital statistics [4]. There were few differences for maternal age,

women's nationality, births outside marriage or twin deliveries. Slight differences existed for parity and occupation, possibly due to variations in reporting or coding of these data between the vital statistics and the national perinatal surveys [4].

The last survey was delayed from October 2009 to March 2010, and the comparisons with the earlier surveys no longer cover the same season. This delay is very unlikely to have affected either preterm births or birth weights, because a seasonal effect has not been generally observed; moreover, when it exists, it appears to be moderate and to exist especially between winter and summer [6,7]. Moreover, testing of the national perinatal survey methodology compared medical practices and children's health status between spring and fall and found no differences [2]. Finally we observed that the recommendations given to women to limit the risk of infection during the A(H1N1) influenza pandemic, especially the limitation of medical visits and the preference for visits to doctors' offices rather than to health centers or hospitals, did not have any notable effect on indicators for prenatal care [4].

Variations between years must be interpreted cautiously. Some differences might be due to chance; the questions or the way of answering them sometimes varied because of changes in practices and the context of the pregnancy. Notes in the tables point out the principal changes to questions and call for a degree of prudence. The recent increase in the total number of antenatal visits might be due to better consideration of emergency department visits; nonetheless the trends for another indicator, the number of ultrasound examinations, suggest a continuing increase in health-care utilisation during pregnancy.

The higher proportion in 2010 of children with a low Apgar score is a more difficult issue. Other indicators do not point toward a worsening in infants' vital status: caesarean deliveries and preterm births increased only slightly, and transfers fell. We

know that the assessment of the criteria making up the score is not always exact [8]. There may be a general trend toward better assessment of babies. Moreover the fact that we asked several questions about resuscitation procedures in 2010, but not in the preceding surveys, could have led to a better transcription of the score in the questionnaires.

An important advantage of the national perinatal surveys is that they furnish information at regular intervals to monitor the principal perinatal indicators and assess health policies. Nonetheless these surveys are not appropriate for studying rare events or for describing situations at a regional or district level [9]. For those purposes, we would need data about the principal indicators for all births, from a medical birth registry, as exists in numerous European countries [10]. We also note that the national surveys cover numerous subjects, but do not allow these subjects to be analysed in detail, as specific surveys could.

Changes in population characteristics

Some of the women's characteristics, such as educational level or employment, influence preventive behaviour and pregnancy outcome and have changed in a positive direction throughout the study period. Recent changes in other social characteristics are less favourable. The augmentation in the proportion of households receiving public assistance is due in part to the introduction of a new grant, established in 2009 to replace several previous types of allocations. It includes a new component intended to aid to help the working poor; consequently, the number of recipients is higher [11]. Moreover, the increase in the percentage of women who reported not having had examinations or care for financial reasons can be explained by the fact that we specified for the first time in 2010 that the examinations skipped might include dental care. Nonetheless, other indicators also suggest that the

economic situation of households has deteriorated; accordingly, the unemployment rate for husbands or partners rose from 5.9% in 2003 to 8.5% in 2010 [4], accurately reflecting the general job market situation for men in France [12]. The degradation of the social situation for the most disadvantaged groups is likely to increase the social inequalities in prenatal care, prevention and health, observed in the preceding surveys [13-15].

Other worrisome trends include the increasing proportions of women 35 years or older and of overweight or obese women. These characteristics have important repercussions on reproductive health, by increasing the risks of infertility, complications during pregnancy and delivery, and morbidity for mothers and children [16-17].

Preventive behaviour during pregnancy and at birth

Two indicators described in this article show that women are increasingly adopting behaviours that benefit their children's health. The reduction in smoking that began between 1998 and 2003 has continued. This general trend corresponds especially to less smoking before pregnancy [4, 18], even though the percentage of women in the general population who smoke has increased recently, including among women aged 20-45 years [19]. A basic trend toward the reduction in smoking among women who want to have a child thus appears to have developed.

The increase in breast feeding first observed in 1998 is also continuing. This suggests that the policy promoting breast feeding set up progressively from the end of the 1990s has had an impact. Thus, in 2010, 75% of maternity units reported that all or some of their personnel had undergone training in breast-feeding and its promotion over the last five years, and 62% of the maternity units had a reference person for this function (lactation consultant or other person) [5].

