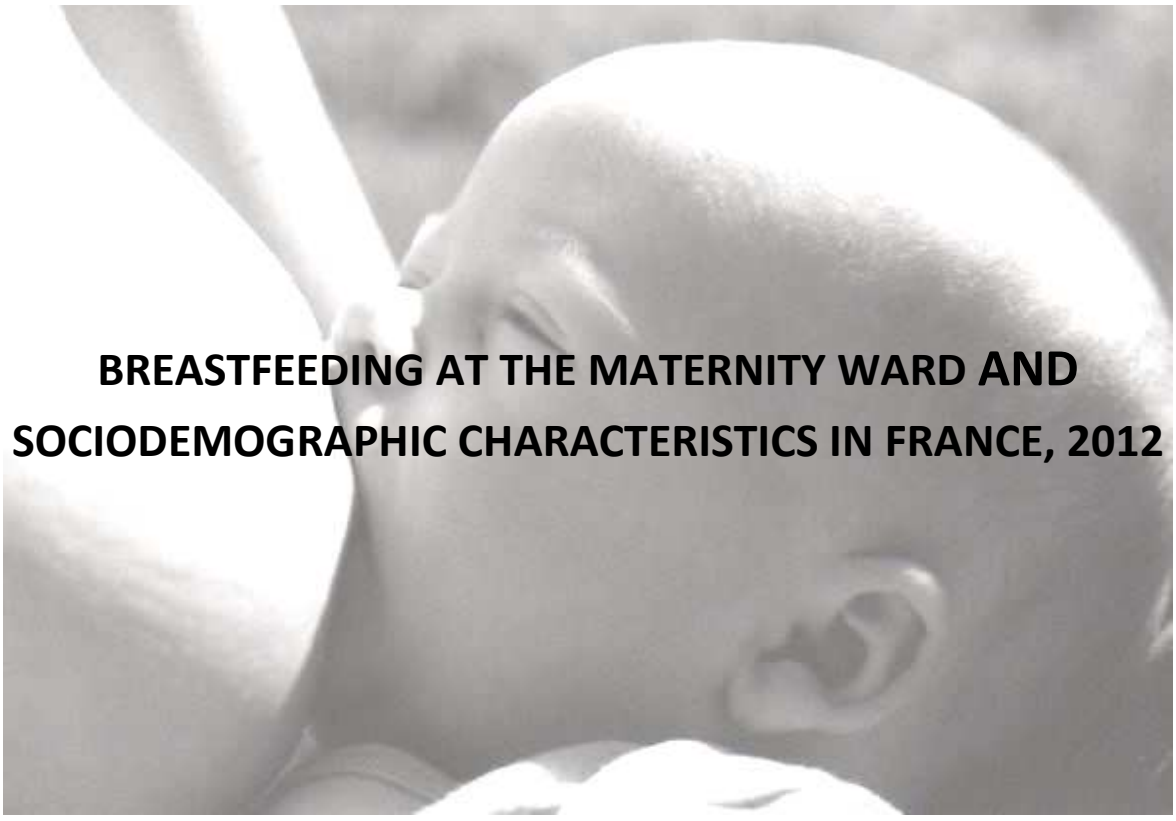
MASTER OF PUBLIC HEALTH

Master International de Santé Publique



BREASTFEEDING AT THE MATERNITY WARD AND SOCIODEMOGRAPHIC CHARACTERISTICS IN FRANCE, 2012

Caroline GUERRISI

MPH M2 2011/2012

Practicum Location: Unité de Surveillance et d'Epidémiologie Nutritionnelle (USEN)

Professional advisor: Benoît Salanave, Usen

Academic advisor: Florence Bodeau-Livinec, EHESP

ACKNOWLEDGEMENTS

I would like to extend my sincere appreciation and gratitude to everybody who contributed in the realisation of this thesis.

First, I would like to thank the “Unité de Surveillance et d’Epidémiologie Nutritionnelle” (USEN) for making me feel so welcome within their team to complete my final internship, and for the good spirits during these four months.

Then, I would like to sincerely thank my professional supervisor, Benoît Salanave, *Epidemiologist and Principal Investigator of the Epifane study*, and Katia Castetbon, *Head of the USEN and Co-Investigator of Epifane*, for their valuable advice, assistance and supervision in the orderly progression of my analysis. I am indebted to them also for their advice and help along the thesis construction.
I would like to thank Catherine De Launay, *Responsible for the Epifane study*, for her assistance during the databases cleaning.

Finally, I also would like to express my gratitude to my academic advisor, Florence Bodeau-Livinec, *Epidemiologist at the EHESP*, for the advice she gave me to build my internship project and to validate my thesis.

LIST OF ACRONYMS

AME: "Aide Médicale d'Etat" (i.e. health insurance for immigrants without papers and leaving in France for at least 3 months)

BFHI: Baby-Friendly Hospital Initiative

BMI: Body Mass Index

CATI: Computer-Assisted Telephone Interview

CAWI: Computer-Assisted Web Interviewing

CI: Confidence Interval

CMU(c): "Couverture Maladie Universelle (complémentaire) " (i.e. health insurance for low income earners)

CVD: Cardio-Vascular Diseases

ENNS: Etude Nationale Nutrition Santé (i.e. French National Survey on Nutrition and Health)

ENP: Enquête Nationale Périnatale (i.e. French National Perinatal Survey)

HIV: Human Immunodeficiency Virus

InVS: Institut de Veille Sanitaire (i.e. French Institute for Health Surveillance)

LBW : Low Birth Weight

OR: Odds Ratio

PNNS: Programme National Nutrition Santé (i.e. French National Nutrition & Health Program)

SES: Socio-economic status

SIDS: Sudden Infant Death Syndrome

STS: Skin-To-Skin

USEN: Unité de Surveillance et d'Epidémiologie Nutritionnelle
(i.e. French Nutritional Surveillance and Epidemiology Unit)

WHO: World Health Organization

WIC: Special Supplemental Nutrition Program for Women, Infants, and Children

LIST OF FIGURES & TABLES

ABSTRACT

Background: Identification of factors associated with women's infant feeding choice is useful so that breastfeeding promotion interventions can be efficiently implemented. The objective of this study was to study the association between maternal socio-demographic characteristics and the initiation of breastfeeding at the maternity ward.

Methods: The analysis was based on the *Epifane 2012-2013* study, on 2,058 mother-infant couples, using data collected at the maternity ward and at one month of age of the infants. Data included birth conditions; socio-economic and demographic characteristics; mother feelings and body weight status known or suspected to be related to the initiation of breastfeeding. Univariate and then multivariate logistic regressions were used to identify independent predictors of breastfeeding (exclusive and partial) at the maternity ward in France.

Results: In the population, 67.3% of the mothers breastfed their newborn at the maternity ward (57.7% exclusively and 9.6% partially), while 32.7% formula fed their infant. Based on the final multivariate analysis, being born abroad was a protective factor for breastfeeding initiation at the maternity ward *(OR = 4.11, [2.47-6.82])*. A maternal education level equivalent to high school *(OR = 0.59, [0.45-0.76])* or below *(OR=0.71, [0.53-0.95])*, no attendance to antenatal classes during pregnancy *(OR = 0.54, [0.43-0.67])* and having smoked during pregnancy *(OR = 0.73, [0.55-0.97])* were risk factors for not initiating breastfeeding. Skin-to-skin (STS) contact after delivery and partners' perception on breastfeeding did not attenuate the relationship between socio-demographic factors and the initiation of breastfeeding. Differed STS contact *(OR = 0.74, [0.57-0.96])*, partners with a negative perception of breastfeeding *(OR = 0.21, [0.10-0.44])* or not having any partner *(OR = 0.27, [0.20-0.36])* were independent risk factors for not initiating breastfeeding.

Conclusion: Clear social disparities are sizeable among the population regarding the initiation of breastfeeding at the maternity ward in France. Targeted promotion programs on women less likely to start breastfeeding, along with a focus on modifiable risk factors (antenatal classes, STS contact and partners' perception), should be implemented in France.

Keywords: socio-demographic characteristics, breastfeeding (exclusive & partial), maternity ward or hospital, newborn, France.

RESUME

« Initiation de l'allaitement maternel à la maternité et caractéristiques sociodémographiques des femmes en France en 2012 »

Contexte: L'identification des facteurs associés au choix des femmes concernant l'alimentation de leurs nourrissons est utile pour mettre en œuvre des interventions efficaces de promotion de l'allaitement maternel. L'objectif de cette étude était d'étudier l'association entre les caractéristiques sociodémographiques et l'initiation de l'allaitement à la maternité.

Méthodes: L'analyse, basée sur l'étude nationale *Epifane 2012-2013*, comptait 2058 couples mère-enfant. Les données utilisées étaient recueillies dans les questionnaires remplis à la maternité et à un mois. Ces dernières portaient sur les conditions de la grossesse et de la naissance, les caractéristiques sociodémographiques des mères, leur corpulence et la perception de leurs partenaires sur l'allaitement. Des régressions logistiques univariées puis multivariées ont été réalisées pour identifier les facteurs indépendants de l'allaitement maternel (exclusif ou mixte) à la maternité en France.

Résultats: Les nouveau-nés étaient allaités à 67.3% (57.7% exclusivement et 9.6% de façon mixte) et 32.7% recevaient des formules lactées. La dernière analyse multivariée montrait qu'être né à l'étranger représentait un facteur favorisant l'initiation de l'allaitement *(OR=4.11, [2.47-6.82])*. Avoir un niveau d'éducation équivalent à celui du lycée *(OR=0.59, [0.45-0.76])* ou inférieur *(OR=0.71, [0.53-0.95])*, ne pas avoir participé à des cours de préparation à l'accouchement *(OR=0.54, [0.43-0.67])* et fumer pendant la grossesse *(OR=0.73, [0.55-0.97])* étaient des facteurs de risque de ne pas commencer l'allaitement. Le contact peau-à-peau (STS) après l'accouchement et la perception des partenaires sur l'allaitement n'ont pas atténué la relation entre les facteurs sociodémographiques et l'initiation de l'allaitement. Un contact peau-à-peau différé *(OR=0.74, [0.57-0.96])*, l'allaitement perçu négativement par les partenaires *(OR=0.21, [0.10-0.44])* ou le fait de ne pas avoir de partenaire *(OR=0.27, [0.20-0.36])* étaient des facteurs de risque indépendants de ne pas débuter l'allaitement.

Conclusion: Des disparités sociales nettes sont mesurables dans la population concernant l'initiation de l'allaitement à la maternité en France. Des programmes de promotion ciblées sur les femmes les moins susceptibles d'allaiter devraient être mis en place, tout en mettant l'accent aussi sur les facteurs de risque modifiables (cours prénatals, peau-à-peau, perception du partenaire).

Mots-clés: caractéristiques sociodémographiques, allaitement maternel (exclusif & mixte), maternité, nourrissons, France.

TABLE OF CONTENTS

The host institution

To complete my final internship, I was hosted at the "Unité de Surveillance et d'Epidémiologie Nutritionnelle" (USEN) i.e. the French Nutritional Surveillance and Epidemiology Unit. USEN is a mixed unit, belonging both to the Paris 13 University and to the "Institut de Veille Sanitaire" (InVS) i.e. the French Institute for Health Surveillance, at the Department of Chronic Diseases and Injuries.

The main goal of USEN is to organize a surveillance system on dietary intakes, physical activity and nutritional status of the population living in France. Regarding public health, nutrition and physical activity represent an important issue worldwide. Indeed, nutrition is one of the major determinants of chronic diseases, such as cardio-vascular disease (CVD), diabetes, osteoporosis, hypertension, and cancer. Thus, developing a nutritional surveillance system enables detecting and understanding health issues related to the current public health situation at the national level and in targeted population groups. The aim is to implement updated recommendations and providing a basis for nutritional epidemiology research.

To describe as proper as possible the nutritional situation in France, USEN has to:

- Describe the nutritional risk factors or protective factors occurring in the population,
- Follow these nutritional risk factors or protective factors over time,
- Identify the emergence of nutritional factors which can have an important impact on public health,
- Consider the relationship between the nutritional factors and morbidity and mortality for a particular disease,
- Evaluate the impact of preventive actions on nutritional factors, with the "Programme National Nutrition Santé" (PNNS) (i.e. French National Nutrition Program) as guidelines.

In a concrete manner on the field, USEN has done a broad range of studies and surveys, in order to describe the current state of the population for various nutritional factors and being able to turn policy makers toward effective recommendations.

