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Territory operational experience of maternity hospital users in Metropolitan France

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Abstract. Significant restructuring have been conducting in France over the past 40 years. Initiated in the 1970s, it refers to the concentration and classification of maternity units in order to optimize the maternity hospitals offer on French territory. However, the appropriate optimization is only possible with an understanding of users' territorial behavior, which is the focus of social and territory justice. Thus we suggest the model which identifies the effective demand for care on operational geographical scale, namely, the health territory. The model will be illustrated with the example of maternity hospitals in France.

Key words: territory operational experience, operational territory, health territory, operational territory ob birth, maternity unit, territorial autarchy.
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Introduction

The territorial network in France has a long history of laws and planning logics successions. More explicitly, the change in planning approaches shows up through the planner's vocabulary passing from care production terms to health resources reasoning. This change in vocabulary impacts the health landscape in France and highlights the transition from the supply paradigm to the paradigm of demand in health planning [1]. The need to follow user in his health care consumption habits and especially the need to admit that his territorial behavior is deferent from that is supposed to be by the planner, have emerged long time. However, the formalization of the approach wasn't imminent. Indeed, the shaping of the French health service landscape has to be analyzed through the prism of its healthcare system. The functioning of the French health care system relays on set of rules and principles, such as the inviolability of the medical profession prerogatives, the hospital-centric approach in public policies and finally the top-down health service management. This leads to consider health as a product manufactured from the resources allocated according to the economic logic of inputs and outputs. However, the supply paradigm in health care planning shows its limits regarding the equal access to care, the territorial justice and the induced demand for care [2].

Indeed, the generations of the Regional Health Organization Scheme (SROS) have long maintained the logic of normative planning of the health care landscape. However, the introducing of SROS 3 (2006-2011) finally recognized the priority of users' needs in the health care planning politics, namely the effective demand, which means the change of normative planning paradigm to the operational planning (figure 1).Thus, the new term is introduced into the French planning vocabulary by the HPST law (2009),*namely the health territory* [5].

However, this conceptual change becomes a real dilemma as much for the planner as for the researchers and quickly faces political (related to the use of ancient scale approaches in territorial shaping and planning reasoning by region, department or canton) and methodological barriers. At the same time, it becomes obvious that the health care users don't necessarily follow the territorial concept imposed "from above" and take advantage of the very principles of the health care system. Indeed, the health care users consult outside the territory to which they are "assigned" by the planner, which is the case of the maternity hospitals. The latest trends in the closure and regrouping of maternity hospitals in France into the largest structures aim to ensure the safety of parturient and pregnant women, but it also raises many different questions. On the one hand, it is the planner's will to secure the maternity hospitals by authorizing the activity to the maternity units which meet the requirements of minimum number of deliveries per year. But on the other hand, it raises the questions of territory justice and equal access to care for parturient and pregnant women, as well as for health territories themselves and maternity

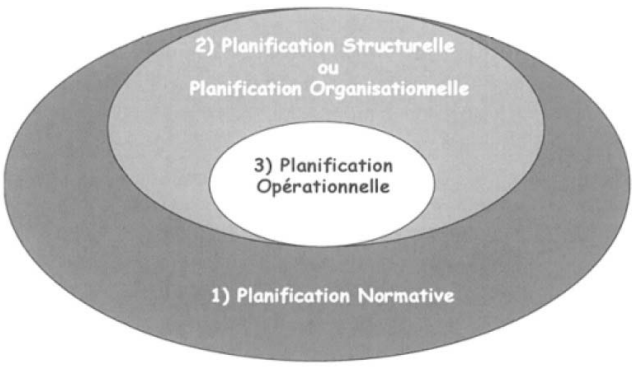


Figure 1. Different planning levels (Macé J-M, 2004).

hospitals in terms of allocation of resources. That is why it is important to identify the territories of real maternity unit services consumption in metropolitan France in order to bring clarity to this dilemma.

The purpose of this study is to analyze the effective demand for maternity hospital services on the French territory and its management according to the current territorial planning. The following question arises: is there enough maternity units to meet the effective demand of population? The example of the maternity hospitals in metropolitan France will be studied.

This research is based on the "relative flows method" to identify users' territory of effective demand for maternity hospitals in metropolitan France.

Evolution of maternity units concept

The maternity sector is one of the health sectors which are characterized by the diversity of care methods practiced simultaneously. The historical review of French maternities highlights that the choice and preference for a particular care practice depend on the cultural, political and organizational characteristics of the society in each period of time, as well as it depends on the socio-professional profile of parturient women.

The history of maternity hospitals in France is, in turn, closely linked to the evolution of the concept of childbirth under its cultural, political and scientific dimension. The development of the concept is marked by two important events, such as the changing of childbirth place and the role of medical intervention in childbirth. However, it is important to note that this is not accidental to mention the cultural dimension first, as it occupies a quite privileged position in childbirth concept compared to science. Indeed, until the 18th century and before the intervention of medical knowledge in labor and delivery, the childbirth was associated to the ethnographic or even ritual context specific to each French region. However, this is not really surprising for the period when the childbirth was not only synonymous of the joy of maternity, but was related above all to the high risk of death for the mother and her child. At this pre-institutional time the organization of childbirth is subject to the traditional wisdom protocol established over the centuries. Thus, every childbirth takes place at home and is assisted by one "specialist in the field "- the matron, called also "Mother". The matron has no training in childbirth and often cannot read or write. Her intervention is based solely on the experience, she had acquired by assisting women in childbirth and her rather positive reputation among women' community in the village. Her practice is not regulated by any authority but has the legitimate recognition by the clerical power which entrusts her to baptize any newborn in poor health. She is also bound to professional secrecy regarding parturient woman's family [11].

