Health policy 126 (2022) 24–34

Contents lists available at ScienceDirect

Health policy

journal homepage: www.elsevier.com/locate/healthpol

An impact evaluation of the strategy for normal birth care on caesarean section rates and perinatal mortality in Spain

Adela Recio Alcaide[a,c], José M. Arranz[b,*]

[a] Instituto de Estudios Fiscales. Avda. Cardenal Herrera Oria, 378 Ed. B 1.59 28035 Madrid (Spain)
[b] Departamento de Economía. Facultad de CCEE y Turismo. Universidad de Alcalá. Plaza de la Victoria 2. Alcalá de Henares 28802 Madrid-España
[c] Public Health Unit, School of Medicine, Universidad de Alcalá, Alcalá de Henares 28871 Madrid-España

ARTICLE INFO

Article history:
Received 18 June 2021
Revised 15 September 2021
Accepted 11 November 2021

Keywords:
Health policy
Impact evaluation
Caesarean
Births
Perinatal mortality
Public and private hospitals
JEL Classification:
C21
I11
I14
I18
J16
L33

ABSTRACT

The objectives of this research are to evaluate the impact of a health policy (the Strategy for Normal Birth Care, EAPN) on caesarean rates and perinatal mortality in Spanish public hospitals belonging to the National Health System (NHS) and to assess the related cost savings. Data from the Spanish Ministry of Health for the period 2002–2011 and quantitative impact evaluation techniques (double difference method) are used to compare the effects of this policy in a treatment group composed of the NHS hospitals and a control group made up of private for-profit hospitals outside the scope of the EAPN. Both groups are compared some years before and after the health policy initiated in 2006 and approved in October 2007. The estimation results show that the EAPN had a significant effect in reducing caesarean rates of approximately 2 percentage points between 2007 and 2011, with increasing cost savings over the years ranging from 24 to 44 million euros depending on the year. Furthermore, EAPN reduced perinatal mortality levels by 0.08% in years 2008–2009.

1. Introduction

The generalized increase in the use of caesarean sections [11], together with evidence that shows the repercussions on the health of mothers when these interventions are carried out without medical indication [34], have provoked, for years, concern and reactions amongst health organizations, public institutions, women's organizations, and professional societies. Global caesarean section rates have tripled from around 6% in 1990 to 18.6% in 2014 [9]. In addition, there are great differences in the international scene; although the rates in western and central Africa were 4.1% in 2015, in Latin America and the Caribbean, the rates were 44.3% in the same year [11]. In North America, Oceania, Europe, and Asia, the rates were 32.3%, 31.1%, 25%, and 19.2%, respectively, in 2014 [9].

Faced with this data, different international institutions have reacted. The World Health Organization (WHO), in a similar line to that of its 1985 statement [39], concluded in its 2015 statement that population caesarean section rates above 10% are not associated with a reduction in maternal and neonatal mortality rates and that, ideally, caesarean sections should be performed only when medically necessary [41]. In addition, the WHO made a series of recommendations to reduce unnecessary caesarean sections [43] and in a similar vein, a recent statement by FIGO (International Federation of Obstetricians and Gynaecologists) urged to stop the caesarean section epidemic [38]. From civil society, multiple women's organizations in different countries denounced, for years, excessive medicalization during childbirth, mistreatment, and abuse of caesarean sections, and the WHO responded by condemning coercive or unconsented medical procedures [40].

When a caesarean section is medically justified, it is effective in preventing both maternal and perinatal morbidity and mortality. However, like any other major surgical operation, it is associated with certain short and long-term risks, such as a higher prevalence of maternal mortality and morbidity, an increased risk of uterine rupture, ectopic pregnancy, foetal death, and premature delivery in subsequent pregnancies or deliveries [34], or a higher prevalence of psychiatric symptoms [15]. Short-term risks of caesarean sections on newborns include impaired immune develop-

* Corresponding author.
E-mail addresses: adela.recio@ief.hacienda.gob.es (A. Recio Alcaide), josem.arranz@uah.es (J.M. Arranz).

https://doi.org/10.1016/j.healthpol.2021.11.003

ment, a higher likelihood of allergy, atopy, and asthma [34], as well as increased respiratory and obesity problems [10, 37]. To all these considerations, it is added that caesarean sections carry substantial health care costs, immobilizing resources that could be used to carry out other essential interventions [19].

Several supply and demand factors explain the increase in caesarean sections. The demand model is consistent with the hypothesis that the increase in caesarean section rates is due to women's decisions, while the supply model implies that, regardless of medical need, the greater the capacity of the health system to perform caesareans, the more are performed [24]. From the demand approach, an elective caesarean section based on women's decision plays a major role. However, contrary to what is perceived, most women in the world do not prefer a caesarean section when there are no complications [26, 27]. In any case, the reasons why a minority of women demand a caesarean section without medical indication include fear of pain during childbirth and fear of certain repercussions on their health (damage to the pelvic floor, sexual dysfunction, etc.). The majority of women who prefer a caesarean delivery perceive, contrary to scientific evidence, that it is safer for them or their baby [8]. The demand model also maintains that the better the socioeconomic conditions (income), the higher the caesarean section rates [4].