The table below states a couple of surveys conducted by USEN

ENNS (2006)	Etude Nationale Nutrition Santé (i.e. French National Study on Nutrition and Health) *Description of dietary intakes, physical activity & nutritional status of the children and adults living in France, regarding the current recommendations*
Corpulence 7-9 ans (2000 & 2007)	*Description of the prevalence of excess body weight and obesity among children aged between 7 and 9 years old*
Escal (2003-2004) **Nutrimay** (2006)	These 2 studies were conducted in French overseas departments: Escal = *eating behavior survey in Martinique* Nutrimay = *survey on the diet, nutritional and health status in Mayotte*
Abena (2004-2005 & 2011-2012)	*Description of dietary intakes and nutritional status of the people who receive food aid*
Anaïs (2009)	*Description of the dietary intake, nutritional status and mental health of institutionalized elderly* (pilot study)

1. Introduction

1.1. What does breastfeeding provide?

The mother's milk is a natural and optimal diet for the newborn during the first six months of life. Actually, breastfed infants receive the most complete and optimal mix of nutrients (macronutrients such as proteins with whey and casein, fats, carbohydrates and micronutrients with vitamins like vitamins A, D, E, K and minerals like iron). Moreover, the varying composition of breast milk keeps pace with the infant's individual growth and changing nutritional needs. The composition varies depending on nycthemeron and throughout the lactation period, according to the infant's age and his/her term. On top of that, mother's milk contains bioactive substances, especially the immune system with antibodies (immunoglobulins A, G or M) and immune cells (lymphocytes, macrophages, leukocytes). These bioactive substances are not present in formula milks [1–3]. In addition to the health effects, breastfeeding enables to develop a special emotional relationship and bonding between the mother and her child. [4]

Even though formula milks represent a good compromise for women who do not want to breastfeed, the health benefits of breastfeeding are greater, both for the mother and her infant at short-, mid- and long-term.

Indeed, breastfeeding might impact newborns' health at different levels. First of all, it has been proven that breastfeeding decreases the risk of infectious diseases, especially gastro enteric infections and acute diarrhoea thanks to the bioactive substances found in breast milk. Some evidences have also shown that mother's milk is a protective factor of allergic diseases such as asthma and eczema. Other studies have suggested that human milk might reduce the risk of obesity in later life and the risk of sudden infant death syndrome (SIDS). Researchers studied also the link between breastfeeding and CVD and diabetes compared with non-breastfed infants. However, for obesity, CVD and diabetes, the protective effect of breastfeeding is still controversial today. [1,3,5,6]

For maternal health, research indicates that women who breastfeed may have lower rates of certain breast and ovarian cancers before menopause [1,3,5,6]. Regarding the contraindications of breastfeeding, they are relatively rare. They impact women with severe illnesses such as mothers infected by HIV, who should not breastfeed their infant risking HIV transmission. Women who cannot offer another feeding type, have to follow specific recommendations expressed by the WHO [7,8]. For less severe diseases, even though drug therapies are required and in spite of the presence of drugs in the milk, few of them collide with breastfeeding pursuance [3].

Even if breastfeeding has many benefits, the current formula milks enable mothers to make a free choice on the feeding mode that seems best suited. Indeed, thanks to advances made in research and development, formula milks are now very close to the mother milk nutrient composition. So, if a mother does not want to breastfeed or cannot breastfeed her infant for various reasons, she can use formula milks without feeling guilty. This is even truer in developed countries, where mothers can have access to drinking water easily without fearing for their infant health.

Breastfeeding practice could play an economic role both for the families and the employers. For the family, formula feeding can represent a factor of impoverishment, especially for the most vulnerable ones. However, we do not know precisely how much a family has to spend if they have to buy breastfeeding equipment. For the employers, a study conducted in 1995 has shown that women who continued to breastfeed after returning to work missed less time from work because of baby-related illnesses, and had shorter absenteeism when they did miss work [9]. Nevertheless, further studies should be conducted as data are scarce in this field.

For all these reasons, breastfeeding currently represents an important challenge to implement. Incidentally and since 2002, the WHO recommends that the optimum form of infant feeding is exclusive breastfeeding (that is to say that the infant only receives breast milk without any additional food or drink, not even water, with the exception of oral rehydration solution, drops or syrups consisting of vitamins, minerals supplements or medicines[1]) for 6 months or beyond, followed by partial breastfeeding for 2 years or more [10,11]. These recommendations were implemented to reach the maximal benefits that human milk may have on health. In fact, it has been proven that there is a dose-response relationship between exclusive breastfeeding and health, up to 6 months of age: the more exclusively the infant is breastfed, the more the benefits on health are true [12,13]. Nevertheless, in developed countries or in countries where the prevalence of HIV-infected mothers is low, short-term breastfeeding or partial breastfeeding (that is to say giving a baby mother milk, and some artificial feeds, either formula or cereal, or other food[1]) still remain beneficial for mother's and infant's health compared to exclusive formula feeding [14]. For most of the developing world, the health and survival benefits of breastfeeding exceed the risks of HIV transmission, especially when antiretroviral interventions are provided [15]. In this way, WHO stated in 2009 that national health authorities should decide whether health services will principally counsel and support mothers known to be HIV-infected to either breastfeed and receive antiretroviral interventions, or avoid all breastfeeding, as the strategy that will most likely give infants the greatest chance of HIV-free survival. [8]

1.2. Current context on breastfeeding in France and abroad

1.2.1. Breastfeeding prevalence and duration

A broad range of breastfeeding initiation and duration promotion programs have been implemented worldwide since the early 90's, with the common aim of increasing breastfeeding rates across the world.

In 1991 was launched the "Baby-Friendly Hospital Initiative"[2] (BFHI) by UNICEF and the WHO to ensure that all maternities become centers of breastfeeding support. After the implementation of the BFHI, the global rate of breastfeeding has increased all around the world, just as the improvement of

[1] WHO definitions in "Breastfeeding & replacement feeding practices in the context of mother-to-child transmission of HIV". 2001
[2] UNICEF website: *http://www.unicef.org/nutrition/index_24806.html*

infant health. In China, which has more than 6,000 Baby-Friendly Hospitals, exclusive breastfeeding in rural areas rose from 29% in 1992 to 68% in 1994; in urban areas, the increase was from 10% to 48%[2]. In the first two years of BFHI implementation at the Central Hospital of Libreville in Gabon, cases of neonatal diarrhea fell by 15%, diarrheal dehydration declined by 14% and mortality fell by 8%[2].

National programs have sprung up too. In the UK, seventy-nine Infant Feeding Projects were funded between 1999 and 2002 by the Department of Health through the Public Health Development Fund. The projects were developmental, capacity building and targeted on women least likely to breastfeed. Their aims were to increase the incidence and duration of breastfeeding [16]. In this context, the breastfeeding initiation rate increased a lot in the UK: from 62% in 1990 to 81% in 2010[3]. This is also true in other countries such as the USA (57% in 1993 to 75% in 2010[4]), Italy (71.8% in 1995 to 78% in 1999[5]) or Canada (81.5% in 2001 to 87.5% in 2009[6]). The highest rates are in the Scandinavian countries with an initiation breastfeeding rate higher than 95%[7].

In France, the breastfeeding initiation rate increased too, from 36% in 1972 to nearly 69% in 2010 [17]. Nevertheless, in spite of recent efforts to increase the breastfeeding initiation rate in France, it still remains low compared to other countries, as shown by the data above.

In the same way, the breastfeeding duration rates increased worldwide. In Cuba, where 49 of the country's 56 hospitals and maternity facilities are baby-friendly, the rate of exclusive breastfeeding at 4 months almost tripled in six years (from 25% in 1990 to 72% in 1996)[2]. In the UK, after the implementation of the Feeding Projects, the breastfeeding rate at 6 months increased from 21% in 2000 to 25% in 2005[8]. The rate increased in the USA (39% at 6 months in 2003 to 43% in 2010[4]) and in Canada (17% of exclusive breastfeeding for at least 6 months in 2003 to 24% in 2009[6]) too. The highest rates for breastfeeding duration go for Scandinavian countries again. In Norway, 68% of the infants are still breastfed at 6 months[9].

In France, if we can have statistics for breastfeeding initiation, no data are available at the national scale for breastfeeding duration.

1.2.2. Breastfeeding determinants

Whereas the increase of the breastfeeding initiation rate occurred in all women population subgroups, clear social disparities persist. Indeed, according to the French and International literatures, a broad range of determinants impact the feeding mode:

- *Socio-economic and socio-demographic characteristics*

[3] NHS Statistics in the "Infant Feeding Survey 2010: early results" report
[4] CDC statistics *http://www.cdc.gov/breastfeeding/data/reportcard/reportcard2010.htm*
[5] Banderali G. et al. Monitoring breastfeeding rates in Italy. Acta Paediatrica Suppl. 2003; 441: 6-8
[6] Statistics Canada *http://www.statcan.gc.ca/pub/82-625-x/2010002/article/11269-eng.htm*
[7] La Leche League International (LLLI) *http://www.lalecheleague.org/cbi/bfstats03.html*
[8] NHS Statistics "Infant Feeding Survey 2005" *http://www.ic.nhs.uk/webfiles/publications/ifs06/2005%20Infant%20Feeding%20Survey%20%28final%20version%29.pdf*
[9] La Leche League International (LLLI) *http://www.lllfrance.org/Autres-textes-LLL/Epidemiologie-de-l-allaitement-Allaitement-et-contraception.html*

The mothers who seem to be the most prone to initiate breastfeeding would be the ones who are *older* (usually the ones who are 30 years old or more) [18-21], *with a higher educational level or with a higher job status* (because their environment enables them to be more sensitive to public health recommendations) [17-20]. Women who *return to work quickly after birth* [22,23] would have higher chance to formula feed their infant at the maternity ward because they would not want to accustom their infants to breast milk for a short-duration period.

Women's birth place would be associated with the feeding mode choice. Indeed, depending on the country, the culture of breastfeeding may be perceived and performed differently. This seems to be truer for the new arrivals in a given country. Usually new arrivals would tend to keep their original culture and practices rather than imitating the culture of the host country. [18,19,21]

- *Pregnancy and delivery characteristics*

Primiparous women seem to be more prone to breastfeed their newborn than multiparous. One explanation might be the fact that more educated women would have their first infant older compared to less educated women. Because of their education level and their older age, they could be proner to breastfeed than less educated women. Another explanation could be that primiparous mothers would not have other dependent children to take care of compared to multiparous women, which might be easier to breastfeed [18-21].

Caesarian delivery [19,21] would be also a constraint on the initiation of breastfeeding at maternity ward. In fact, breastfeeding initiation would be delayed and often not implemented thereafter, because of maternity wards' policies regarding the time needed for the mothers to recover after a caesarean without starting breastfeeding.

Meeting *complications* during pregnancy might impact directly or indirectly the feeding mode. Often complications during pregnancy lead to *prematurity* and so to infant *low birth weight* (LBW), which both would decrease breastfeeding [21]. Indeed, a premature and/or a LBW newborn will have more chance to require early neonatal care. Like this, the infant will not have an early access to breast milk, which decreases the chances to start breastfeeding. Moreover, premature newborn would not have the capacity to suckle which does not enable him/her to initiate breastfeeding.

Multiple births status [20] decreases the chances to breastfeed. This could be linked with the fact that multiple births would be sometimes synonymous with prematurity, caesarean and mother's or infant's complications, which would decrease breastfeeding initiation.

- *Individual characteristics and Individual behavior*

Some studies have shown that women who have *excess body weight* tend to breastfeed less their infant [24-27]. Rasmussen [27] recounts that this might be explained by the fact that obese women produce less prolactin than normal weight women. They would have also an excess risk of complications, both for them and their newborn during pregnancy and at delivery, which would decrease the chances to start breastfeeding. Moreover, obesity seems to be linked with the socio-

economic status (SES) and less educated women would be less prone to breastfeed (as presented above).

Behavioral factors such as *smoking* [28,29] and *alcohol consumption* [30-32] during pregnancy would be linked with a decrease of breastfeeding initiation. Generally, it exists a complex interplay between socio-demographic, SES and behavioral factors. This would be also true with regard to breastfeeding. Like this, the less educated mothers would be the more prone to smoke and less prone to breastfeed [33,34].

Married women tend to breastfeed their infant much more than non-married women, because the husbands would assist and support their wives [18-21]. In fact, women who would have an effective *peer support* (partner's or close relatives' support) regarding breastfeeding would have more chance to breastfeed their infant at the maternity ward than women who do not have any support [19,20]. However, the peer support would be largely socio-cultural and socio-demographic dependent. Women from higher socio-cultural backgrounds would be proner to follow health professionals' prescription, as holders of a more reliable scientific knowledge. Conversely, women from lower socio-cultural backgrounds would consider their mothers' experience as more helpful. [35]

- *Maternity wards' practices*

It has been studied that postponed *skin-to-skin contact (STS)* after birth would be negatively associated with breastfeeding initiation [36-38]. Indeed, this early contact (in the first thirty minutes of life) between the mother and her child would encourage the infant to learn how to suckle.