Despite this trend, France in 2010 remains at a fairly mediocre level for these two behaviour indicators compared with other European countries for whom statistics were available in 2004 [10]. This behaviour modification has occurred in all social and demographic groups, but the most notable changes were observed in nulliparas and women in higher social classes, for smoking [18], and for French women and moderately skilled workers for breast feeding [20]. These changes depend on the baseline level of smoking and breast feeding according to the mothers' characteristics; they also underline the difficulties in disseminating prevention measures while attenuating social disparities.

Pregnancy management

Obstetricians have the leading role in prenatal care, including for pregnancy certifications. Nonetheless general practitioners signed nearly one quarter of these certifications. They thus play a role in guiding this care and in the antenatal screenings of early pregnancy.

An important change took place between 2003 and 2010 in the distribution of roles between providers, with the role of midwives growing. This development simultaneously concerned antenatal care at the maternity unit and in private practice. In maternity units, this trend has been confirmed at the level of department organisation, since 90% of departments offering antenatal visits involved midwives in these in 2010, compared with 74% in 2003 [5, 21]. Detailed data from before 2003 are not available, and we therefore cannot yet follow this trend over the long term; nonetheless the place of midwives in antenatal care is clearly larger than it was 30 years ago: a representative sample of births in 1981 found that only 19% of women had had at least one visit with a midwife at the maternity ward [3].

Trends of practices related to guidelines

This survey took place too early to assess the impact of the recent guidelines for diabetes screening [22] or the application of the new regulation on Down syndrome screening in the first trimester and its effects on the use of trophoblast biopsies [23-24]. For other aspects of care, however, numerous practice indicators show that decisions made during pregnancy and at delivery tend to follow clinical practice guidelines and evidence-based medicine. For trisomy 21 screening, fetal karyotyping only for maternal age is no longer justified [23], even though reimbursement for it by the health insurance funds still seems possible. The number of amniocenteses of women aged 38 years or older has decreased substantially since 2003.

Corticosteroid therapy for fetal lung maturation has become more frequent and its administration has changed in accordance with changes in scientific knowledge and clinical practice guidelines in cases of threatened preterm delivery [25]. A recent French study showed that the absence of corticosteroid therapy in very preterm babies was rare and was associated with factors largely inaccessible to modification by caregivers [26].

Monitoring the increase in the caesarean rate is a major concern in view of the high risks for a repeat caesarean and the risks of morbidity for both mothers and children [27]. The increase in the caesarean rate is slowing and was not significant between 2003 and 2010, either overall, or among nulliparas or multiparas with or without previous caesareans [4]. Stabilisation or slowing of the increase in the caesarean rate has also been observed in other western countries [28].

The practice of episiotomies has also changed substantially since 1998, which is the only year to which we can compare the situation in 2010: the overall episiotomy rate has been cut in half. The rate is thus in an intermediate position relative to national statistics known for other European Union countries at the beginning of this century

[10]. The guidelines recommending against routine episiotomies are relatively recent in France [29]. Immediately after their promulgation, compliance varied strongly between maternity units [30]; it is thus possible that this practice will continue to decline in the future.

Place of delivery

The closing and restructuring of maternity units has led to major changes in the place of delivery. The number of maternity units has declined from 816 in 1995 to 756 in 1998, 618 in 2003 and 535 in 2010. The annual decrease has thus slowed slightly since 2003. This general trend has had two principal effects: 1) the progressive reduction of the proportion of deliveries in small maternity units, first in those with fewer than 500 annual deliveries, then in those with fewer than 1000, and 2) the concentration of nearly half of all deliveries in maternity units delivering at least 2000 babies a year. This development is a response to constraints related both to economic viability and to medical demography; it facilitates the organisation of staffing and meets demands for greater medical safety. Women report that this trend has not impaired the geographic accessibility of maternity units, in terms of transportation time to the facility [4, 31]. Nonetheless, in remote areas, for women who must travel more than 30 kilometers to reach the nearest maternity unit, the risk of out-of-hospital birth is high [32]. How this restructuring is affecting management of care in France, and in particular, the extent of medicalisation of delivery, requires exploration. There is no consensus in the literature about the effects of large specialised maternity units on the content of care for women at low risk [33-34].