Childbirth takes place at home under special conditions and in the presence of all women of the village to provide moral assistance to the parturient. This feminine solidarity also takes care of all the preparations for childbirth, such as fire, hot water and sheets, and assists the new mother in her daily routine the first days after the delivery. Childbirth usually takes place in the common room, which is generally the most spacious and warmest room in the house, next to the fireplace. The windows and doors are carefully sealed to protect the mother and her child from the cold, but also from any "bad spirits" [11]. The birthing position is not imposed and even differs from one French region to another, as do matrons' birthing skills and methods. Matrons is undeniably a central figure in assisting the parturient, but herself is sometimes assisted in the case of difficult delivery by the husband of the parturient whose physical strength and knowledge of calving are called for help . But beside this occasional man assistance, birth is still a women' business. The feminization of childbirth care is also explained by the social role to be played by women in society for centuries. As far as the medical doctor profession is available only for men, the woman is supposed to be satisfied with the role of wife and mother. In the Middle Ages the medicine has not yet found its place in the delivery room and obstetrics has a long way to go before it. However, medical intervention requiring the surgeon's assistance is possible in case of difficult delivery, but its objective is to save the mother's life and not necessary the child. Unsurprisingly, the image of the surgeon and the medical assistance is associated with the messenger of bad news. Maternal mortality and postpartum complications for the mother and her child are also common for this time and are considered as a part of normality.

At the same time, the first attempt to institutionalize the childbirths is undertaken and practiced simultaneously with home birth. The first maternity hospital is opened in Paris in 1348 as the unit of the Hôtel-Dieu Hospital and known as the Newborn Office [9]. Thus, this unit of the Hôtel-Dieu Hospital is set especially aside for women in childbirth. The childbirth institution opens its doors to all pregnant women, but generally welcomes married and unmarried women in need, because after all *"honest women give birth at home"*[4]. The Hôtel-Dieu birth unit mainly exercises a social function, as men are still not admitted to the delivery room, and the religious sisters refuse to assist the delivery, so the childbirth is only assisted by the woman-mother. However, before the concept of asepsis is definitively and regularly integrated in medical practice, these specific places of parturient women density remained the spots of potential death.

Indeed, the Newborn Office was located near the wounded hospital unit and quickly faced the high rate of maternal death. Consequently, it acquires a sad reputation of "place of death" which will be associated to it for centuries. Indeed, the mortality rates in the Newborn Office explode and achieve 6.7% between 1776 and 1786 [9]. But this result becomes more impressive once it is compared to the home birth mortality rate, which is 1%. This very high mortality rate in childbirth units is generally due to the puerperal fever, this *"[…] black plague of mothers coming out of the cradles […]"*[1] and invades the childbirth units all over France and especially in Paris. Cabanis [13] points out that the danger that women face in the hospital childbirth units far outweighs the value of free assistance that the hospital offers to parturient women. Thus, the Port-Royal maternity hospital, which replaced the Newborn Office of the Hôtel-Dieu in 1795, has an average mortality of 5.7% which lasts until 1871 with a particularly deadly period occurring in the first week of May 1856 when 31 of the 32 women die from puerperal fever. Tarnier's research shows even more explicitly the operating difficulties faced by maternity hospitals in 1856 and until the mid-nineteenth century when the maternal mortality rate achieves 5.9 % while the mortality rate of home birth is equal to 0.3%. [14] Thus, the high mortality rate among mothers in childbirth units doesn't result from the epidemic, but is due to nosocomial or healthcare associated infections emerging in hospitals. Thus, the institutionalization of childbirth in France became synonymous with potential death risk until the end of the XIX century.

The miasmas of puerperal fever are finally defeated under the implementation of hygiene measures, first imposed on doctors and midwives, but also thanks to the hospital reorganization by the separation of pregnant and parturient women and the isolation of women with signs of disease [10]. The results of the new spatial approach in the maternity hospitals organization are impressive as in 1871 the average maternal mortality falls to 2.5%. The Baudelocque clinic in Paris passes from 10% to 2.3% of maternal and childbirth mortality, and finally reaches the rate of 0.13% in 1900 [9]. It seems that maternity hospitals manage to overcome the bad reputation associated to these establishments for centuries. Progress in medicine dramatically changes the image of hospitals and maternity units and allows maternity hospitals to considerably expand the number of women, who until this moment preferred to give birth at home. However, hospital service still lacks of trust among women. Wealthy families still choose the home birth assisted by a midwife and a general practitioner whose knowledge in obstetrics is quite blurred. The real shift in mentality comes after 1950, when maternity hospitals became synonymous with safe childbirth. This preference for institutionalized birth among parturient women is also related to the change in medical practices and childbirth professions [11].