The breastfeeding determinants presented above seem to be more or less linked together and so, they often offset their action on breastfeeding and would come out onto an increase or a decrease of breastfeeding.

A French study based on the French National Perinatal Surveys (*ENP*) (i.e. Enquête Nationale Périnatale) from 1998, 2003 and 2010, and which assessed breastfeeding trends in hospital according to several characteristics of mothers and maternity units, has shown an increase in breastfeeding rates among highly qualified women and foreign women. This increase would show that it would be possible to enhance breastfeeding further in particular social and cultural contexts, suggesting that higher rates could be reached in France though social inequalities regarding prenatal care, prevention and health at birth are still important today [17,18]. That is the reason why to reduce social disparities, further efforts are required targeting particular groups of mothers less likely to breastfeed.

This kind of targeted program has been implemented in the UK and in the United States already. In the USA, since 1974, a Special Supplemental Nutrition Program for Women, Infants, and Children also known as WIC[10] has been conducted. WIC provides Federal grants to States for supplemental foods, health care referrals, and nutrition education for low-income pregnant and postpartum women,

[10] WIC website: *http://www.fns.usda.gov/wic/*

and to infants and children who are found to be at nutritional risk. Mothers are encouraged to breastfeed their infants and are highly supported by the WIC program. For example, breastfeeding mothers receive a greater quantity and variety of foods than mothers who fully formula feed their infants, they may receive follow-up support through peer counselors or breast pumps and other aides to help support the initiation and continuation of breastfeeding.

Other targeted interventions should aim to influence modifiable risk factors like maternal and paternal feeding perception or peer-counseling because these factors play an important role in the initiation of breastfeeding [19,21,39]. Indeed, a randomized trial in the United States demonstrates that well-structured and intensive breastfeeding support, provided by hospital and/or community-based peer-counselors, is effective in improving exclusive breastfeeding rates among low-income, inner-city women [40]. Health care providers have to be involved in the breastfeeding promotion during the prenatal and early postpartum periods, in order to give the chance to the mothers to make highlighted choices regarding the type of feeding [21]. In fact, women seem to pay a deep attention to health care providers' advices (physicians, pediatricians, midwives or even nurses) [39].

1.2.3. French surveillance regarding breastfeeding

While breastfeeding promotion, with a focus on social disparities, is one of the objectives of the PNNS 2011-2015 [41], rather scarce data are available on the epidemiological situation of breastfeeding and on the infant diet habits in France.

The *ENP*, conducted in regular time intervals, aims at monitoring the evolution over time of perinatal health and medical practice indicators, as well as providing information on specific topics like maternal characteristics, pregnancy follow-up and infant characteristics. In 2010, the last *ENP* survey shows that breastfeeding is still insufficient in France compared to other developed countries [17]. However, the data are based on the description of the food practices at the maternity ward only and no data are available anymore as soon as the mothers go back home with their newborn. Then, "l'Etude Longitudinale Française depuis l'Enfance" (*Elfe)* (i.e. French child cohort study) was launched in 2011 in France, with the aim of following 20,000 infants over a 20 years period. It is a national cohort study which has collected data at the maternity ward on breastfeeding practices and will follow the infant diet habits over time, for two decades. One of the objectives of the study is to find any possible relationship between the diet habits and disease occurrence. Therefore, unlike *ENP*, data on infant diet habits are available both at the maternity ward and during different time periods after birth. Nevertheless, *Elfe* is a 20 year followed-up study, so it is impossible to implement a surveillance system based on this study, aiming at observing any evolution over time. Thus, there is no evenly national information on breastfeeding duration, exclusiveness or weaning time yet, as no breastfeeding surveillance system has been implemented at the moment in France.

In this context, USEN is filling the gap by providing descriptive data of the breastfeeding situation and of the nutritional status of infants from 0 to 1 year-old in France, through the study: *Epifane (2012-2013)*. *Epifane* is a descriptive and longitudinal study which will enable estimate:

- the frequency, duration and exclusive feature of breastfeeding;
- the type, duration and amount of formula used;
- details about weaning process (the time-period when solid foods are given to the infant, their characteristics and their amount).

The goal of *Epifane* is to be able to repeat surveys evenly so as to observe any evolution over time. *Epifane* will help to adapt the public health recommendations to the new parents depending on what will be observed. For instance, it is recommended to feed the newborns till six months only with mother's milk or formula, and to start the weaning process not before the fifth month [42]. With *Epifane*, USEN will be able to know whether mothers follow the public health recommendations and whether policy-makers have to adapt or implement information campaigns. In addition, breastfeeding initiation is linked with numerous factors:

- Demographic, socioeconomic, cultural and psychosocial characteristics of the mothers;
- Clinical practices;
- Social networks and norms;
- Regulations and professional recommendations.

All these factors may vary over time. Therefore, they should be followed regularly at the national level, to facilitate the development of effective promotion programs, adapted to the priorities and needs of different community groups [18].
In France, unlike the WIC program in the United States, the national breastfeeding promotion programs have not targeted any particular group of population. So, it is not known whether the recent increase in breastfeeding rates (as observed in *ENP 2010*) and its continuation occurred to the same extent for women with different socio-demographic characteristics [18]. That are the reasons why a surveillance system regarding infant (from 0 to 1 year-old) nutritional status was needed.

First of all, to implement an effective surveillance system, it is useful to understand the factors which are involved in the breastfeeding initiation. On this subject, few data are available at the national scale in France. For this reason my internship was trying to identify and to describe factors associated with breastfeeding.

1.3. Aims and Objectives

The general objective of my internship was **to study the association between the maternal socio-demographic characteristics and the initiation of breastfeeding at the maternity ward.**

Based on the literature, we have seen previously that various socio-demographic factors might influence the initiation of breastfeeding (age, education level, marital status, place of birth, job status) [18,19,21]. However, socio-demographic factors are not the only ones associated with breastfeeding initiation. So, we studied the association between initiation of breastfeeding and socio-demographic factors taking into account other important issues such as:

- **Pregnancy and delivery characteristics** (complications during pregnancy, multiple birth, prematurity, type of delivery, infant birth weight);
- **Individual behavior** (smoking status and alcohol consumption during pregnancy), **individual characteristic** (BMI, parity status).

We included other complementary characteristics in order to investigate how the relationship between socio-demographic characteristics and breastfeeding status was partly explained by the following factors:

- **Psychological factors** (mother's perception of partner's attitude regarding breastfeeding);
- **Maternity wards' practices** (skin-to-skin contact directly after birth).

Thus, the analysis conducted represents an overview of the possible individual factors of women who delivered in 2012 in France.

2. Materials and Methods

2.1. General considerations of the *Epifane* protocol

2.1.1. Data selection

The targeted population is composed by live births, collected in 136 maternity wards which were randomly selected throughout France. The selection was proportional to the number of deliveries and stratifications were based on the private-public status, the equipment level of the maternity hospital (levels I, II or III), and on five French geographic areas (Ile-de-France, Northeast, West, Southwest, Southeast). In this way, twenty-five strata were built in total. After the review of the eligibility criteria (being above 18 years of age; living in France in a classical household[*] or not willing to move out from France for the next 12 months coming; speaking, reading and writing French or being able to be helped by someone else; having a baby being born at least at 33 amenorrhea weeks; having a newborn without heavy antenatal pathology or without requiring a transfer in another unit or a hospitalization), the mothers were included in the study one or two days after delivery. Each maternity ward had to include 25 mothers.

[*] Classical household means all people who share the same principal residence without those people are necessarily bound by ties of kinship. Mothers living in mobile households or living in institutions are classified as living "outside the classical household" and are therefore not eligible.

2.1.2. Data collection

Epifane is carried out on 3,376 mother-infant couples, over a one year period, from birth till the one year of age of the infants. Mothers who delivered between January the 16th 2012 and mid-April 2012 in a selected maternity ward were proposed to participate in the study. They have to fill in questionnaires based on five life-time periods: at birth, 1 month, 4 months, 8 months and 12 months of infant's age. The questionnaires are dealing with various data: birth conditions; socio-economic and demographic characteristics; food practices (breastfeeding vs. formula feeding, weaning); mother feelings and anthropometric data among others.

Three questionnaires were to be filled in at the maternity ward: one filled by the mother and two by the midwife (one dealing with the mother-infant couple and another one about breastfeeding policy at the maternity ward). A questionnaire was also given to the women who refused to enter the study. Data on refusal is also important because it enables to have an overview of the characteristics of women who do not want to participate. The goal will be to evaluate how much such refusing mothers are different from the mothers who are included in the cohort.

The data collection at 1, 4, 8 and 12 months is made by an external provider (TNS Sofres) through both:

- Phone interviews: CATI (i.e. computer-assisted telephone interview) by TNS Sofres interviewers, and
- Self-administered questionnaires by mothers: either using CAWI (i.e. computer-assisted web interviewing) on a dedicated website *www.epifane.fr*, or by post mail using paper-based questionnaire.

2.1.3. Data analysis

USEN has and will have to conduct validation programs on all the databases of the different questionnaires received from TNS Sofres. The sample will be described and compared with data obtained in the *ENP 2010*. Afterthat, the data will be analyzed throughout a quantitative and qualitative aspect in order to describe the breastfeeding practices (prevalence, duration, degree of exclusivity), the use of formula (type, duration, amount) and the details of the weaning process (moment, type of food, amount) in France. This sample description will be done globally and depending on mothers', infants' and maternity wards' characteristics.

2.2. Detailed context of this preliminary analysis on breastfeeding initiation & maternal socio-demographic characteristics

2.2.1. Data source

The study was conducted on databases provided by TNS Sofres, based on the data they collected at the maternity wards (mothers' questionnaires and midwives' questionnaires dealing with the mother-

infant couples). For two variables (women's place of birth and parity), data were extracted through the self-administered questionnaires done at the first month survey.

Before the data processing, a quality control analysis of the databases was performed. I implemented validations' programs on the Stata Software, to verify the databases received. As soon as outlier data were detected (such as a failure to comply eligibility criteria, or unlikely data), the provider was urged to verify the data capture or to contact mothers and midwives again if needed.

2.2.2. Study population

The mother-infant couples represent the statistical units. The analysis was conducted on a subsample of the *Epifane* population, that is to say on 2,058 couples, for whom non-missing data were available on all the selected variables. Indeed, if we had the complete databases regarding the birth questionnaires, we had only intermediate data for the first month survey. So, we lost statistical units as the analysis was carried on the mother-infant couples present in the first month databases.

2.2.3. Variables selection

- *Outcome variable*

The outcome variable is the feeding status at the maternity ward. It is a dichotomous variable, having for reference the exclusively formula fed (coded as 0), compared to the entirely and partly breastfed (coded as 1). We decided to merge the entirely and partly breastfed because the partly breastfed at the maternity ward represented too few couples (9.6%, *Appendix A*), which was not enough to compare with the exclusively breastfed or formula fed. Moreover, we were focused on the feeding type at the maternity ward solely. It would be possible that among the partly breastfeeding mothers some will go back to exclusive breastfeeding or among the exclusively breastfeeding mothers some will become partly breastfeeding mothers soon after they would go home.

- *Explanatory variables*

The independent variables are the socio-demographic characteristics and individual behavior and characteristics of the mothers. We chose to focus on a broad range of variables representing the main important ones, according to the literature review I did in this field and to the data we had in the questionnaires. The independent variables were almost all built with classes, to observe more specifically the effect of the dependent variables on the type of feeding. Indeed, depending on a given category, mothers could have been more or less prone to breastfeed than the ones in the other categories. Thus, the explanatory variables selected are:

- **Age**, studied both as a continuous variable and in classes. I computed four age categories, representing the most often met in the literature. The four categories were the following: from 18 to 24 years old, from 25 to 29, from 30 to 34 and equal or above 35 years of age.

- **Education**, as a categorical variable. Three classes were built to study the effect of the education level on the feeding type: less than high school level, high school diploma, more than high school;
- **Employment status before birth** as a categorical variable with three categories: Unemployed, Part-time employment and Full-time employment;
- **Marital status** as a dichotomous variable (married, non-married);
- **Place of birth** as a dichotomous variable. One category included mothers born in France and the other one the mothers born abroad;
- **Parity status** as a dichotomous variable representing the primiparous women and the multiparous ones;
- **Complementary health insurance status** as a dichotomous variable: the ones having the "classic" complementary health insurance scheme and others not having any coverage, or with the ones dedicated to people depending on social criteria: "Couverture Maladie Universelle complémentaire" (CMUc) or "Aide Médicale d'Etat" (AME);
- **BMI before pregnancy**, as a categorical variable, with the four categories defined by the WHO[11]: underweight (< 18.5 kg/m^2), normal weight (from 18.5 to 24.99 kg/m^2), overweight (from 25 to 29.99 kg/m^2) and obese (≥ 30 kg/m^2);
- **Smoking status and alcohol consumption during pregnancy**, as dichotomous variables (smokers vs. non-smokers and drinkers vs. non-drinkers);
- **Antenatal follow-up visits** as a dichotomous variable (six or less antenatal follow-up visits vs. seven or more antenatal follow-up visits). This threshold was based on the one implemented in *ENP 2010*;
- **Antenatal classes** to prepare the mother for the delivery as a dichotomous variable (women who have had antenatal classes vs. women who did not have such classes).