Gestational age and birth weight

Because of their very high rates of preterm birth and low birth weight, twins strongly influence the rates of these morbidity indicators in the overall population. Singletons

show a continuous trend toward an increase in preterm birth, but this is difficult to demonstrate between every survey, because of the size of the sample; it appears to have begun at the beginning of the 1990s [1]. It has occurred in a context where many preterm births are planned: nearly half the children born before 37 weeks of gestation are born after a planned caesarean or induction of labour [4].

The trends in low birth weight newborns and SGA newborns followed the same course as that of preterm birth until 2003. The increase in SGA persisted after taking changes in maternal characteristics and smoking into account [35]. The current change could be due to chance; alternatively, it might express effects of increased maternal BMI, decreased smoking, or other factors, or might result from changes in the management of fetal growth restriction. It will be necessary to study this regular increase in preterm births and the changes in trend for birth weight in more detail, to understand their causes. The study of changes in the newborn's characteristics in these surveys should also help us to understand better why infant mortality is currently stagnating in France and thus deteriorating in relation to that in other European countries [36].

Conclusion

The results presented in this article show the major trends in the risk factors, medical practices and the health status of children at birth. More detailed analyses allow us to rank France in relation to other European countries, to study some risk factors in greater detail and to assess the application of some regulatory measures (see appendix).

National perinatal surveys conducted fairly close to one another serve as an important monitoring tool in the French national perinatal information system (9) and

constitute an essential information base for answering questions that physicians and public health officials ask.

Appendix:
Main publications based on the National Perinatal Surveys

Risk factors for adverse pregnancy outcome

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Table 1 – Characteristics of mothers and households between 1995 and 2010

	1995 %	p[1]	1998 %	p[2]	2003 %	p[3]	2010 %
Age (years)							
<20	2.4	<0.001	2.6	<0.001	2.6	<0.001	2.5
20-24	19.0		15.0		16.1		14.5
25-29	38.2		37.8		33.3		33.2
30-34	27.9		29.8		32.1		30.7
35-39	10.2		12.4		13.2		15.7
≥40	2.3		2.3		2.7		3.5
mean	28.6±5.0	<0.001	29.1±5.1	0.001	29.3±5.2	< 0.001	29.7±5.3
	(13 004)		(13 297)		(14 228)		(14 401)
Parity[4]							
0	41.3	NS	42.8	<0.001	43.3	NS	43.4
1	34.9		33.3		35.0		34.5
2	14.9		15.3		14.1		14.3
3	5.1		5.1		4.7		5.0
≥4	3.8		3.5		2.9		2.8
	(12 913)		(13 382)		(14 258)		(14 499)
Does not live with partner	7.0	NS	7.0	NS	7.3	NS	7.3
	(12 864)		(13 092)		(13 980)		(14 000)
Foreign nationality	11.8	<0.001	10.5	<0.001	11.8	<0.001	13.4
	(12 917)		(13 187)		(14 010)		(14 123)
Educational level							
Middle school or less	46.9	<0.001	39.2	<0.001	35.9	<0.001	28.3
High school	20.5		22.2		21.5		19.9
Beyond high school	32.6		38.7		42.6		51.8
Some college	-		-		-		*21.3*
College	-		-		-		*17.7*
Post-graduate	-		-		-		*12.8*
	(12 378)		(12 908)		(13 736)		(14 060)
Worked during pregnancy	60.2	<0.001	64.3	0.004	66.0	<0.001	70.2
	(12 817)		(13 098)		(13 904)		(14 103)
Household resources[5]							
Unemployment or other benefits	23.1	-	19.5	<0.001	18.7	<0.001	22.9
Other financial support	-		3.5		2.8		5.5
Income from work	75.9		76.2		77.5		70.8
None	1.0		0.8		1.0		0.8
	(12 523)		(12 988)		(13 780)		(13 827)
Visits or examinations not done for financial reasons [6]	-	-	1.8	0.002	2.3	<0.001	4.4
			(12 903)		(13 734)		(13 842)