Change in medical practices, change in social habits

Indeed, for a long time, maternity hospitals bear the burden of deeply despised establishments providing generally parturient women in need, while the normality of the time expects women to give birth at home. Thus, two childbirth assistant definitely exist in parallel, i.e. childbirth in maternity hospital and childbirth at home. The home births have been assisted by matrons for centuries, but their delivery practices are increasingly criticized by doctors who begin to claim their exclusive rights to practice medicine. This is how medical knowledge takes the first steps into the maternity hospitals by means of midwives' assistance and then by delivery physicians' support. Unlike matrons, midwives followed the medical training in the city in a very renowned maternity school at Hôtel-Dieu Hospital and subsequently at the maternity school of Port-Royal maternity hospital internationally recognized for the quality of its training. However, the childbirth practices are critically different between the city and the countryside at the point, the royal authority launches in 1760 a massive training campaign of midwives in France [9]. One of the best known training campaigns is organized from 1759 to 1783 by Madame du Coudray and is based on the innovative pedagogy methods such as the training on a figure made out of wicker and covered with material. Madame du Coudray's pedagogical campaign was then continued by delivering physicians who have successfully trained ten to twelve thousand midwives in 40 years all over France [8].

At the moment when the midwife profession finally obtains its legitimate recognition in society, the new profession of delivering physicians appears and marks a breaking point with midwifes. Indeed, men being for a long time not admitted to the delivery room find themselves competing with midwives. [4] Firstly, midwives are rejected by the Church, which considers them as witches and then definitely recognizes them as the parturient women' guardians against the "bad spirits". Then, finally midwife profession find themselves under the power and orders of delivering physicians, represented by surgeons and medical doctors. At the same time, the former image of a surgeon, represented as a messenger of death, is definitely turned into the symbol of a savior assisting women in childbirth and saving their lives in case of complications. The doctors' involvement considerably changes the practices and conditions of childbirth.

First, the childbirth is definitively released from its ritual past, the feminine solidarity is no longer welcome in the room, and the childbirth becomes henceforth the exclusive subject of medical assistance. However, for the parturient woman this change also means the loss of the freedom to dispose of her own body during the labor and delivery. Indeed, the new practice requires the woman to be lied on her back during childbirth process, which is very convenient for the doctor but not necessarily for the parturient woman [11].

However, no deviation from the rule is possible, since any other birth position is henceforth considered indecent and compared to animal behavior. Thus, medical moral picks up the place which has been reserved for the custom and the culture for years, but offered an exchange the assistance without violence and the safety for the mother and the newborn. Delivering physicians definitively reinforce their position on the field of childbirth by an exclusive right to use instruments, such as forceps, requiring more skills than midwives have. The only exception to this rule is granted to a famous Maternity school in Port-Royal, where the chief midwife assists deliveries with forceps and the chief surgeon doesn't ban on this practice. However, this independence won't last long time and the school will be deprived of this privilege from 1881, when the profession of delivering physician appears and tries to protect their professional territory. However, the delivering physicians' activity in not completely homogenous and also faces the professional differences in practices and approaches like the appropriate use of instruments. Some of them remain mistrustful regarding the use of forceps, while others abuse it too much and thus endanger the life of the mother and the newborn. The technical sophistication of childbirth continues with the attempts to use the anesthetic and analgesic substances which are already applied in medicine since 1840, but the French delivering physicians remain distrustful to this new medical practice too.

Thus, the sophistication of medicine draws the explicit dividing line between the delivering physicians and the midwives. This reinforces the doctors' professional position in assisting childbirth by providing them with the exclusive right to use obstetrics instruments, to perform cesareans and to administer the anesthesia. Gelis [6] points out that this childbirth role sharing is resulting from the competition between the two professions appeared almost simultaneously and should not be considered as a male domination. But it has to be considered as a change of the societal birth paradigm, where the concept of procreation disappears altogether in favor of unconditional parents' love for their child.

Thus, the end of the 18th century is marked with the formalization of obstetrics as an independent branch of the medical sciences, which is followed then with a transition to the medicalisation of childbirth and its subsequent transfer to hospital in 20th century. However, hospital childbirth reach its popularity only since the 1950s with 57% of hospital births, it will be 97.4% in 2016 [9].

