

Is there perinatal health consequences to the closure of maternities in France? Evidence from administrative database

Lea Ambroise

The closure of maternity units in France like in a number of others developed countries is a highly sensitive question that cause heated debate. It broaches questions of accessibility of care, public service proximity and geographical inequalities. In France, a wave of maternity unit closures starting in the late 70s until the early 2000s was carried out because of safety concerns and changing health care regulations¹, however these measures have been unpopular and often considered as a cost-cutting exercise.

Maternity closures in France have been carried out officially because of safety concerns, notably the ability of smaller units to safely care for more risky pregnancies, and the lack of experience of the medical teams in such units when they only deliver few babies each year. Nonetheless, in the academic literature, the effect of maternity units closures on newborns and mothers' health has produced contradictory results (see for instance GRYTTEN et al., 2014, LORCH et al., 2013, KILDEA et al., 2015 or PILKINGTON et al., 2014), and with some studies (see COMBIER et al., 2013, BLONDEL et al., 2011) suggesting that closures could have adverse effects on women and infants' health. For instance, does closures increase the probability of out-of-hospital births or urgent non-planned cesarean sections? Are babies delivered more likely to have a low birth-weight or being born pre-term?

The public debate and some of the academic literature assumes that closure of maternity units increases the distance to medical care, however, previous research is ambiguous on the subject. Notably PILKINGTON et al., 2008 find no change in average time needed for expecting women to reach their local hospital, despite 20 % of maternities closing between 1998 and 2003 in France.

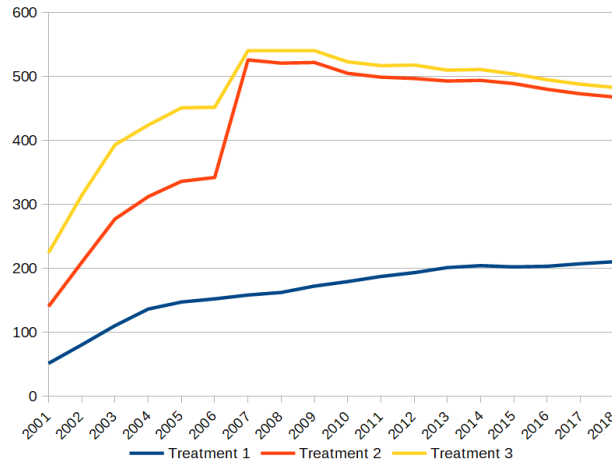
This paper makes use of exhaustive administrative data that identifies all health facilities in France, merged with exhaustive civil registration data that records all births. This allows me to (1) observe the opening and closure of maternity units over a recent 20 year study period and characterize them, (2) construct three groups of maternities affected by the closure of a neighboring maternity units, and (3) estimate the impact of closures on mother and child health at birth. Data and methods for step 1 to 3 are described below; preliminary results are also presented and further work is summarized at the end of the abstract.

Study design and data

My primary source of data is an administrative questionnaire distributed every year to each health facility in France : the *Statistique Annuelle des Etablissements de santé* (SAE) (Annual Health facility statistics), available between 2000 and 2018. Most maternity unit closures happened before 2000 :there were 1369 maternity units in France in 1975 and only 814 in 1996, which is a much steeper decrease than either the total number of births or the birthrate on the same period. Nevertheless, upward of 300 maternity units closed in France in the last twenty years. SAE surveys are a compulsory and exhaustive data source that uniquely identify each health facility under a registration number which facilitate their monitoring over several years. Among others, data collected in the surveys include whether a health facility has an obstetrics department, the type of maternity unit (level 1, 2 or 3), the number of births,

1. See for instance the Dienesch decree in 1972 that impose updated security norms in maternity units

FIGURE 1 – Number of maternities treated, depending on the type of treatment, over time.



SAE data, author's computations.

equipment (number of beds) and number and type of medical staff. Data contain the facility's location at the municipal level and can be easily merged with other administrative data.

From SAE data, I identify which health facilities host maternity units, and whether maternity units stay open during the length of my study period (2000-2018), whether a new maternity unit opens or whether an existing one closes (temporarily or definitely). I then gather information at the municipality level in order to draw a picture of maternity units locations in France, how many municipalities have a maternity unit (or more than one) and how many see their only maternity unit closing during my study period (Step 1).

As a second source of data, the civil registry allows me identify the municipalities in which pregnant women live and the ones in which they deliver (a piece of information available on birth certificate). I estimate year-by-year flows between municipalities without a maternity unit and those with one. Let us note that evidently, this flow may be considered from the point of the maternity unit's municipality (what are the towns in which the pregnant women reside and therefore are traveling from?) or the expecting women's municipality of residence (where do the expecting women of this town travel to deliver their children?).

In step 2, I define what it means being affected by the closure of a neighboring maternity unit. As I lack perinatal health indicators at the individual level, I estimate effects of maternity units closure on health data at the maternity level. I first compute the distance in kilometers and time between each maternity unit and their neighbors. I build three groups of treated maternities : the first group is being the closest maternity unit of a closed maternities units ; the second group is being among the three closest maternities units and the third is being among the five closest maternities units (see Figure 1).