NS: not significant if $p \geq 0.01$
(1) comparison 1995-1998, (2) comparison 1998-2003, (3) comparison 2003-2010, (4) obtained by interviews in 1995 and from the medical records thereafter, (5) if several resources, classified in this order, (6) including dental care in 2010 only

Table 2 – Fertility treatment and preventive behaviour between 1995 and 2010

	1995 %	p[1]	1998 %	p[2]	2003 %	p[3]	2010 %
Fertility treatment							
None			94.3	< 0.001	95.1	0.002	94.4
In vitro fertilisation[4]			1.4		1.7		2.3
Intrauterine insemination			0.8		0.8		1.0
Ovulation induction alone			3.5 (12 882)		2.4 (13 530)		2.3 (13 677)
Mean weight before pregnancy (kg)	58.9 ±10.6 (12 290)	<0.001	60.1 ± 11.6 (12 926)	<0.001	61.6 ±12.6 (13 710)	<0.001	63.4 ±13.6 (13 801)
BMI[5]							
< 18.5	-		10.7	<0.001	9.2	<0.001	8.2
18.5-24.9	-		69.5		68.0		64.6
25.0-29.9	-		13.8		15.4		17.3
30.0 or more			6.0 (12 829)		7.4 (13 605)		9.9 (13 644)
Number of cigarettes in the 3rd trimester							
0 a day	75.2	NS	75.2	<0.001	79.2	<0.001	82.9
1- 9	14.1		14.9		12.8		12.2
≥ 10	10.7 (12 326)		9.9 (12 873)		8.0 (13 143)		4.9 (14 082)
Antenatal classes (nulliparas)	64.7 (5 211)	<0.001	69.7 (5 590)	<0.001	66.8 (5 940)	<0.001	73.2 (6 104)
4th month appointement[6]							75.8
No							21.4
Yes							2.8
Doesn't know							(13 821)

NS: not significant if $p \geq 0.01$
(1) comparison 1995-1998, (2) comparison 1998-2003, (3) comparison 2003-2010 (4) with or without ICSI, (5) Body mass index: weight × height^2, (6) appointment with a midwife or doctor, who would identify any problems and provide important prevention information.

Table 3 – Antenatal care between 1995 and 2010

	1995 %	p[1]	1998 %	p[2]	2003 %	p[3]	2010 %
Number of visits[4]							
0-3	1.0	<0.001	1.1	<0.001	1.0	<0.001	1.1
4-6	8.5		8.7		8.1		7.4
7	17.2		19.1		18.6		13.3
8-9	45.3		46.1		43.8		33.1
≥ 10	28.0		25.0		28.4		45.1
mean	8.9 ± 2.8	< 0.001	8.7 ± 2.6	< 0.001	8.9 ± 2.8	< 0.001	9.9 ± 3.7
	(12 712)		(12 927)		(13 761)		(13 750)
Visits with the maternity ward team[5]							
None	11.3	<0.001	6.6	<0.001	8.4	<0.001	5.2
Several	51.9		49.5		58.2		59.2
All	36.8		43.9		33.4		35.6
	(12 623)		(12 866)		(13 672)		(13 715)
Certification of pregnancy after the 1st trimester[6]	4.2	NS	4.4	NS	4.9	<0.001	7.8
	(12 587)		(12 882)		(13 459)		(13 775)
Certification of pregnancy by							
General practitioner	-		-		23.8	<0.001	22.0
Private obstetrician	-		-		47.2		46.7
Obstetrician at the maternity ward	-		-		27.6		26.0
Midwife at the maternity ward	-		-		1.2		3.5
Other midwife	-		-		0.2		1.8
					(13 634)		(13 738)
At least one antenatal visit with[7]							
General practitioner	-		-		15.4	<0.001	23.8
Private obstetrician	-		-		46.2	<0.001	48.7
Obstetrician at the maternity ward	-		-		66.4	<0.001	63.4
Midwife at the maternity ward	-		-		26.6	<0.001	39.4
Midwife in private practice	-		-		3.5	<0.001	16.1
Midwife at health center[8]	-		-		1.6	<0.001	4.2