➢ *Confounding variables*

Variables which would have a proven impact on the type of feeding were also enclosed in the analysis. Most of the variables are not modifiable and are above all linked with pregnancy and delivery characteristics. These variables are all dichotomous variables:

- **Complications during pregnancy** (coded as Yes/No);
- **Type of pregnancy** (singletons vs. multiple births);
- **Prematurity** (infants born between 33 and 36 weeks of amenorrhea and the ones born at 37 weeks of amenorrhea or more);
- **Type of delivery** (vaginal pathway vs. caesarean)
- **Infants' birth weight** (the low birth weight infants with a body weight below 2500 g vs. the "normal" birth weight, weighting at least 2500 g)

[11] WHO: Global database on Body Mass Index, *http://apps.who.int/bmi/index.jsp?introPage=intro_3.html*

Other potential confounding variables which would influence breastfeeding initiation were also included in the analysis. However, these variables are much more modifiable as they deal with women perception and maternity wards' practices. The first variable was about the **perception of the women regarding their partners' attitude towards breastfeeding**. This variable comprises three categories: one representing the partners who have a positive perception of breastfeeding, another one for those who have a negative perception and the last one including mothers who did not know their partners' opinion, or those who had no partner or a partner without any opinion on breastfeeding. The second variable was about the maternity wards' practices on **skin-to-skin contact after delivery (STS)** (those who pursue direct STS contact vs. differed STS contact).

2.2.4. Statistical analysis

The sample was weighted on the inverse probability of being included, and calibrated on the age (4 classes) and the marital status variables, provided by *ENP 2010*. The weighted process took also into account the sampling design, based on the strata as each stratum was supposed to be equally represented in the analysis.
The feeding type chosen at the maternity ward and the different explanatory and some confounding variables were described by using frequencies and graphs in order to have an overview of the sample distribution. *ENP 2010* and *Epifane 2012* sample (weighted) were compared by using an adjusted Wald test. The p-value obtained enabled to state whether the population of our sample was different from the *ENP* one, for the various variables studied.

A univariate analysis was performed to identify factors associated with breastfeeding. The association between the outcome variable and the explanatory variables was assessed through simple logistic regression using odds ratios (ORs), the 95% confidence intervals and the p-values. This was done to be able to measure the effect of the independent variables on the breastfeeding status. We decided to reject the null hypothesis when the p-value was below 0.2.

Two multivariate logistic regression analyses were then performed on the preselected variables, to determine which independent variables could best explain the likelihood of breastfeeding initiation. The multivariate analysis enables also to identify whether the degree of the relationship between the outcome and the explanatory variables were modified compared to the univariate analysis.
The first model was a multivariate logistic regression based on explanatory variables listed above, adjusted for the potential confounders as following: complications during pregnancy; type of pregnancy; prematurity; type of delivery; infants' birth weight. The dependent variable was the dichotomous feeding status and variables with $p<0.05$ were retained in the final model. However, we decided to keep in the model the calibration variables (age and marital status) even though they were not significant.
The second model was based on the final model obtained previously and additionally included the women's perception of their partners' attitude regarding breastfeeding and STS after delivery, to

study their contribution on the relationship between the feeding type chosen and the previous explanatory variables.

3. Results

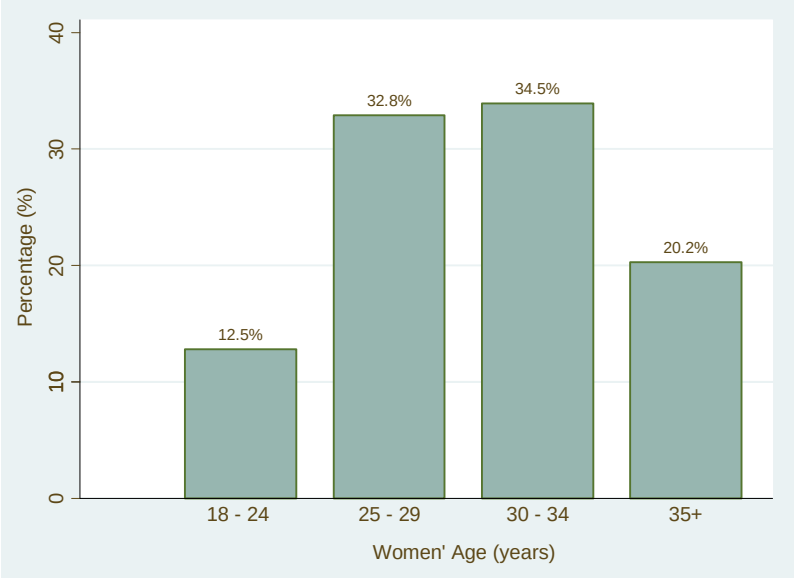
3.1. Description of the study population

Overall our sample included 2,058 mother-infant couples. Mothers who initiated exclusive breastfeeding at the maternity ward counted for 57.7%, while 32.7% fed their newborn with formula exclusively. The mothers who fed their newborn with both breast milk and formula (mixed feeding type) represented 9.6%. *(Appendix A)*

- *Socio-demographic characteristics of the mothers*

Figure 1. shows the age repartition of the mothers included in the sample. The women who delivered between 30 and 34 years of age represented 34.5% of the population. More than half of the women (54.7%) were above 29 years of age.

Figure 1. **Age repartition of the women included in the analysis**

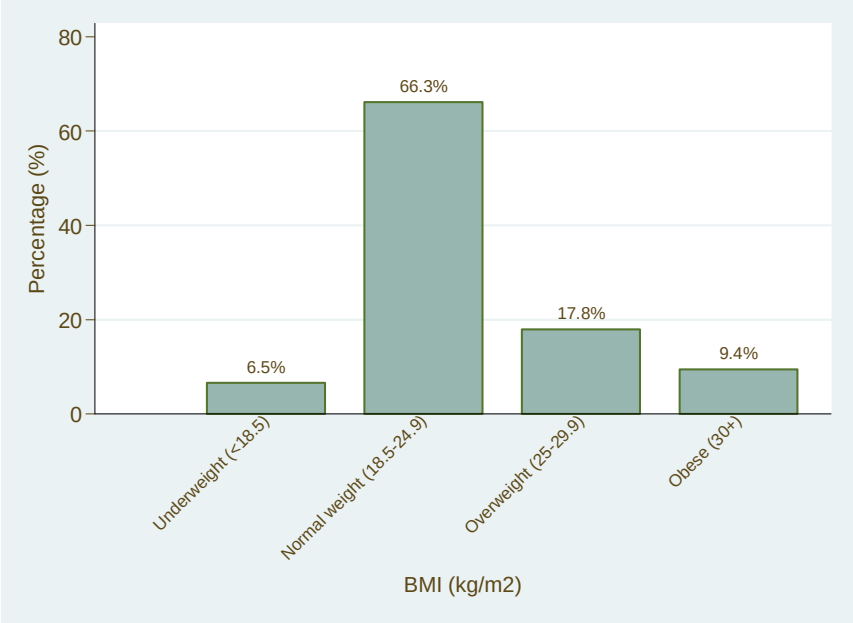


Considering the socioeconomic status, 60% of the mothers had an education level above high school and 68% were full-time workers. Half of the women were married but 97% declared living with a partner. Our population included 9% of women born abroad. “CMU” or “AME” were allocated to 3% of the women and only 0.1% did not have any coverage at the beginning of their pregnancy. *(Appendices A* and *B)*

- *Individual behavior and health characteristics*

Figure 2. presents the mothers’ BMI before pregnancy, based on declaration of body weight and height.

Figure 2. **BMI repartition of the women included in the analysis**

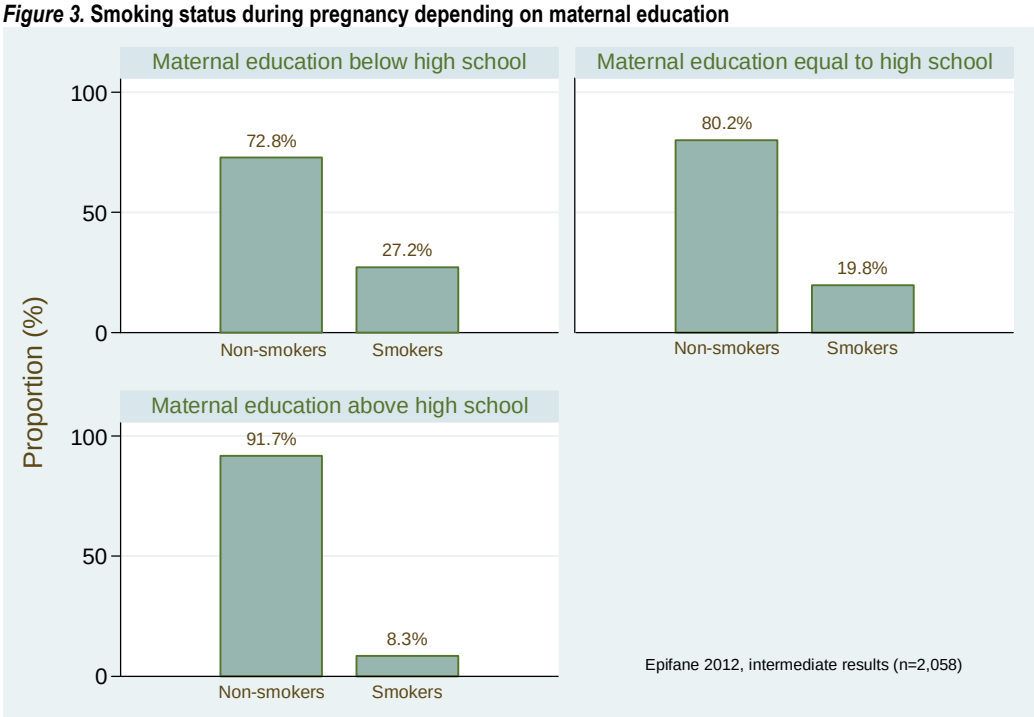


Normal weight women represented two thirds of the population. Around one quarter of the mothers had excess weight and among them 9.4% were obese.

Mothers who smoked during their pregnancy were 14.2% in the population, and 6.6% declared they had consumed alcohol during pregnancy. *(Appendix B)*

Figure 3. states the smoking status during pregnancy regarding maternal education. Among the smokers during pregnancy, the least educated mothers were the ones who smoked the more (27.2%), whereas the most educated mothers were the ones who smoked the less during pregnancy (8.3%) *(p<0.001)*.

Figure 3. **Smoking status during pregnancy depending on maternal education**



Regarding the parity status, multiparous mothers counted for 56%.

- *Pregnancy and delivery characteristics*

Seven antenatal care visits or more were done by 90% of the mothers, and 62% of the population attended antenatal classes to prepare the delivery. During these classes, 75% of the women declared that they had received information on infants' feeding. Primiparous mothers were 86% to attend antenatal classes whereas this was the case for 43% of the multiparous women.

The *Table 1.* below states that around 82% of the women with the lowest education level had seven or more antenatal follow-up visits during their pregnancy. The highest educated ones were 93% who had seven or more follow-up visits.
Regarding antenatal classes, *Table 1.* outlines a linear trend between maternal education level and the attendance to antenatal classes. The least educated mothers were less likely to attend antenatal classes (42%) than the most educated ones (71%) *(p<0.001)*.