Preliminary results

Nearly 400 maternities closed at least one year between the year 2000 and 2018. The evolution by year is seen in Table 1, as well as by type : unsurprisingly maternities that close are mostly of type I, and sometimes of type II. It confirms the idea that most maternity units close because they don't perform enough deliveries (fixed at least 300 a year) to be estimated safe by health authorities. Over time, the number of municipalities that has at least on maternity unit decreased and 209 municipalities went from having at least one maternity unit to none. A large part of these municipalities are actually in the parisian region : departments that are the most affected in that regard are *Seine Saint Denis* (93) and *Hauts de Seine* (92) with respectively 10 and 9 municipalities that went from having at least

TABLE 1 – Number of maternities closure, by year and by type.

Year	Total number of closures	Type I	Type II	Type III
2001	42	33	7	0
2002	31	26	4	0
2003	30	28	1	1
2004	38	28	9	1
2005	22	16	6	0
2006	17	13	3	1
2007	19	16	2	1
2008	20	16	2	1
2009	14	13	1	0
2010	29	18	6	5
2011	10	6	3	1
2012	22	11	7	4
2013	42	26	15	1
2014	1	1	0	0
2015	11	6	4	1
2016	12	9	3	0
2017	16	13	3	0
2018	11	7	2	2

Reading note : In 2001 42 maternities closed in France, from which 33 were of type I and 7 of type II (therefore one was of an unknown type non-specified in the data) .

Source : SAE data, author's computation

one maternity unit to none.

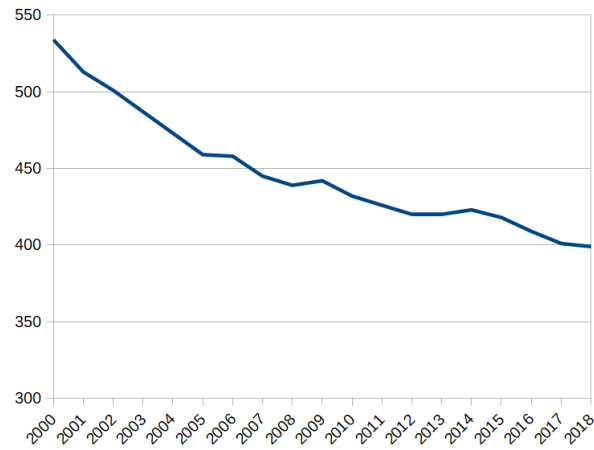
I construct my data in a panel structure, with identification at the maternity level. I use fixed effects for the analysis. My first results show that being treated is associated with an increase in the number of deliveries as well as an increase in the number of cesarean section performed. This effect decreases the farthest the maternity units are from the closed maternity unit, which is as expected. Results are still inconclusive on the stillborn ratio to deliveries.

Early conclusions and work to come

First results show that distance to a maternity unit increases but with great individual disparities. While for some mothers, the additional distance is marginal, for some others the time or distance needed to access care is much more important. The next steps will be (1) to consolidate those findings on the entire 2000-2018 study period and (2) to describe and analyze several outcomes of mother's and infant health. The health outcomes' variables that I intend to exploit are primarily on newborn's health : prevalence of premature birth (in weeks of amenorrhea), prevalence of low- and very low- birth weight, prevalence of stillborn. Those outcomes are widely considered as proxy for a newborn's health status as well as potential predictors of their later development (see ALMOND et CURRIE, 2011 ; CURRIE, 2011 for some discussion on the matter). For maternal health, I intend to use urgent non-planned cesarean section which may be indicative of longer distance to maternity units.

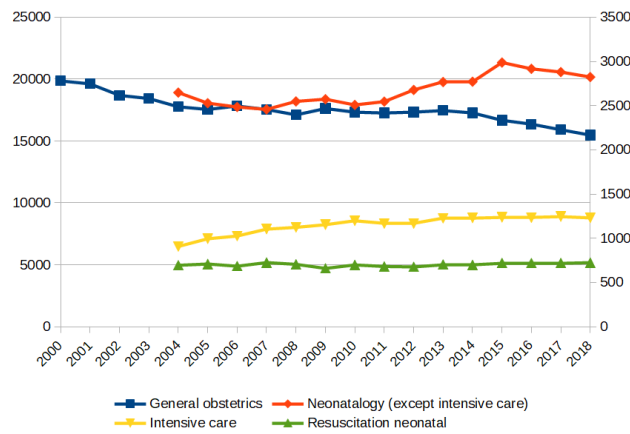
My next step is to repeat the analysis on the effects on perinatal health by using the evolution of the number of beds rather than the closures of maternity unit. This allows me to have a more detailed, precise and continuous analysis rather than a discrete one. As a preliminary information, Figure 3 shows the evolution of the number of beds in France, by type of specialized risk.

FIGURE 2 – Number of municipalities that had at least one maternity unit, by year, in France.



SAE data, author's computations.

FIGURE 3 – Evolution of the number of beds, by type, over time.



SAE data, author's computations. The left y-axis gives the number of beds in general obstetrics and the right y-axis the number of beds in specialized units.

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