NS: not significant if $p \geq 0.01$
(1) comparison 1995-1998, (2) comparison 1998-2003, (3) comparison 2003-2010, (4) including in 2010 visits to the emergency department, (5) visit at the maternity unit or visit with the obstetrician who delivered the baby, (6) medical certificate, which is required to be submitted to the health insurance fund in the 1st trimester, (7) visits after the certification of pregnancy; the sample size varies for each percentage and ranges from 13 223 to 13 481 women, (8) Maternal and Child Health clinics.

Table 4 – Screening procedures during pregnancy between 1995 and 2010

	1995 %	p[1]	1998 %	p[2]	2003 %	p[3]	2010 %
Number of ultrasound examinations							
≤3	51.6	<0.001	46.0	<0.001	43.0	<0.001	33.0
4-5	32.6		35.2		35.5		38.4
≥ 6	15.8		18.8		21.5		28.6
mean	4.0 ± 1.9	< 0.001	4.3 ± 2.0	< 0.001	4.5 ± 2.2	< 0.001	5.0 ± 2.5
	(12 793)		(13 077)		(13 940)		(14 140)
Screening test for HIV during pregnancy[4]							
Yes	63.2	-	60.9	<0.001	75.1	<0.001	72.8
No			35.8		19.2		19.2
Doesn't know			3.3		5.7		8.0
	(12 582)		(12 974)		(13 797)		(13 891)
Nuchal translucency measurement							
Yes	-		-		76.0	<0.001	86.5
No	-		-		5.4		4.5
Doesn't know	-		-		18.6		9.0
					(13 768)		(14 674)
Serum screening for Down syndrome							
Yes	-		66.5	<0.001	79.7	<0.001	84.2
No, not offered	-		16.2		4.0		1.9
No, refused	-		8.3		6.1		5.5
No, other or unknown	-		4.7		6.8		5.8
Doesn't know			4.2		3.4		2.7
			(12 910)		(13 775)		(13 827)
Amniocentesis							
Total population	-		11.1	NS	11.0	<0.001	9.0
			(13 053)		(13 243)		(12 389)
Women 38 years or older	-		68.5	0.003	61.4	<0.001	41.8
			(718)		(876)		(992)
Screening for diabetes							
No	-		-		-		12.3
Yes	-		-		-		85.9
Doesn't know	-		-		-		1.8
							(13 898)

NS: not significant if p ≥ 0.01
(1) comparison 1995-1998, (2) comparison 1998-2003, (3) comparison 2003-2010, (4) in 1995, the performance of the test and its timing were asked in two questions; in 1998, women were asked if they had had a test before or during pregnancy. The meaning of the response "doesn't know" therefore changed between 1998 and 2003.

Table 5 – Hospitalisation and pregnancy complications between 1995 and 2010

	1995 %	p[1]	1998 %	p[2]	2003 %	p[3]	2010 %
Prenatal hospitalisation	19.9 (12 868)	<0.001	21.6 (13 162)	<0.001	18.6 (13 969)	NS	18.8 (14 282)
Mean duration of hospitalisation (days)	8.5±11.2 (2 521)	0.008	7.7±11.1 (2 788)	NS	7.1±11.7 (2 538)	NS	6.4±9.3 (2 635)
Hypertension							
No	-		-		95.9	<0.001	95.1
With proteinuria	-		-		1.2		2.1
Without proteinuria	-		-		2.9		2.8
					(14 256)		(14 520)
IDD[4] before pregnancy							0.3 (14 500)
Gestational diabetes							
No	-		-		-		92.8
Insulin treatment	-		-		-		1.7
Diet	-		-		-		5.1
Treatment unknown							0.4
							(14 318)
TPD[5] with hospitalisation							6.5 (14 431)
Corticosteroid therapy for fetal lung maturation	-		-		3.8 (14 233)	<0.001	5.2 (14 325)
Age at 1st course of corticosteroids							
<26 weeks	-		-		5.9	NS	6.8
26-33	-		-		77.6		77.5
34-36	-		-		16.1		13.8
37 and +	-		-		0.4		1.9
					(509)		(723)
Number of courses of corticosteroids							
1	-		-		69.7	<0.001	80.9
2 and +[6]	-		-		30.3		19.1
					(521)		(729)
Severe haemorrhage in 2-3rd trimester							
Placenta praevia	-		-		0.5	NS	0.5
Abruptio placentae	-		-		0.2		0.2
					(14 296)		(14 153)