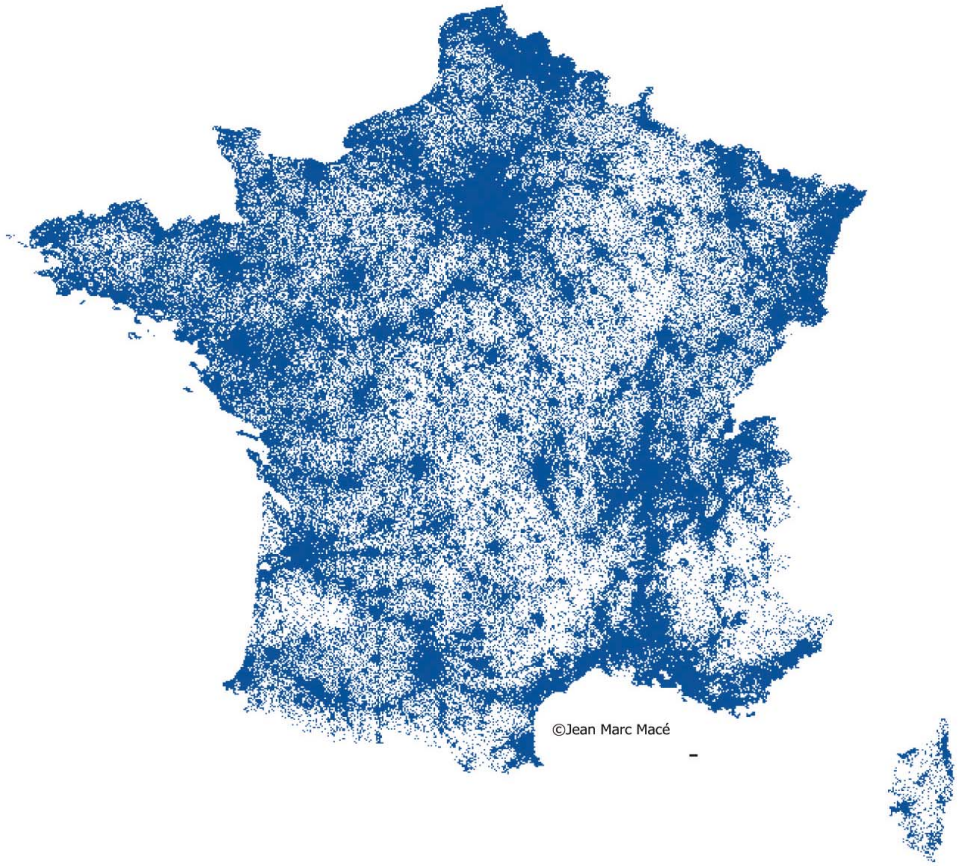
However, the medical and technical practice of childbirth is not really homogeneous throughout France [6]. Large disparities exist between the city and the countryside, as well as between Paris and the province. The childbirth in the countryside is still largely assisted by matrons while the cities are well equipped with delivering physicians and midwives. Moreover, the midwifery training school is almost entirely concentrated in Paris and in the big cities, which increases deeply the gap between the birth practices in the city and the countryside [7]. At the same, the supervision of midwife practices in rural areas remains very complicated, which results in the use of obstetrics instruments by some midwives without having any authorization or training for that. Likewise, the disparities between the North and the South of France in the preparation of the childbirth assistance professions are also striking, the north regions dispose more infrastructure and medical resources than the south of France.

Statistics also show wide disparities in the socio-economic profile of parturient women choosing maternity hospital for childbirth after the Second World War. Indeed, peasant women and bourgeois women still prefer to give birth at home, while the hospital maternity is rather chosen by the working class women. The promotion of childbirth in the medical environment comes with an active implication of the State which provides the French population with the Health Insurance opening access to the medical services and covering the biggest part of medical charges including maternity hospital birth.

The maternity sector is henceforth included in the organization and territorial planning of French health care politics.

Maternity hospitals landscape in metropolitan France in 2018

In 2018 France has 67,187 million inhabitants, including 65,018 million in metropolitan France. The distribution of the population on the French territory is not homogeneous with significant concentrations in the Parisian agglomeration, as well as in Alsace region, in the department of North, on Atlantic and Mediterranean coasts, as well as on the Rhône valley, Loire and Garonne valleys.



Map 1. Concentration on population in metropolitan France in 2018.

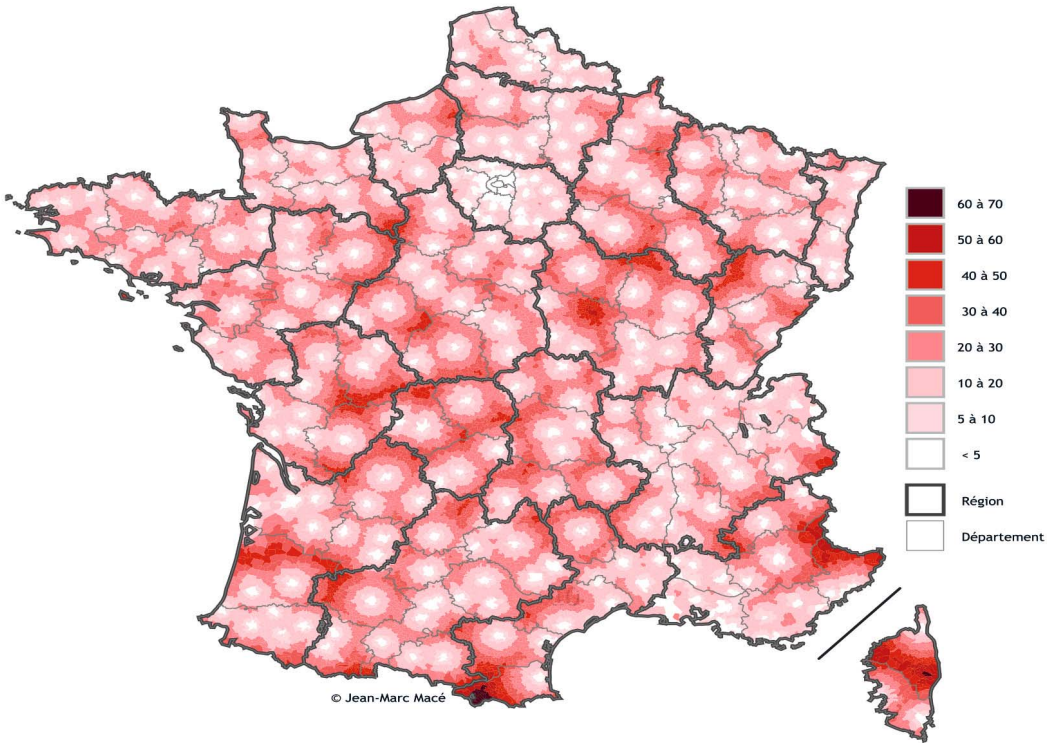
The French population is relatively stable and has only increased by 0.3% compared to 2017. The increase in births begins to slow down from 2008, namely France counted + 0.5% of births between 2008 and 2013, they were only 0.4% between 2014 and 2016. This slight increase is largely due to the positive natural balance, although paradoxically the number of births has been declining steadily for two decades. In fact, metropolitan France counted in 2015 more than 873 thousand births, while there were only 711 thousand children born in 2018, which represents a decrease of 161 thousand births in 3 years. This positive natural balance is therefore mainly linked to a decrease in deaths, which means the French life expectancy improves year after year.