Table 1. **Proportions of follow-up visits and antenatal classes depending on maternal education level**

	Proportions of women who had 7 or more follow-up visits during their pregnancy		**Proportions of women who attended antenatal classes during their pregnancy**	
	(%)	[95% CI]	(%)	[95% CI]
Women with education level below high school	81.8	[0.78-0.86]	41.7	[0.37-0.47]
Women with education level equal to high school	92.1	[0.89-0.95]	56.2	[0.52-0.61]
Women with education level above high school	92.6	[0.91-0.94]	70.6	[0.68-0.73]

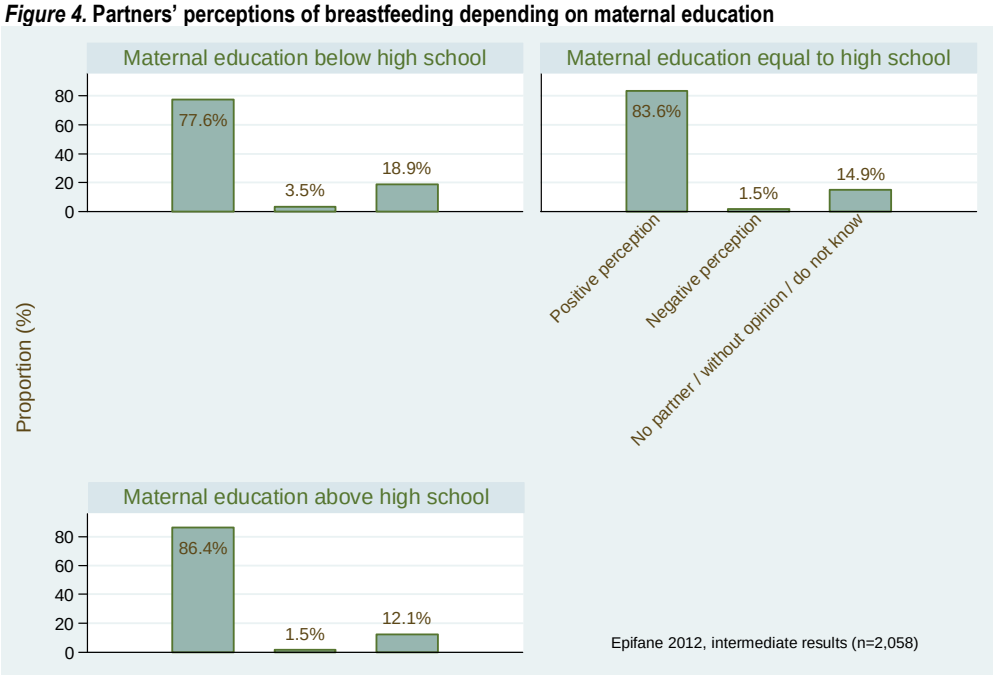
Regarding the type of pregnancy, singletons represented nearly the totality of the total births. Caesarean was practiced for 17% of the whole deliveries.

Our population encountered 3.4% of premature births (from 33 to 36 weeks of amenorrhea) and 3.6% of the infants born weighted less than 2500g. *(Appendix B)*

- *Psychological factors*

The *Figure 4*. shows partners' perception of breastfeeding regarding maternal education. Partners who had a positive perception of breastfeeding were 78% among the least educated women while they were 86% among the most educated ones. Concerning partners who had a negative perception of breastfeeding, we can observe that the least educated women were the ones who had more partners with negative breastfeeding perception (3.5%), whereas the most educated women were the ones who had less partners with negative breastfeeding perception (1.5%) *(p=0.04)*. In the same way, the least educated women were most likely to have no partner or to have partners without opinion (19%) compared to the most educated ones (12%) *(p=0.003)*.

Figure 4. **Partners' perceptions of breastfeeding depending on maternal education**



➢ *Comparison between ENP 2010 and Epifane 2012*

The *Appendix A* presents the comparison between the observations coming from the *ENP 2010* and *Epifane 2012.* Different variables were compared using frequencies and percentages. The Wald test conducted on the different variables stated that our population was different from the *ENP 2010* one. Indeed, the p-values obtained for the different variables studied were all equal to 0.000, which enabled us to reject the null hypothesis (H0: no difference between *ENP 2010* and the sample of *Epifane 2012*).

However, the percentages obtained both in *ENP 2010* and *Epifane* were rather close. The most different variables were the ones directly related to the eligibility criteria as the inclusion factors were different from one study to another. This was the case with age and birth weight for example.

3.2. Variations of breastfeeding according to characteristics (Univariate analyses)

The *Tables 2, 3 and 4*. show the proportion of breastfeeding according to the characteristics of the women and for each subclass. It presents also the results of the univariate analysis to determine the factors associated with the type of feeding.

Table 2. outlines the variations of breastfeeding according to the explanatory variables:

- **Age** was significantly associated with both mixed and exclusive breastfeeding initiation when it was included in the study as a continuous variable. For an increase of 1 year, breastfeeding likelihood was increased by 1.03 *(p=0.008)*. When age was grouped into classes, only the 18-24-year-old category was significantly associated with breastfeeding: compared to the ones above 35 years, the youngest ones had a decreased odd to breastfeed.

- The **marital status** was significantly associated with breastfeeding. Not married women were less likely to breastfeed their infant than married women.

- Women with an **education level** lower than high school or equal to high school diploma were less inclined to start breastfeeding at the maternity ward compared to women with an education level above high school. Women with an education level below or equal to high school had twice *(=1/0.49)* less chance to breastfeed their infants than women with an education level above high school.

- **Obese women** were significantly less prone to breastfeed their infant at the maternity ward *(OR=0.64, [0.46-0.89])* compared to "normal" weight mothers.

- Women who **smoked during pregnancy** had twice less odds to breastfeed their infants than non-smoking mothers *(OR=0.5, [0.38-0.64])*.

- Women who did not follow the **antenatal classes** for delivery preparation had 0.51 *[0.42-0.62]* decreased odds to breastfeed their infant compared to the ones who followed these classes.

- The women who had a **multiple birth** (twins or more) *(OR=0.49, p=0.14)* and the **multiparous women** *(OR=0.87, p=0.15)* had less odds to initiate to breastfeed their infants than women who had singletons or primiparous women. Nevertheless, parity status was significant at *p<0.2*.

- The **maternal place of birth** was highly significantly associated with breastfeeding. Indeed, women born abroad have nearly four higher odds to breastfeed their infants at the maternity ward compared to women born in France *(p<0.001)*.

Employment status before birth, health insurance coverage, alcohol consumption during pregnancy, and number of antenatal follow-up visits were not associated with breastfeeding at *p<0.2* and were not included in the multivariate analysis.

Table 2. **Proportion of breastfeeding in each category and Univariate analysis for the explanatory variables, *Epifane 2012* (intermediate results n=2,058)**

Variables		Breastfeeding proportion for each category (%)	ORs	[95% CI]	p-values
Age in classes◦	18 – 24	58.0	0.58	[0.40-0.83]	0.003
	25 – 29	66.3	0.82	[0.62-1.09]	0.173
	30 – 34	69.8	0.97	[0.74-1.27]	0.810
	≥ 35	70.5	1.00		
Age as continuous◦		-	1.03	[1.00-1.05]	0.008
Marital status◦	Not married	64.3	0.75	[0.62-0.91]	0.004
	Married	70.4	1.00		
Education level	< high school	57.9	0.49	[0.39-0.63]	0.000
	High school	57.6	0.49	[0.38-0.62]	0.000
	>high school	73.6	1.00		

Women's birth place	Abroad	88.2	3.96	[2.48-6.34]	0.000
	France	65.3	1.00		
Employment status before birth	Unemployed	64.8	0.81	[0.58-1.14]	0.236
	Full-time employment	67.6	0.92	[0.69-1.23]	0.580
	Part-time employment	69.4	1.00		
Health insurance coverage	CMUc / AME / No coverage	62.4	0.80	[0.52-1.21]	0.288
	Classical scheme	67.6	1.00		
Parity status	Multiparous	65.9	0.87	[0.71-1.05]	0.150
	Primiparous	69.1	1.00		
BMI (kg/m^2)	< 18.5	63.4	0.77	[0.52-1.14]	0.194
	18.5 – 24.9	59.2	1.00		0.272
	25 – 29.9	69.2	0.87	[0.67-1.12]	0.009
	≥ 30	66.1	0.64	[0.46-0.89]	
Smoking status during pregnancy	Smokers	53.3	0.50	[0.38-0.64]	0.000
	Non-smokers	69.6	1.00		
Alcohol status during pregnancy	Drinkers	68.4	1.06	[0.73-1.54]	0.775
	Non-drinkers	67.2	1.00		
Antenatal follow-up visits	≤ 6	67.7	1.02	[0.74-1.41]	0.906
	≥ 7	67.3	1.00		
Antenatal classes	No	58.0	0.51	[0.42-0.62]	0.000
	Yes	73.0	1.00		

° **Calibration variables**

Table 3 and 4. represent the variations of breastfeeding according to the confounding variables:

Table 3. outlines that the **type of pregnancy** solely was associated with breastfeeding at *p<0.2*. It was the only confounding variable on which we decided to adjust our multivariate model, as complications during pregnancy, prematurity, mode of delivery and infant birth weight were not associated with breastfeeding at *p<0.2*.

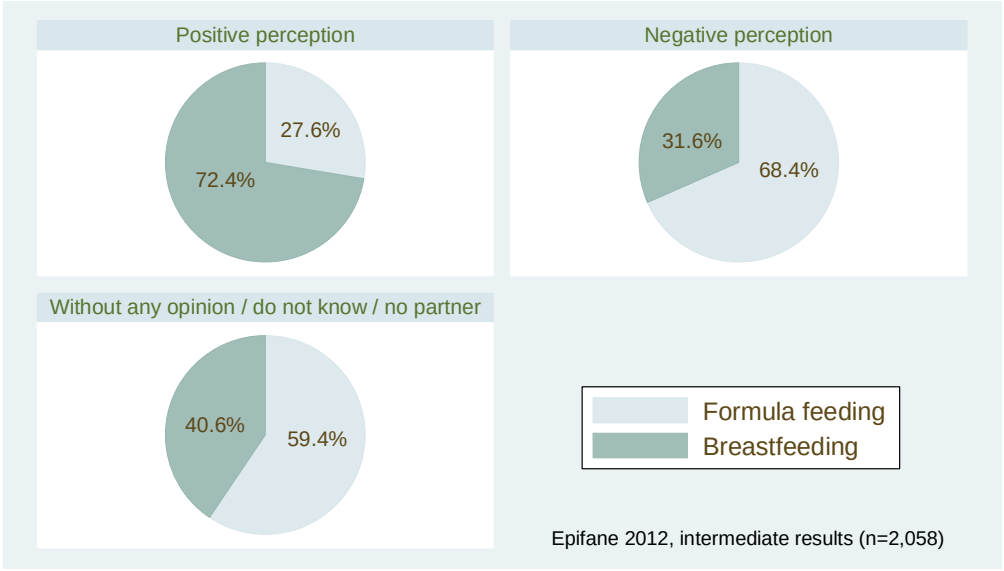
Table 3. **Proportion of breastfeeding in each category and Univariate analysis for the confounding variables, *Epifane 2012* (intermediate results n=2,058)**

Variables		Breastfeeding proportion for each category (%)	ORs	[95% CI]	p-values
Complications during pregnancy	Yes	66.2	0.94	[0.74-1.18]	0.585
	No	67.6	1.00		
Type of pregnancy	Twins or more	50.6	0.49	[0.19-1.26]	0.139
	Singletons	67.4	1.00		
Prematurity	33 – 36	66.5	0.96	[0.57-1.61]	0.889
	≥ 37	67.3	1.00		
Mode of delivery	Caesarean	64.9	0.88	[0.68-1.12]	0.296
	Vaginal pathway	67.8	1.00		
Infant birth weight	< 2500	66.8	0.98	[0.59-1.62]	0.926
	≥ 2500	67.3	1.00		

Figure 5. and Table 4. represent the modifiable confounding variables which might influence breastfeeding behavior at the maternity ward.

The *Figure 5.* clearly shows that the feeding type was associated with the partners' perception regarding breastfeeding. Indeed, partners who had a positive perception made women breastfeed more (72% were breastfeeding their newborn) than women whose partners had a negative perception (around 32% of breastfeeding). Women who did not have any partner or whose partners had no opinion regarding breastfeeding tended to breastfeed their infants for nearly 41% of them.

Figure 5. **Feeding type chosen at the maternity ward depending on partners' perception of breastfeeding**



Regarding the maternity wards' practices, two thirds (68%) of the women who had direct STS contact after birth were breastfeeding their infants at the maternity ward, while 62% of the mothers who had differed STS contact were breastfeeding their newborn. (*Appendix C*, *Figure 6.* Impact of the Skin-to-Skin contact on the feeding type at the maternity ward)

In the univariate analysis, the maternity wards' practices regarding **STS contact after delivery** were significantly associated with breastfeeding. Women who had a differed STS contact have 0.77 lower odds to breastfeed than women who had a direct STS contact after delivery *(p=0.036)*.

Partners' perception regarding breastfeeding was highly significantly associated with breastfeeding. Women whose partners had a negative perception of breastfeeding had nearly 6 times *(=1/0.17)* less odds to breastfeed their newborn compared to those whose partners had a positive perception *(p<0.001)*. Women whose partners did not have any opinion on breastfeeding or women who did not have any partner had also 4 times *(=1/0.25)* less odds to breastfeed their newborn compared to those whose partners had a positive breastfeeding perception *(p<0.001)*.