NS: not significant if $p \geq 0.01$
(1) comparison 1995-1998, (2) comparison 1998-2003, (3) comparison 2003-2010, (4) insulin-dependent diabetes, (5) threatened preterm delivery (6) including 3 or more courses: 10 cases in 2003 and 2 cases in 2010

Table 6 – Characteristics of deliveries between 1995 and 2010

	1995 %	p[1]	1998 %	p[2]	2003 %	p[3]	2010 %
Maternity unit status[4]							
public	55.9	0.006	57.6	<0.001	61.2	<0.001	64.4
PSPH[5]	4.7		4.9		5.0		7.4
other private	39.4		37.5		33.8		28.2
	(13 147)		(13 478)		(14 471)		(14 672)
Maternity unit size[4] **(annual deliveries)**							
< 500	14.3	<0.001	10.3	<0.001	4.6	<0.001	2.5
500-999	30.2		29.0		20.7		14.9
1000-1499	24.6		22.8		22.7		20.6
1500-1999	15.0		16.9		16.3		14.0
2000-2999	13.5		16.6		27.8		29.2
3000 or more	2.4		4.3		7.9		18.8
	(13 145)		(13 478)		(14 471)		(14 671)
Level[4]							
I	-		-		36.3	<0.001	30.2
IIA	-		-		25.9		26.4
IIB	-		-		18.4		20.4
III	-		-		19.4		23.1
					(14 471)		(14 672)
Onset of labour[4]							
Spontaneous	71.0	NS	70.5	<0.001	67.8	<0.001	66.5
Induced	20.5		20.3		19.7		22.6
Caesarean	8.5		9.2		12.5		10.9
	(13 037)		(13 426)		(14 446)		(14 624)
Mode of delivery[6]							
Spont vaginal delivery	70.0	<0.001	70.0	<0.001	68.7	<0.002	66.9
Operative delivery[7]	14.1		12.5		11.1		12.1
Caesarean	15.9		17.5		20.2		21.0
	(13 197)		(13 649)		(14 696)		(14 729)
Episiotomy[8]							
Nulliparas	-		71.3	<0.001	-		44.4
			(4 576)				(4 780)
Multiparas	-		36.3	<0.001	-		14.2
			(6 366)				(6 573)
Analgesia, anaesthesia[4]							
None	38.4	<0.001	29.5	<0.001	22.5	<0.001	15.7
Epidural	48.6		58.0		62.6		70.0
Spinal anesthesia	5.2		8.5		12.3		11.4
General anesthesia	5.4		2.6		1.7		1.2
Other analgesia	2.4		1.4		0.9		1.6
	(13 023)		(13 415)		(14 411)		(14 547)

NS: not significant if $p \geq 0.01$
(1) comparison 1995-1998, (2) comparison 1998-2003, (3) comparison 2003-2010, (4) percentage of women, (5) private non-profit maternity units, (6) percentage of children , (7) Operative vaginal deliveries in 2010: forceps (3.9%), spatulas (2.9%), ventouse (5.3%), (8) for women who gave birth by vaginal delivery.