The majority of births take place in the maternity units. In 2018, metropolitan France has 479 establishments; in contrast there were 521 maternity hospitals in 2015. The trend of decrease in the number of maternity hospitals persists since 1970 and was initiated by restructuring reforms looking for the concentration and specialization of maternity units. Set up by the Dienesch decree (OJ: 72-162 of February 21, 1972), the reforms order the closure of any maternity unit whose park capacity is below the 15 beds. Thus, the small obstetric clinics mainly run by midwives disappear. They are also followed by the closure of maternity units in local hospitals which carry out a very small amount of activity and are unable to ensure the regular presence of *obstetrician–gynecologists*; generally the maternity unit in such hospitals is placed under the responsibility of a general practitioner. Thus, the number of maternities is fallen by more than 50% in 20 years passing from 1369 maternities in 1975 to 814 in 1996. The 1990s are marked by the political will to consolidate the groupings of obstetric services by classifying them into three types of maternity units according to the level of pregnancy and delivery complications. Thus, the maternity units of types 2 and 3 are equipped with a sophisticated technical platform (in particular with a neonatology service) to deal with at-risk pregnancies and complex births. The maternity units of types 2 and 3 are mainly concentrated in the public sector, while the basic activity (specific to maternity unit of type 1), like uncomplicated deliveries, is largely developed in the for-profit private sector [12].

At the national level, the territorial distribution of maternity hospitals follows the population distribution with a relative coherence between the position of maternity unit and the population density on the national territory.

The concentration and classification of the maternity hospital offer is part of a quality approach which aims both to improve the security of care for the parturient

Map 2. Territorial distribution of maternity hospitals in metropolitan France in 2018.



Map 3. Distance and access to maternity hospitals in metropolitan France in 2018.

and the optimization of maternity care guidance on French territory. However, the regulatory framework does not explicitly state the optimal and recommended distance and time to access to the maternity hospital. Indeed, the ex-post analysis states only, that the median value of access to maternity in metropolitan France in the period from 2001 to 2010 is equal to 17 minutes (DREES, 2012). However, the median value risks hiding significant disparities insight the regions.

Kilomètres	Minutes	Communes	Femmes de 15 à 45 ans	%
< 5	15	2 491	6 472 082	*50*
> 5 et < 10	20	5 811	2 058 837	*16*
> 10 et < 20	25	14 781	2 487 303	*19*
> 20 et < 30	30	14 809	1 563 338	*12*
> 30 et < 40	40	5 119	353 988	*2,7*
> 40 et < 50	50	734	44 049	*0,34*
> 50 et < 60	60	93	8 101	*0,06*
> 60 et < 70		28	2 447	*0,02*
France métropolitaine		43 866	12 990 145	*100*

Thus, 458,500 women aged from 15 to 45 years, or 3.1% of the 13 million, are more than 30 minutes away from the maternity unit.

As shown in researches (Combier, Evelyne, et al., 2013), (Ravelli AC, Jager KJ, de Groot MH, et al., 2011), there is a significant positive link between mortality rate and access time to maternity. The research, conducted on the subject of the access to care in the Burgundy region in France highlights the rate of perinatal mortality of 0.64% for all distances of 16-30 minutes away from maternity hospital, this risk increases up to 1.07% for any distance greater than 45 minutes away from maternity hospital. However, as the research states, the significance of the statistics test results is quite fragile, due to the shortage of the sample.

Methods

The methodology of this study is based on the setting up of the operational network. The application of the operational network technique in health geography is inspired by the Mirabel method of The National Institute of Statistics and Economic Studies (INSEE) proposed in 1975 by J-J Ronsac and C. Terrier. This method is initially based on the analysis of users' "home-work" flows in order to delimit the "employment territory" [23, 24].

To set up an operational network, the "departure-arrival" flows should be studied according to a given problematic (obstetrics, urology, etc.) by means of the "relative flow method". Transposed to the hospital area, the "home-health centre" users' flows are analysed. This method allows identifying the operational territory based on users' territorial practices which doesn't necessarily coincide with administratively planning borders.

This concept of present territorial approach is illustrated with a scheme. In Figure 2, each arrow symbolises, not only, the volume of hospitalised patients living on this territorial entity (municipality, postal code), but also the major orientation of hospitalisation flows (even in relative terms) living in each municipality or postal code. The method is based on a "descending sort" of each "place of departure" to all "place of arrival".