Table 4. **Proportion of breastfeeding in each category and Univariate analysis for the *"skin-to-skin contact after delivery" and "partners' perception regarding breastfeeding" variables*, *Epifane 2012* (intermediate results n=2,058)**

Variables		Breastfeeding proportion for each category (%)	ORs	[95% CI]	p-values
Skin-to-skin contact after delivery	Differed	62.0	0.77	[0.60-0.98]	0.036
	Direct	68.3	1.00		
Partners' perception regarding breastfeeding	Negative perception	31.6	0.17	[0.09-0.34]	0.000
	Without opinion / do not know / no partner	40.6	0.25	[0.19-0.33]	0.000
	Positive perception	72.4	1.00		

3.3. Characteristics associated with exclusive and partial breastfeeding (Multivariate analyses)

Table 5a. presents the results of the multivariate analysis, including all the variables retained in the univariate analysis.

Table 5a.* Factors associated with breastfeeding initiation: *Initial model
(Multivariate analysis, *Epifane 2012* (n=2,058): *with all the variables having a p-value < 0.2 in the univariate analysis)*

Variables		ORs	[95% CI]	p-values
Age as continuous°		1.01	[0.99-1.03]	0.361
Marital status°	Not married	0.91	[0.74-1.13]	0.393
	Married	1.00		
Education level	< high school	0.66	[0.50-0.88]	0.004
	High school	0.59	[0.46-0.76]	0.000
	>high school	1.00		
BMI (kg/m^2)	< 18.5	0.75	[0.50-1.12]	0.163
	18.5 – 24.9	1.00		
	25 – 29.9	0.93	[0.71-1.21]	0.583
	≥ 30	0.71	[0.50-1.00]	0.054
Smoking status during pregnancy	Smokers	0.69	[0.52-0.90]	0.008
	Non-smokers	1.00		
Antenatal classes	No	0.52	[0.41-0.66]	0.000
	Yes	1.00		
Women's birth place	Abroad	4.29	[2.60-7.08]	0.000
	France	1.00		
Parity status	Multiparous	1.08	[0.84-1.38]	0.547
	Primiparous	1.00		

Model adjusted for the type of pregnancy
°**Calibration variables**

The age variable was studied both as continuous variable and in classes. They both were not significant *(p-value>0.05)*, just like the marital status variable. However, we decided to keep them into our final model as these two variables were used for calibration.

The parity status variable was excluded from the final analysis as it was not significant.

Regarding the BMI variable, the obese category was borderline significant. We decided to compute the same multivariate analysis but this time with BMI as a global ordinal variable, in order to know whether the variable was significantly associated with breastfeeding (*Appendix D*, table 5b). BMI was significantly associated with breastfeeding *(p=0.03)* and when BMI increased by one unit, the odds to breastfeed decreased by 0.89. Thus, we decided to maintain BMI in classes in the final model.

Our final multivariate model is presented below, in *Table 4*.

Table 6.* Factors associated with breastfeeding initiation: *Final model **(Multivariate analysis, *Epifane 2012* (n=2,058))**

Variables		ORs	[95% CI]	p-values
Age as continuous°		1.01	[0.99-1.04]	0.245
Marital status°	Not married	0.90	[0.73-1.11]	0.334
	Married	1.00		
Education level	< high school	0.67	[0.51-0.88]	0.004
	High school	0.59	[0.46-0.77]	0.000
	>high school	1.00		
BMI (kg/m^2)	< 18.5	0.75	[0.50-1.13]	0.171
	18.5 – 24.9	1.00		
	25 – 29.9	0.93	[0.71-1.21]	0.600
	≥ 30	0.71	[0.50-1.00]	0.054
Smoking status during pregnancy	Smokers	0.68	[0.52-0.90]	0.007
	Non-smokers	1.00		
Antenatal classes	No	0.54	[0.44-0.66]	0.000
	Yes	1.00		
Women's birth place	Abroad	4.26	[2.59-7.03]	0.000
	France	1.00		

Model adjusted for the type of pregnancy
°**Calibration variables**

In the final model, women's birth place, antenatal classes to prepare mothers for delivery, smoking status during pregnancy and education level were still highly significantly associated with breastfeeding, after adjustment on all the other variables in the model (just like the results of the univariate analyses).

Table 7a. presents the model when partners' perception and STS contact after delivery were also included in the multivariate analysis.

Table 7a. **Multivariate analysis, *Epifane 2012* (n=2,058):**
Final model including "skin-to-skin contact after delivery" and "partners' perception regarding breastfeeding" variables

Variables		ORs	[95% CI]	p-values
Age as continuous°		1.02	[0.99-1.04]	0.156
Marital status°	Not married	0.96	[0.78-1.19]	0.713
	Married	1.00		
Education level	< high school	0.71	[0.53-0.95]	0.023
	High school	0.59	[0.45-0.76]	0.000
	>high school	1.00		
BMI (kg/m^2)	< 18.5	0.75	[0.50-1.14]	0.177
	18.5 – 24.9	1.00		
	25 – 29.9	0.94	[0.72-1.24]	0.673
	≥ 30	0.77	[0.54-1.10]	0.145
Smoking status during pregnancy	Smokers	0.73	[0.55-0.97]	0.032
	Non-smokers	1.00		
Antenatal classes	No	0.54	[0.43-0.67]	0.000
	Yes	1.00		
Women's birth place	Abroad	4.11	[2.47-6.82]	0.000
	France	1.00		
Skin-to-skin contact after delivery	Differed	0.74	[0.57-0.96]	0.026
	Direct	1.00		
Partners' perception regarding breastfeeding	Negative perception	0.21	[0.10-0.44]	0.000
	Without opinion / do not know / no partner	0.27	[0.20-0.36]	0.000
	Positive perception	1.00		

Model adjusted for the type of pregnancy
°**Calibration variables**

When we included both the STS contact after delivery and the partners' perception in the final model, BMI in categories became clearly not associated with breastfeeding anymore. When BMI was computed as an ordinal variable, it also became not associated with breastfeeding *(p=0.07)* (*Appendix D*, table 7b).

Other variables (education level, women' birth place, antenatal classes and smoking status during pregnancy) remained significantly and independently associated with breastfeeding. Moreover, the intensity of the association between the explanatory variables and breastfeeding initiation status were rather the same. Indeed, we can observe that the ORs obtained in *Table 6*. and *Table 7a* did not move more than 10%.

4. Discussion

Overall, 67% of the women from our population breastfed their infant exclusively or partially at the maternity ward. This is substantially similar to values reported in *ENP 2010,* where exclusive and partial breastfeeding represented nearly 69%. However, French practices are still far from the

percentages obtained in other developed countries, where the proportion of breastfeeding initiation tends to reach 80%[12] and much more (cf. Scandinavian countries[12]).

Regarding the comparison between the percentages obtained in *ENP 2010* and our population, we found that the two populations were different. This was not really surprising to have significant results as for both studies the population size was large. However, the differences between the percentages obtained in the two studies were not so important. Therefore, such differences would be explained by the choice of the eligibility criteria, which differed from the two studies. In *ENP 2010*, all births that took place the week during which the study was conducted were included, no matter mothers' or infants' characteristics. Conversely, *Epifane* had various eligibility criteria (quoted in the Method part, "2.1.1 Data Selection") that could have made the two populations different. For example, the women included in *Epifane* had to be over 18, whereas there was no age restriction in *ENP*. This can explain the difference between the two age categories "≤ 24 years old" (17.0% in *ENP 2010* vs. 12.5% in our population, *Appendix A*). The extremely premature infants were neither included in *Epifane* (no premature child below 33 weeks of amenorrhea), while they were included in the *ENP*. This last point could lead to the differences observed in the results. Indeed, the prematurity criterion is linked with other variables such as infants' birth weight, the delivery mode and the type of pregnancy. Extremely premature infants are often born of multiple pregnancies, through caesareans [43], and would have low birth weight. This may be one explanation of the differences between the two populations as much more infants weighting less than 2500g, born by means of caesarean and from multiple births were found in *ENP 2010 (Appendix A)*.

- *Discussion on the association between socio-demographic characteristics and exclusive and partial breastfeeding status (Table 6.)*

We found various socio-demographic characteristics associated with breastfeeding initiation. Thus, maternal education, maternal smoking status during pregnancy, maternal birth place and having followed antenatal classes were significant predictors of any breastfeeding at the maternity ward.

Indeed, women with an education level below or equal to high school were less likely to breastfeed their infant compared to women with an education level above high school. Mothers who smoked during pregnancy or the ones who did not follow antenatal classes were also less likely to breastfeed at the maternity ward. Such results are consistent with international literature. In fact, highly educated and non-smoking women during pregnancy are usually expected to have better breastfeeding behavior [18-21,28,29].

For antenatal classes, it is known in the literature that women who are informed and discussed breastfeeding with their prenatal care providers were more likely to initiate breastfeeding [20]. Like this, we would assume that women received advice regarding the feeding mode of their infant during these preparation courses and were encouraged to breastfeed.

[12] Cf. footnote references 3 to 9, page 4

The place of birth of the women was a major predictor of breastfeeding, as women not born in France were four times more likely to breastfeed than mothers born in France. By this, we can see that breastfeeding would be societal and cultural dependent, which appeared in the international literature too [18,19,21]. This finding was also similar to the study conducted on the *ENP 2003*, where non-French mothers were more likely to breastfeed at the maternity ward [18].

Health-related factors (pregnancy type, BMI) were also associated with breastfeeding initiation.
The type of pregnancy was borderline significant and even not significant when STS contact after delivery and partners' perception were included in the model. Infants from multiple pregnancies were less likely to be breastfed at the maternity ward, which was reported also in another study [20]. This factor might be linked with other health-related factors such as prematurity, infant low birth weight and delivery mode, as explained above. For that matter, infants from multiple pregnancies tend to be preterm. Nevertheless, even if extremely premature infant were not included in *Epifane*, some preterm infants were still present in the study. These preterm infants may often encounter suckling troubles and so would be more likely to be formula fed.
BMI was borderline significant for the obese class, who tended to breastfeed less than the normal weight class. When BMI was ordinal we found an association with breastfeeding and with all the other variables being constant, the more the BMI increased, the less was the likelihood to breastfeed. These results were also found in the literature [19,24-27]. Obese women would produce less prolactin than normal body weight women [27], which is the main reason of a decrease of breastfeeding. In addition, obese women in developed countries tend to be the ones from lower socioeconomic status [44], and lower educated women are less likely to breastfeed.

Our multivariate analysis did not show any significant association between breastfeeding initiation and the age or the marital status, though the association was significant in the univariate analysis for both variables, and despite the fact that these associations are widely reported in literature [20,21]. This could be explained by the fact that marriage in France is not as socially marked as it can be in Italy [20] or in the US [21]. In other words, French would not feel pressured by the society to get married to have children. This idea is reinforced by the *ENP 2010* and *Epifane* results where at least 51% of women who had an infant were not married. So, age and marital status would not be social markers as such in France, compared to other countries.

- *Discussion on the impact of STS contact and partners' perception on the relationship between socio-demographic characteristics and breastfeeding status (Table 7a.)*

The two variables added in the last model were associated with breastfeeding initiation. Both STS contact and partners' perception regarding breastfeeding were significant predictors of any breastfeeding at the maternity ward, and both are modifiable risk factors. The first one is dealing with maternity ward practices and the second one with psychosocial factors.

We found that maternity ward practices with regard to STS contact after delivery is important in terms of breastfeeding achievement. Maternity wards which implemented direct STS contact after birth tended to enhance breastfeeding initiation. Conversely, for those in which STS contact was delayed, the likelihood to breastfeed at the maternity ward was decreased. This is consistent with international literature [36-38]. Indeed, the first contact between the mother and her infant should be done right after delivery if possible, or within the first hour following the birth [38]. Like this, maternal bonding is improved and infants who have early maternal contact have been found to nurse more effectively at the first feeding [37].

In our study, the partners' perception regarding breastfeeding was highly associated with breastfeeding initiation, and women whose partners had negative perception of breastfeeding were less likely to initiate breastfeeding compared to women whose partner had a positive perception. The same trend was observed when we compared women without any partner or whose partners had no opinion or did not know to women whose partners had a positive perception. This result is again consistent with the literature. *Scott et al.* found that the strongest independent predictor of any breastfeeding at hospital discharge was the father's infant feeding attitude as perceived by the mother [19]. If the mothers feel support, approval towards breastfeeding and their feeding choice, they will be much more confident in the feeding mode they chose and will be proner to start breastfeeding.

Concerning the other variables in the model, BMI and the type of pregnancy were not associated with breastfeeding initiation anymore when STS contact and partners' perception were added in the model. The association between BMI and pregnancy type would be explained partly by STS contact and partners' perception.