Table 7: – Newborns' health status between 1995 and 2010

	1995		1998		2003		2010
	%	p[1]	%	p[2]	%	p[3]	%
Gestational age							
≤31 weeks	1.0	<0.001	1.3	<0.001	1.6	<0.001	1.5
32-33	0.6		0.8		0.8		0.8
34	0.7		0.8		0.8		0.8
35	0.9		1.5		1.3		1.5
36	2.6		2.5		2.7		2.8
37	7.1		7.4		6.4		6.7
38	16.0		15.9		14.5		16.5
39	28.4		27.2		24.4		24.3
40	26.3		26.4		26.8		27.0
41	14.9		15.1		19.7		17.8
≥42	1.5		1.1		1.0		0.3
< 37 weeks	5.9	0.002	6.8	NS	7.2	NS	7.4
	(13 205)		(13 654)		(14 669)		(14 832)
Birth weight							
≤1499 g	1.1	NS	1.1	NS	1.5	NS	1.4
1500-1999	1.1		1.3		1.5		1.3
2000-2499	4.0		4.8		5.0		4.4
2500-2999	20.0		19.8		20.4		19.5
3000-3499	40.8		40.7		39.6		40.4
3500-3999	26.1		25.4		25.4		26.0
4000-4499	6.1		6.1		5.7		6.3
≥ 4500	0.8		0.8		0.9		0.7
<2500 g	6.2	<0.001	7.2	NS	8.0	0.004	7.1
mean weight (g)	3263	NS	3247	NS	3231	<0.001	3254
	± 542		± 558		± 584		± 568
	(13 289)		(13 635)		(14 683)		(14 844)
5-min Apgar score[4]							
≤ 4	0.3	NS	0.2	NS	0.3	<0.001	0.3
5-7	1.2		1.0		0.8		1.4
8-9	5.1		4.8		4.6		5.6
10	93.4		94.0		94.3		92.7
	(13 065)		(13 458)		(14 471)		(14 602)
Neonatal transfer[4,5]							
No	91.3	<0.001	91.7	NS	91.9	<0.001	93.4
Yes same department	1.3		1.2		1.1		2.7
Yes same site	4.6		5.1		5.1		2.9
Yes other site	2.8		2.0		1.9		1.0
	(13 173)		(13 576)		(14 353)		(14 181)
Feeding[4]							
Breast	40.5	<0.001	43.9	<0.001	55.4	<0.001	60.2
Breast and bottle	11.1		8.0		6.9		8.5
Bottle	48.4		48.1		37.7		31.3
	(12 522)		(13 260)		(13 821)		(14 176)

NS: not significant if $p \geq 0.01$; (1) comparison 1995-1998, (2) comparison 1998-2003, (3) comparison 2003-2010, (4) live born children, (5) transfer to neonatal unit or monitoring in a special care section of the maternity unit for health reasons

Table 8 – Preterm delivery and low birth weight in singletons and twins between 1995 and 2010 (live births)

	1995 %	p[1]	1998 %	p[2]	2003 %	p[3]	2010 %
Gestational age <37 weeks							
Singletons	4.5 (12 777)	NS	4.7 (13 073)	NS	5.0 (14 009)	NS	5.5 (14 261)
Twins	39.2 (316)	0.04	46.8 (453)	NS	44.0 (496)	NS	41.7 (432)
Total[4]	5.4 (13 105)	0.008	6.2 (13 538)	NS	6.3 (14 508)	NS	6.6 (14 696)
Weight < 2500 grams							
Singletons	4.6 (12 869)	NS	5.0 (13 076)	NS	5.5 (14 039)	NS	5.1 (14 285)
Twins	47.5 (318)	0.01	56.4 (452)	NS	55.9 (492)	NS	49.5 (428)
Total[4]	5.7 (13 199)	<0.001	6.8 (13 450)	NS	7.2 (14 534)	0.004	6.4 (14 716)
Small for gestational age(10th percentile)[5]							
Singletons	9.0 (12 748)	NS	9.3 (12 986)	0.001	10.4 (13 918)	<0.001	8.5 (14 226)
Twins	28.7 (314)	NS	27.9 (452)	NS	29.4 (489)	0.01	22.2 (428)
Total[4]	9.5 (13 074)	NS	9.9 (13 540)	0.001	11.1 (14 410)	<0.001	8.9 (14 657)

NS: not significant if $p \geq 0.05$
(1) comparison 1995-1998, (2) comparison 1998-2003, (3) comparison 2003-2010, (4) including triplets, (5) percentiles by gestational age and sex, AUDIPOG, 2008.