As a result, all municipalities (postal codes) are then classified without any overlap or omission, according to the importance of their place of departure and destination. All municipalities (or postal codes), whose major (even relative) flows of hospitalised patients

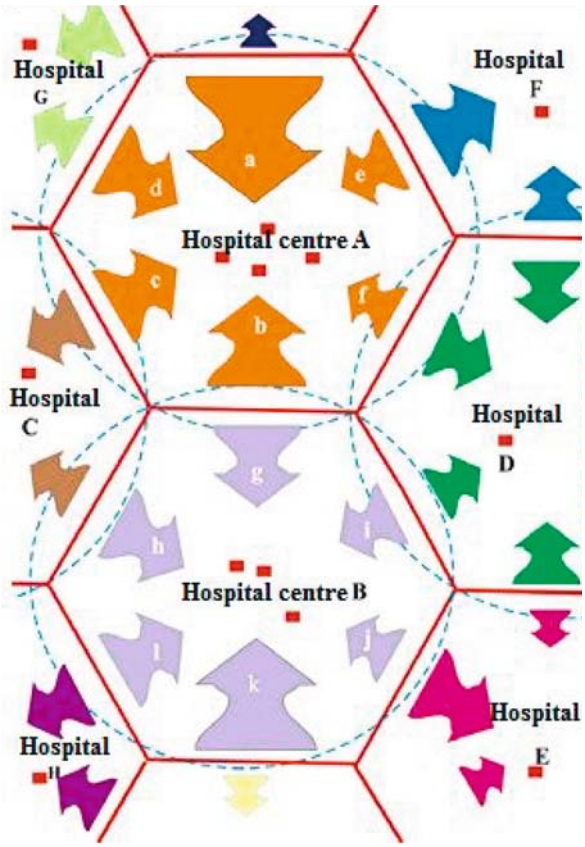


Figure 2. Relative major orientation of hospitalized patients to a hospital centre.

are directed to the same hospital centre, belong and constitute a health territory. The formulation of this major orientation of hospitalised patients to a hospital centre is represented as:

$$\text{Majority tie " Home " Hospital"} = \frac{\text{Hospitalised patients coming from the municipality "a" to the hospital center "A"}}{\sum \text{hospitalised patients coming from the municipality a"}}$$

Where « a » is a « departure » spatial entity of hospitalised patients ;

« A » is an « arrival » hospital centre of hospitalised patients;

As this analysis is carried out for a given discipline (obstetrics, etc.) or for a given specialty segment (births, etc.), it comes to defining a space which reflects a homogeneous spatial activity of hospitalised patients. This corresponds to a real "territory hospital experience".

The operational territorial network of maternity units in metropolitan France

In 2015, metropolitan France had 873,000 births in 535 maternity units (in both public and private sectors), 23

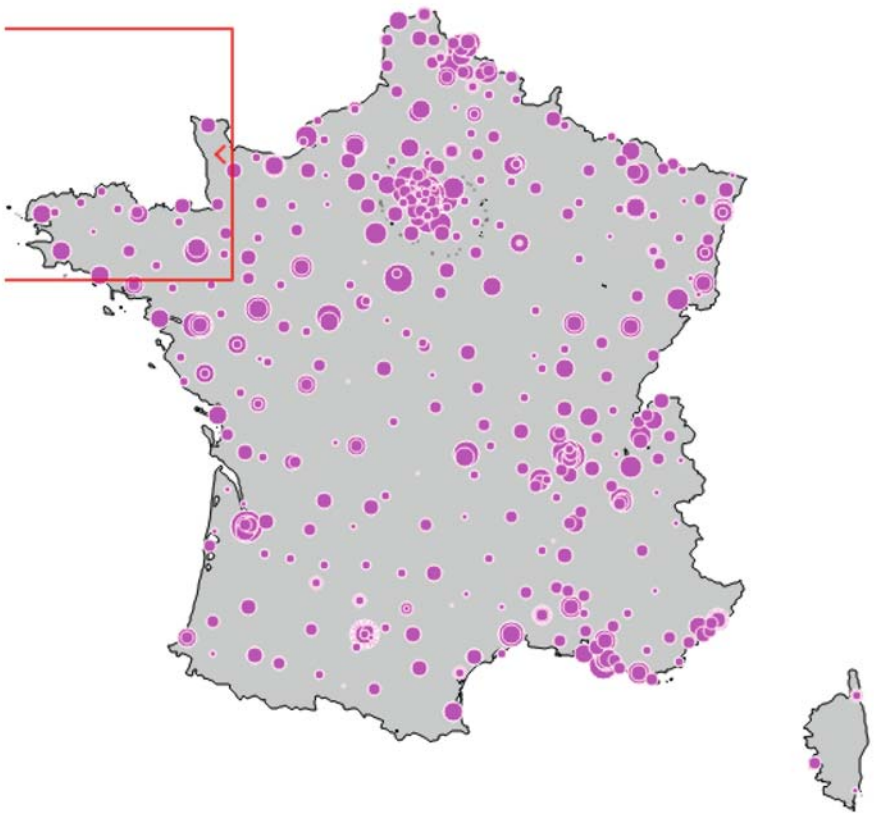
of them registered only one emergency childbirth in the year and 14 other maternity units registered fewer than 100 births in the year. It is therefore, in fact, 498 maternity units that have really structured the maternity landscape in 384 operational territories of birth in metropolitan France. Between 2015 and 2018, births decreased by 18% in three years (-161,383 births) to reach only 711,000 births. This dynamic is the result of cyclical reflection of the population aging in France over the past two decades, linked in particular to the demographic structure of women of reproductive age. At the same time, the territorial distribution of maternity units also decreased between 2015 and 2018 and 35 maternity units have been definitely closed. Private maternity hospitals are particularly affected with 23 closed units, compared to only 12 maternity units closed in the public sector. 80% of the 29,000 births registered in these closed units have been carried out in private maternity hospitals. Then, in 2018 the territorial network of maternity hospitals is therefore modified and counts 479 maternity hospitals, 14 of them have been created during the past three years, mainly by the merger or absorption of former maternity units which are definitely closed now. Thus, in 2018, these 479 maternity units generated 361 operational territories of birth which cover metropolitan France with a new hospital landscape specific to obstetrics service.