Maternal education, maternal smoking status during pregnancy, antenatal classes and maternal place of birth remained still associated with breastfeeding initiation after the inclusion of STS contact and partners' perception, showing that these variables are independently associated with breastfeeding. STS contact and partners' perception did not change the association between these variables and the breastfeeding status. In this way, the relationship between socio-demographic characteristics and breastfeeding status is not explained by STS contact or partners' perception.

- *Limitations*

While the study, based on the cohort *Epifane*, was representative of the mothers' population delivering and living in France, with an infant in good health, one limitation of our study was maybe the fact that eligibility criteria were implemented to include the mother-infant couples in the study. In particular the followings:

- Being above 18 years of age;
- Having a baby being born at least at 33 amenorrhea weeks;

- Having a newborn without heavy antenatal pathology or without requiring a transfer in another unit or a hospitalization.

We might have expected that women or infants excluded would have had maybe particular socio-demographic characteristics and would have represented particular groups. In particular regarding the breastfeeding status, we could have thought having lower rates of breastfeeding (exclusive and partial) in comparison with *ENP 2010,* but this was not the case.

For example the effect of the BMI by class on breastfeeding initiation was "borderline" not significant for the obese category. Moreover, the sense of the association was the one encountered in the international literature [24-27]: obese women would be less prone to start breastfeeding. The fact that the association was just borderline but not significant was maybe due to our eligibility criterion dealing with the exclusion of infants with heavy antenatal pathology or requiring a transfer in another unit. In fact, women who are overweight or obese would be more likely than normal weight women to encounter pregnancy complications or to have infants with severe complications at birth [45]. Thus we may have failed to have significant results because of this eligibility criterion.

Even though the inclusion criteria did not enable to take into account particular population subgroups, these subgroups remain atypical among the population and so, the population included in the study was still representative of the population living in France.

5. Public Health implications

Based on our findings, exclusive and partial breastfeeding initiation are facing a broad range of socio-demographic factors (education, smoking status, having followed antenatal classes, maternal birth place). For that matter, breastfeeding initiation likelihood decreases for women from lower SES, highlighting social disparities among the population regarding the initiation of breastfeeding at the maternity ward. Therefore, it would be important to focus future interventions on these social disparities in order to offer targeted interventions on women less likely to breastfeed. Indeed, in several countries, targeted interventions have been successful for promoting breastfeeding in subgroups of mothers less likely to breastfeed [16].

One way to achieve an increase of breastfeeding initiation among women less likely to start breastfeeding would be to act directly on modifiable risk factors such as STS contact after delivery, partners' perception of breastfeeding and antenatal classes, as underlined by our study and others previously published. It would be even more important to act on these variables as they represented in our analysis those which had a major impact on the breastfeeding status.

In fact, through the antenatal classes and the partners' perception variables we have seen that women seem to place importance towards external advice or perceptions regarding breastfeeding.

Regarding the antenatal classes, for those who had attended, nearly three quarters of them had received information on infants' feeding. We would assume that antenatal courses tend to promote breastfeeding as the ones who did not follow the classes were less likely to breastfeed. However,

mothers who attended the classes were also the most educated ones, who were by the way the ones who breastfed the more. Thus, it would be important to promote access to antenatal classes close to women from lower SES. But this might be harsh. One solution may be also to make health care providers promote and perhaps reinforce women' decisions as regard to breastfeeding, in the prenatal and early postpartum periods. Indeed, antenatal follow-up visits tend to increase among all socio-economic categories in France [46], and in our population 80% of the less educated ones had seven or more antenatal followed-up visits. Trying to involve health care providers in the breastfeeding promotion to give the chance to the mothers to make highlighted choices could be a good way to reach women from lower SES.

Regarding partners' perception, it would be appropriate to involve them in promotion programs instead of having targeted programs on women solely. Targeted interventions should be done on women less likely to breastfeed for sure, but also on their partners to make them understand what breastfeeding can provide. Then, they would support the mothers to make free choices regarding the feeding mode they wanted to implement. Nevertheless, these interventions on partners are not as simple. To be able to act on partners, we should act first on the society as a whole, in order to trivialize breastfeeding since-last is not fully integrated. An enabling environment to breastfeeding should be created first so that attitudes could change in respect.

For the STS contact after delivery, interventions on maternity wards' policies should be reinforced regarding the benefits of direct STS contact. Globally, policies regarding the benefits of strengthening mother-infant ties from the maternity wards should be enhanced because this would promote breastfeeding initiation [37]. In fact, women who have a ceasarean often have a delayed STS contact, whereas in most of the cases they could have nearly direct STS contact with their newborn. In the same way, midwives should ask the mother if she agrees to keep the infant with her in the room (a.k.a. rooming-in) more systematically, which would be not often the case. Indeed, frequent breastfeeding would help to produce milk and keep up milk supply. [36-38]

6. Conclusion

Finally, we have seen in our study that both exclusive and partial breastfeeding initiation is associated with socio-demographic characteristics: maternal education, smoking status during pregnancy, attendance to antenatal classes and maternal birth place. STS contact after delivery and partners' perception did not change significantly the relationship between the socio-demographic factors and breastfeeding, as it was thought before the analysis.

The study conducted represents a first set of prospective analyses on *Epifane 2012*. Other studies are and will be conducted such as considering the evolution of breastfeeding and its associated factors between birth and the first month of life, or investigating factors associated with breastfeeding discontinuation at one month of age. From this perspective, I was offered to continue to study infants' feeding through a thesis based on the weaning process modeling.

References

1. Castetbon K, Duport N, Hercberg S. Bases épidémiologiques pour la surveillance de l'allaitement maternel en France. Rev Epidemiol Sante Publique. 2004; 52:475-483.

2. Sante allaitement maternel, le site des professionnels de santé.
http://www.santeallaitementmaternel.com/index.php

3. Turck D. Propositions d'actions pour la promotion de l'allaitement maternel « Plan d'Action: Allaitement Maternel ». June 2010; p. 1 - 40

4. Institut National de Prévention et d'Education à la Santé. Le guide de l'allaitement maternel. 2009.

5. Agency for Healthcare Research and Quality (AHRQ). Breastfeeding and maternal and infant health outcomes in developed countries. 2007.

6. World Cancer Research Fund. Résumé scientifique du rapport Alimentation, Nutrition, Activité Physique et Prévention du Cancer: une Perspective Mondiale. 2007.

7. OMS. La transmission du VIH par l'allaitement au sein: bilan des connaissances actuelles. 2005

8. HIV and Infant Feeding: Revised Principle and Recommendations, Rapid Advice. WHO. November 2009.

9. Cohen R, Mrtek MB, Mrtek RG. Comparison of maternal absenteeism and infant illness rates among breast-feeding and formula-feeding women in two corporations. Am J Health Promot. December 1995; 10(2):148–53.

10. WHO. Global Strategy for Infant and Young Child Feeding. 2003.

11. WHO. Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals. 2009.
Available on: http://whqlibdoc.who.int/publications/2009/9789241597494_eng.pdf

12. Quigley MA, Kelly YJ, Sacker A. Breastfeeding and Hospitalization for Diarrheal and Respiratory Infection in the United Kingdom Millennium Cohort Study. Pediatrics. January 2007, 4;119(4):e837–e842.

13. Shiva F, Ghotbi F, Padyab M. Infant feeding and hospitalization during the first six months of life. J Pak Med Assoc. December 2007 ;57(12):599–603.

14. Bilenko N, Ghosh R, Levy A, Deckelbaum R, Fraser D. Partial breastfeeding protects Bedouin infants from infection and morbidity: prospective cohort study. Asia Pac J Clin Nutr. 2008;17 (2):243-249

15. Kuhn L, Aldrovandi G. Survival and health benefits of breastfeeding versus artificial feeding in infants of HIV-infected women: developing versus developed world. Clin Perinatol. December 2010; 37(4):843-x.

16. Dykes F. Infant Feeding Initiative: A report evaluating the breastfeeding practice projects 1999-2002. UK Department of Health; 2003.

17. Blondel B., Kermarrec M. Enquête Nationale Périnatale 2010 - Les naissances en 2010 et leur évolution depuis 2003. INSERM. May 2011; p. 1 - 132.
Available on: http://www.sante.gouv.fr/IMG/pdf/rapport_naissances2010.pdf

18. Bonet M, Kaminski M, Blondel B. Differential trends in breastfeeding according to maternal and hospital characteristics: results from the French National Perinatal Surveys. Acta Paediatr. September 2007;96(9):1290–5.

19. Scott JA, Binns CW, Graham KI, Oddy WH. Temporal changes in the determinants of breastfeeding initiation. Birth. March 2006;33(1):37–45.

20. Kambale MJ. Social determinants of breastfeeding in Italy. Afr Health Sci. September 2011; 11(3):508–17.

21. Ahluwalia IB, Morrow B, Hsia J, Grummer-Strawn LM. Who is breast-feeding? Recent trends from the pregnancy risk assessment and monitoring system. J. Pediatr. May 2003; 142(5):486–91.

22. Hawkins SS, Griffiths LJ, Dezateux C, Law C. Maternal employment and breast-feeding initiation: findings from the Millennium Cohort Study. Paediatr Perinat Epidemiol. May 2007; 21(3):242–7.

23. Noble S. Maternal employment and the initiation of breastfeeding. Acta Paediatr. April 2001; 90(4):423–8.

24. Amir LH, Donath S. A systematic review of maternal obesity and breastfeeding intention, initiation and duration. BMC Pregnancy Childbirth. 2007; 7:9

25. Li R, Jewell S, Grummer-Strawn L. Maternal obesity and breast-feeding practices. Am. J. Clin. Nutr. April 2003; 77(4):931–6.

26. Wojcicki JM. Maternal prepregnancy body mass index and initiation and duration of breastfeeding: a review of the literature. J Womens Health (Larchmt). March 2011; 20(3):341–7.

27. Rasmussen KM. Association of maternal obesity before conception with poor lactation performance. Annual Review of Nutrition. 2007; 27(1):103–121.

28. Weiser TM, Lin M, Garikapaty V, Feyerharm RW, Bensyl DM, Zhu B-P. Association of Maternal Smoking Status With Breastfeeding Practices: Missouri, 2005. Pediatrics. December 2009; 124(6):1603–10.

29. Di Napoli A, Di Lallo D, Pezzotti P, Forastiere F, Porta D. Effects of parental smoking and level of education on initiation and duration of breastfeeding. Acta Paediatr. June 2006; 95(6):678–85.

30. Bowen A, Tumback L. Alcohol and Breastfeeding. Nursing for Women's Health. December 2010; 14(6):454–61.

31. Mennella JA. Regulation of milk intake after exposure to alcohol in mothers' milk. Alcohol. Clin. Exp. Res. April 2001; 25(4):590–3.

32. Giglia RC, Binns CW, Alfonso HS, Scott JA, Oddy WH. The effect of alcohol intake on breastfeeding duration in Australian women. Acta Paediatr. May 2008; 97(5):624–9.

33. Kelly YJ, Watt RG. Breast-feeding initiation and exclusive duration at 6 months by social class: results from the Millennium Cohort Study. Public Health Nutrition. June 2005; 8(4):417–21.

34. Gudnadottir M, Sigurdur Gunnarsson B, Thorsdottir I. Effects of sociodemographic factors on adherence to breastfeeding and other important infant dietary recommendations. Acta Paediatrica. April 2006;95(4):419–24.

35. Barona-Vilar C, Escribá-Agüir V, Ferrero-Gandía R. A qualitative approach to social support and breast-feeding decisions. Midwifery. April 2009;25(2):187–94.

36. Crenshaw J. Care Practice #6: No Separation of Mother and Baby, With Unlimited Opportunities for Breastfeeding. J Perinat Educ. 2007; 16(3):39–43.

37. Righard L, Alade MO. Effect of delivery room routines on success of first breast-feed. The Lancet. November 1990; 336(8723):1105–7.

38. Sinusas K, Gagliardi A. Initial management of breastfeeding. Am Fam Physician. September 2001; 64(6):981–8.

39. Khoury AJ, Moazzem SW, Jarjoura CM, Carothers C, Hinton A. Breast-feeding initiation in low-income women: Role of attitudes, support, and perceived control. Women's Health Issues. March 2005; 15(2):64–72.

40. Anderson AK, Damio G, Young S, Chapman DJ, Pérez-Escamilla R. A randomized trial assessing the efficacy of peer counseling on exclusive breastfeeding in a predominantly Latina low-income community. Arch Pediatr Adolesc Med. September 2005; 159(9):836–41.

41. Programme National Nutrition Santé (PNNS) 2011-2015.
Available on: http://www.sante.gouv.fr/IMG/pdf/PNNS_2011-2015.pdf

42. WHO. Stratégie mondiale pour l'alimentation du nourrisson et du jeune enfant - durée optimale de l'alimentation au sein exclusive. 2001.
Available on: http://apps.who.int/gb/archive/pdf_files/WHA54/fa54id4.pdf

43. Goldenberg RL, Culhane JF, Iams JD, Romero R. Epidemiology and causes of preterm birth. The Lancet, 2008; 371(9606):75–84.

44. Molarius A, Seidell JC, Sans S, Tuomilehto J, Kuulasmaa K. Educational level, relative body weight, and changes in their association over 10 years: an international perspective from the WHO MONICA Project. Am J Public Health. August 2000;90(8):1260–8.

45. Lu GC, Rouse DJ, DuBard M, Cliver S, Kimberlin D, Hauth JC. The effect of the increasing prevalence of maternal obesity on perinatal morbidity. American Journal of Obstetrics and Gynecology. October 2001;185(4):845–9.

46. Enquête Nationale Périnatale 2010: les naissances en 2010 et leur évolution depuis 2003. Rapport rédigé par Blondel B. et Kermarrec M. - Inserm U.953. Mai 2011

Appendices

Appendix A

Comparison between *ENP 2010* (n=14,681) and *Epifane 2012* (intermediate results n=2,058)

		ENP 2010 n = 14,681 (%)	***Epifane 2012*** Crude analysis n = 2,058 (%)	***Epifane 2012*** Weighted analysis *(on age & marital status)* n = 2,058 (%)	**Difference between *ENP 2010* & *Epifane 2012* weighted** p-value*
Breastfeeding	Breastfed	60.2[1]	58.6	57.7	0.000
	Breast & Formula fed	8.5[1]	9.1	9.6	
	Formula fed	31.3[1] (n=14,176)	32.3	32.7	
Women' age (years)	≤ 24	17.0[2]	10.0[3]	12.5[3]	0.000
	25 – 29	33.2	31.5	32.8	
	30 – 34	30.7	39.4	34.5	
	≥ 35	19.2 (n=14,401)	19.1	20.2	
Living with a partner	Yes	92.8	97.6	97.4	0.000
	No	7.2 (n=14,000)	2.4 (n=2,045)	2.6 (n=2,045)	
Married	Yes	47.3	46.7	49.0	0.000
	No	52.7 (n=13,979)	53.3	51.0	
Education level	Unschooled, Primary School	2.4	1.1	1.1	0.000
	Middle school	25.9	17.6	18.2	
	High school	19.9	20.0	20.3	
	HSD[4] +1 or +2 years	21.3	25.0	24.8	
	HSD[4] +3 or more years	30.5 (n=14,060)	36.3	35.6	
Women's birth place	France	81.8	91.6	91.2	0.000
	Abroad	18.2 (n=14,038)	8.4	8.8	
Parity status	Primiparous	43.4	43.2	43.9	0.000
	Multiparous	56.6 (n=14,499)	56.8	56.1	
Having a job during pregnancy	Yes	70.2	82.0	81.2	0.000
	No	29.8 (n=14,103)	18.0	18.8	
Work time	Full-time	79.4	83.6	83.7	0.000
	Part-time	20.6 (n=9,610)	16.4 (n=1,687)	16.3 (n=1,687)	
Health insurance coverage	"Sécurité Sociale"	86.1	96.7	96.5	0.000
	"CMU or AME"	12.9	3.2	3.3	
	No coverage	1.0 (n=13,888)	0.1 (n=2,045)	0.2 (n=2,045)	
BMI before pregnancy (kg/m^2)	< 18.5	8.3	6.3	6.5	0.000
	18.5 – 24.9	64.6	66.6	66.3	
	25 – 29.9	17.3	17.9	17.8	
	≥ 30	9.9 (n=13,644)	9.2	9.4	
Number of cigarettes smoked during pregnancy	0	82.9	85.6	85.8	-
	1 – 9	12.2	12.5	12.4	
	≥ 10	4.9 (n=14,082)	1.9	1.8	
Type of pregnancy	Singleton	97.0	99.0	99.2	0.000
	Twin	3.1	0.9	0.8	
	Triple	0.0 (n=14,903)	0.1	0.0	
Number of antenatal follow-up visits	≤ 6	8.5	9.4	9.6	0.000
	7 – 11	68.0	65.2	64.9	
	≥ 12	23.5 (n=13,750)	25.4	25.5	
Mode of delivery	Vaginal pathway	79.0[5]	82.7[6]	82.6[6]	0.000
	Caesarean	21.0[5] (n=14,729)	17.3[6]	17.4[6]	
Prematurity (weeks of amenorrhea)	33 – 36	5.6	3.5	3.4	0.000
	≥ 37	94.4 (n=14,555)	96.5	96.6	
Birth weight (g)	< 2500	7.1[5]	3.5[6]	3.6[6]	0.000
	≥ 2500	92.9[5] (n=14,844)	96.5[6]	96.4[6]	

*Using adjusted Wald test
[1]Normalized with respect to the number of live births
[2]≤24 years old ; [3]18-24 years old
[4]HSD=High School Diploma
[5]Based on all births including infants with severe antenatal pathologies and very premature newborns
[6]Excluding infants with severe antenatal pathologies and very premature newborns (≤32 amenorrhea weeks)

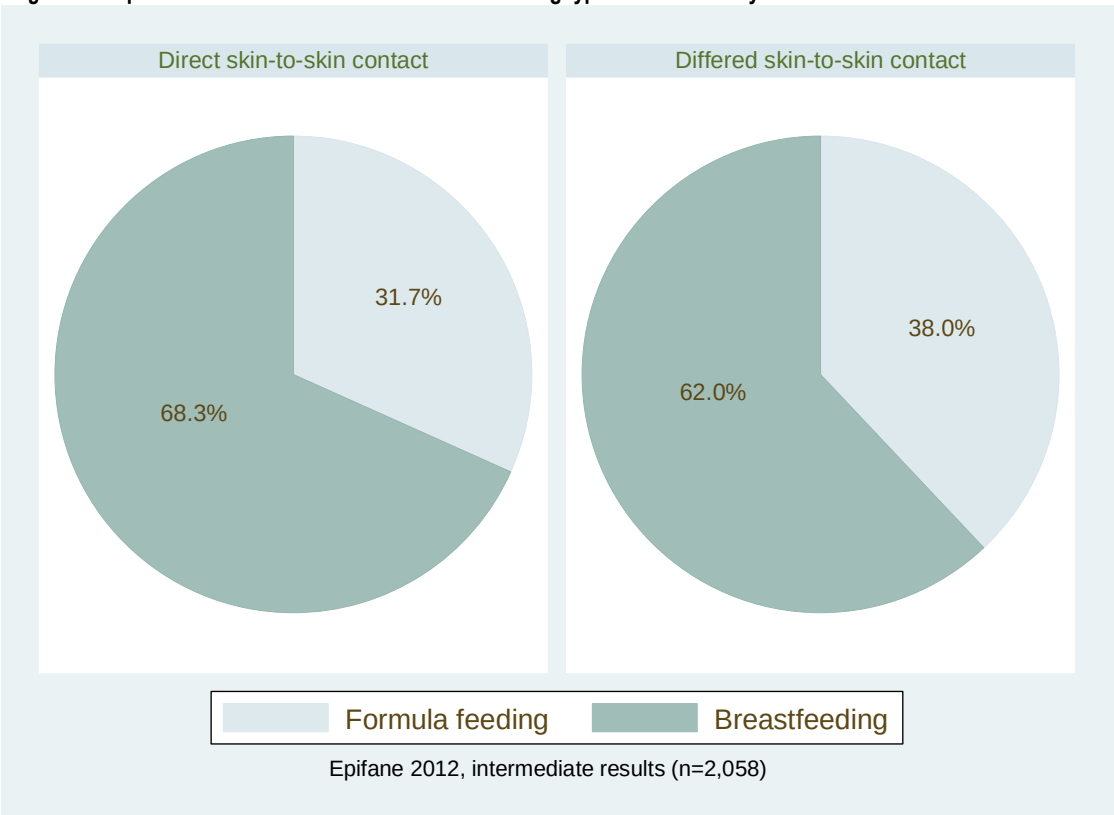
Appendix B

***Epifane 2012*: Descriptive analysis weighted on age and marital status variables**
Intermediate results on 2,058 mother-infant couples

		Relative frequency (%)
Breastfeeding	Breastfed	67.3
	Formula fed	32.7
	Total	100.0
Age (years)	18 – 24	12.5
	25 – 29	32.8
	30 – 34	34.5
	≥ 35	20.2
	Total	100.0
Marital status	Married	49.0
	Not married	51.0
	Total	100.0
Education level	<HSD*	19.3
	HSD*	20.3
	>HSD*	60.4
	Total	100.0
Women's birth place	France	91.2
	Abroad	8.8
	Total	100.0
Parity status	Primiparous	43.9
	Multiparous	56.1
	Total	100.0
Employment status before birth	Unemployed	18.8
	Full-time	67.9
	Part-time	13.3
	Total	100.0
Health insurance coverage	Classical scheme	94.7
	CMUc / AME / No coverage	5.3
	Total	100.0
BMI before pregnancy (kg/m^2)	< 18.5	6.5
	18.5 – 24.9	66.3
	25 – 29.9	17.8
	≥ 30	9.4
	Total	100.0
Smoking status during pregnancy	Smokers	14.2
	Non-smokers	85.8
	Total	100.0
Alcohol consumption during pregnancy	Drinkers	6.6
	Non-drinkers	93.4
	Total	100.0
Type of pregnancy	Singletons	99.2
	Twins or more	0.8
	Total	100.0
Complications during pregnancy	Yes	20.4
	No	79.6
	Total	100.0
Antenatal follow-up visits	≥ 7	90.4
	≤ 6	9.6
	Total	100.0
Antenatal classes	Yes	62.1
	No	37.9
	Total	100.0
Mode of delivery	Vaginal pathway	82.6
	Caesarean	17.4
	Total	100.0
Prematurity (amenorrhea weeks)	33 – 36	3.4
	≥ 37	96.6
	Total	100.0
Birth weight (g)	< 2500	3.6
	≥ 2500	96.4
	Total	100.0

*HSD: High School Diploma

Figure 6. **Impact of the Skin-to-Skin contact on the feeding type at the maternity ward**



Epifane 2012, intermediate results (n=2,058)

Table 5b. **Multivariate analysis, *Epifane 2012* (n=2,058): *with all the variables having a p-value < 0.2 in the univariate analysis;* Initial model with BMI as a continuous variable**

Variables		ORs	[95% CI]	p-values
Age as continuous°		1.01	[0.99-1.03]	0.350
Marital status°	Not married	0.91	[0.74-1.12]	0.389
	Married	1.00		
Education level	< high school	0.67	[0.51-0.88]	0.004
	High school	0.60	[0.46-0.77]	0.000
	>high school	1.00		
BMI as continuous		0.89	[0.80-0.99]	0.026
Smoking status during pregnancy	Smokers	0.69	[0.52-0.90]	0.007
	Non-smokers	1.00		
Antenatal classes	No	0.52	[0.41-0.66]	0.000
	Yes	1.00		
Women's birth place	Abroad	4.29	[2.60-7.06]	0.000
	France	1.00		
Parity status	Multiparous	1.08	[0.84-1.38]	0.547
	Primiparous	1.00		

Model adjusted for the type of pregnancy

° **Calibration variables**

Table 7b. **Multivariate analysis, *Epifane 2012* (n=2,058):**
Final model including "skin-to-skin contact after delivery" and "partners' perception regarding breastfeeding" variables and BMI as continuous

Variables		ORs	[95% CI]	p-values
Age as continuous°		1.02	[0.99-1.04]	0.148
Marital status°	Not married	0.96	[0.78-1.19]	0.703
	Married	1.00		
Education level	< high school	0.72	[0.54-0.96]	0.024
	High school	0.59	[0.45-0.77]	0.000
	>high school	1.00		
BMI as continuous		0.91	[0.82-1.01]	0.072
Smoking status during pregnancy	Smokers	0.73	[0.55-0.97]	0.030
	Non-smokers	1.00		
Antenatal classes	No	0.54	[0.44-0.68]	0.000
	Yes	1.00		
Women's birth place	Abroad	4.10	[2.47-6.81]	0.000
	France	1.00		
Skin-to-skin contact after delivery	Differed	0.74	[0.57-0.97]	0.029
	Direct	1.00		
Partners' perception regarding breasfeeding	Negative perception	0.21	[0.10-0.43]	0.000
	Without opinion / do not know / no partner	0.27	[0.20-0.36]	0.000
	Positive perception	1.00		

Model adjusted for the type of pregnancy

° **Calibration variables**