This draws 361 operational territories of birth in France in 2018

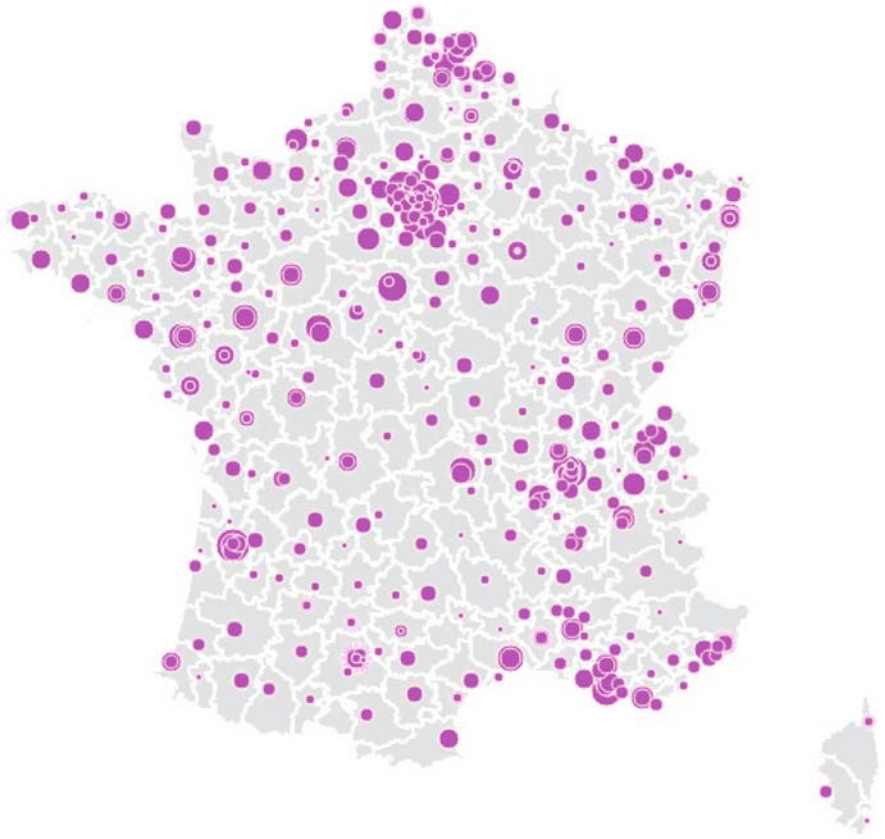
86% of the 361 operational territories of birth of 2018 remain practically identical to operational territories of birth of 2015. In contrast, 41 operational territories of birth have undergone a substantial modification and are now oriented towards a new hospital centre than the hospital centre of 2015.

The operational territories of birth of 2015 is illustrated with red boundaries, while 361 operational territories of birth of 2018 are illustrated with black boundaries

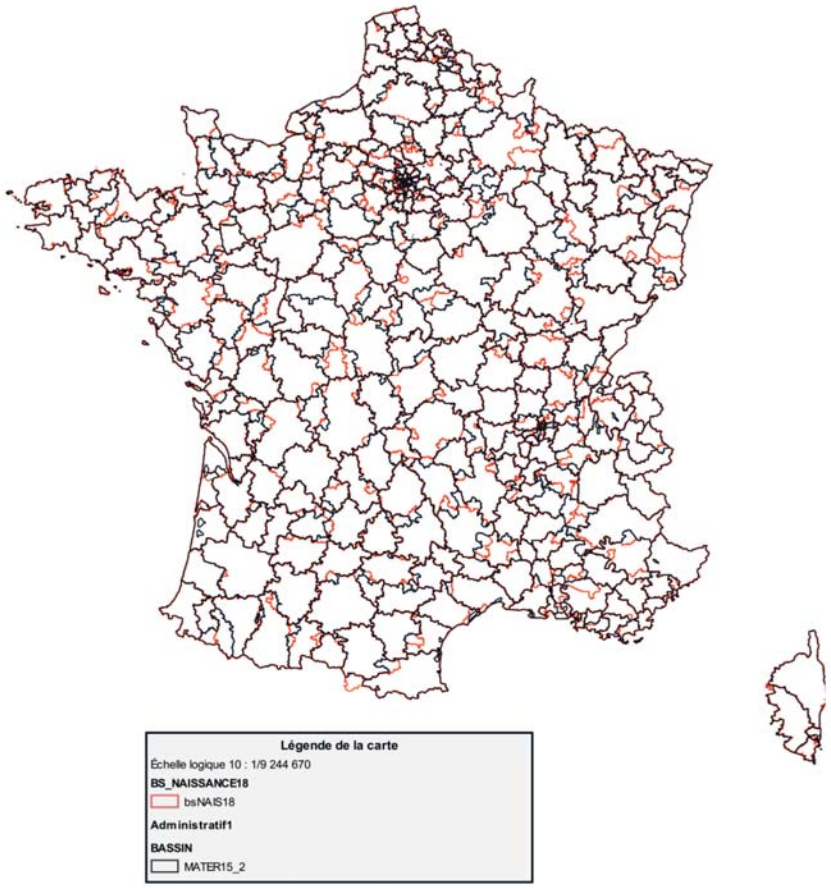
33 operational territories of birth have an autarchy rate of less than 50%. These operational territories are generally located in large agglomerations like Paris, Lyon or Marseille. These low autarchy rates are mainly explained by the effect of flows dissolving in a particularly large offer of hospital services, such as for Paris 10 (40.2%), Paris 13 (39.5%) Paris 19 (39.3%). In contrast, there is a strong concentration of births in certain territories due to social and psychological reasons as in Corsica, where women prefer to return to their "native Land" to give birth to a child, so born in Corsica. (Bastia 98%, Ajaccio 95%). (Map 7)



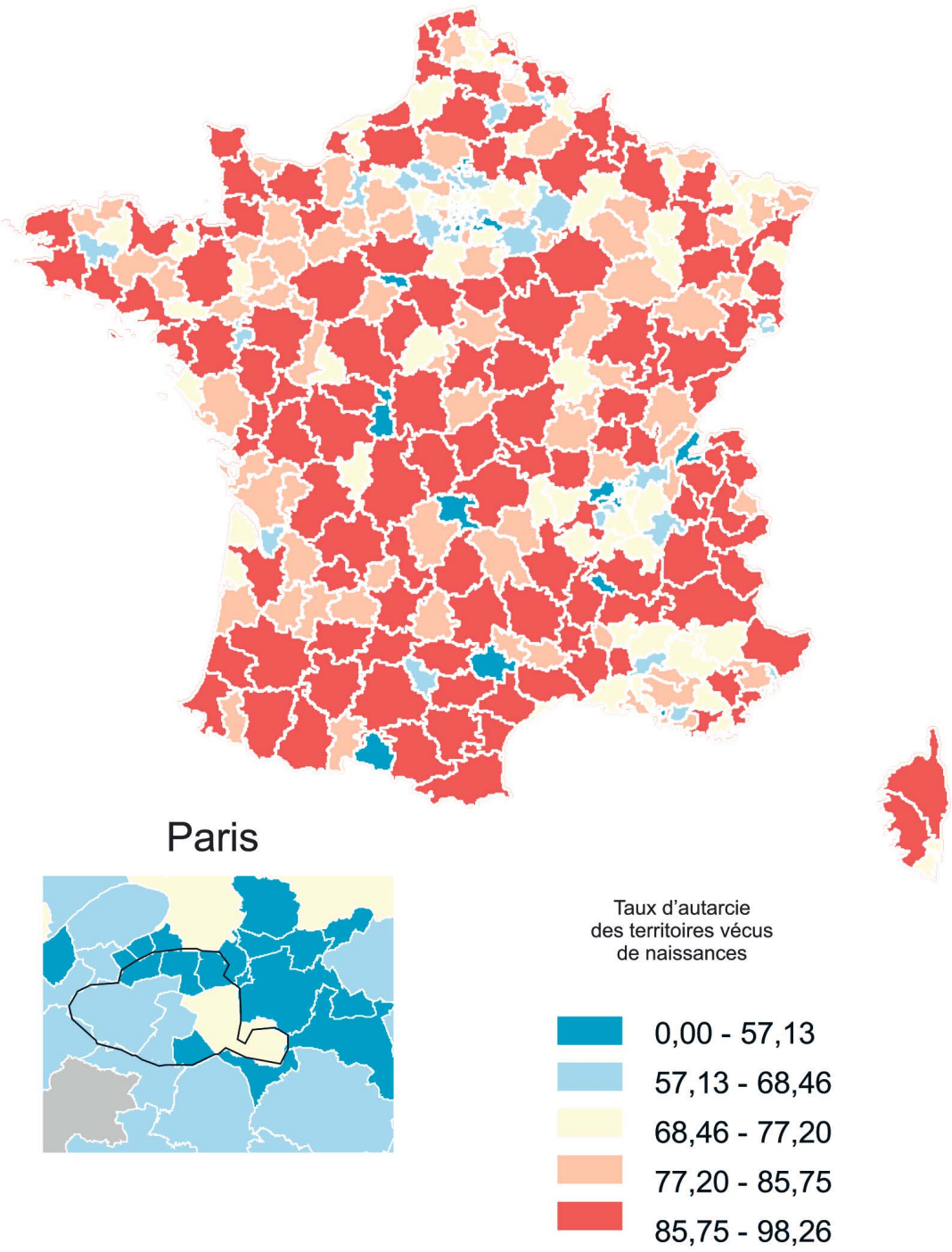
Map 4.Distribution of maternity units in metropolitan France in 2018 .



Map 5. Maternity hospital distribution and operational territories of birth in metropolitan France in 2018.



Map 6. Variation in operational territories ob birth in metropolitan France between 2015 and 2018.



Map 7. Autarchy rates of operational territories of birth in metropolitan France in 2018.

Conclusion

This research aims primarily to provide the most realistic territorial diagnosis in order to present an objective expertise to "public authorities". As the restructuring of maternity units continues, the optimization of maternity units supply is increasingly confronted with the demands of social and territorial justice. The analysis of territorial justice should be based on the comprehension and the integration of real territorial practices of users, i.e. effective demand for care, which represent the real needs of population in maternity service. Hence, this study has identified the real operational territories of birth reflecting the real women' need in maternity service in metropolitan France in 2018, as well as the autarchy rate of each operational territory of birth.

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