However, the evidence shows that supply factors, such as the capacity of health systems to perform caesarean sections, their financial structure, or the profile of their workforce, have a greater effect on caesarean section rates in developed countries than the level of income [24]. This supply model suggests that obstetricians, as providers of caesarean deliveries, have a substantial influence on the type of delivery, contributing decisively to the increase in caesarean section rates [24]. Thus, the doctor or obstetrician is often fundamental in the choice of the mode of delivery in most countries, influenced by factors such as logistical and financial incentives, fear of complaints, and the woman's own demand [8]. In some countries, most caesarean sections occur during working hours [16], suggesting that caesarean sections are sometimes performed for convenience. When obstetricians combine public and private activities, scheduling caesarean sections allows them to reconcile the two [31]. Regarding health systems, caesarean section rates are usually higher in the private sector [2, 21]. In addition, in some private hospitals, delivery care supports the finances of the entire hospital, which implies that since the admission for a caesarean section is higher than that for a vaginal delivery, there are financial incentives to convince women that a caesarean section is the best option [31]. Other findings suggest an association between financial incentives and caesarean delivery rate [33]. Additionally, Gruber and Owings [20] speak of "induced demand" and conclude that, in the event of negative income shocks, doctors can provide excessive care to maintain their income [3]. Inexperience or inadequate training of professionals to attend a vaginal birth are factors that have been associated with a higher frequency of caesarean sections, especially in cases where there is little training and supervision [25]. Finally, international organizations coincide in pointing out that, amongst the causes that explain the abuse of caesarean sections and the over-medicalization of deliveries, gender stereotypes still dominate in society regarding the capacity of women to make decisions about their own reproductive processes, even in the medical field [14, 35].

There are various strategies used to reduce unnecessary caesarean sections. According to Betrán et al. [8], strategies can be initially classified according to whether they are clinical, that is, directed to a specific medical practice (such as performing an external cephalic version or attending vaginal deliveries after caesarean section) or non-clinical, that is, those that address one or more aspects of the health systems design. Non-clinical strategies are usually multifactorial and can be classified according to who they are addressed to: firstly, those aimed at women, families, and communities, such as prenatal training aimed at them; secondly, those aimed at health professionals, such as training for a practice based on scientific evidence or second opinion and audit and review policies amongst professionals; and thirdly, those aimed at organizations and health systems, such as changes in organizational culture, reforms in health insurance systems, external peer review, legislative policies to limit legal liability in case of lawsuits, changes in staffing models, specific caesarean section frequency targets, or targeted financial strategies.

As in other European countries, Spain far exceeds the 10−15% of caesarean sections advocated by the WHO in 1985, showing 25.2% in 2005, 24.9% in 2008, and 24.6% in 2018, according to data from the Ministry of Health. However, the difference between the rates of caesarean sections in public and private centres has been high for many years, with an average of 22.3% in public hospitals and 36.4% in private hospitals in 2005, 21.8% versus 37.2% in public and private hospitals in 2008, and recently, 21.8% and 36.5% in public and private hospitals in 2018. In the European context, inequalities and variability in medical practice are verifiable between countries [17]. In 2015, Iceland, Finland, Norway, and the Netherlands had the lowest caesarean section rates in Europe, below 18%. The rest of the countries were above the 10−15% advocated by the WHO. At the opposite extreme, Italy, Hungary, Poland, Bulgaria, Romania, and Cyprus had rates above 35%. Spain, above the recommended 10−15%, is in an intermediate position with 25%. Regarding instrumental deliveries (vaginal but with the help of forceps, vacuum extraction, or spatulas), the rates vary widely in the European continent. Although the median was 7.2% in Europe in 2015, Spain, with a rate of 15.1%, is the country in Europe with the most instrumental deliveries together with Ireland. This over-medicalization does not translate into better results in terms of perinatal mortality when compared to other countries, which have fewer interventions and have lower perinatal mortality rates (mainly the Nordic countries) [17].

These high rates of caesarean sections and other obstetric interventions, the over-medicalization of childbirth in general, and poor maternal experiences led to the formation of women's organizations (such as the "Via Lactea" association in 1987 or "El Parto es nuestro" in 2003) and a considerable public debate in Spain on obstetric care since the 2000s [36]. The public debate that was generated led the Ministry of Health to initiate in 2006, the process of elaboration of the Strategy for Normal Birth Care (EAPN, Estrategia de Atención al Parto Normal) aimed at public hospitals of the National Health System (NHS), in which all the agents involved participated: social and women's organizations, scientific and professional societies, Spanish regions and experts, coordinated by the Women's Health Observatory of the Ministry of Health [29]. As stated by the Ministry of Health, the EAPN was a response to a social, professional, and health administration demand, manifested in the presence of the progressive medicalization and increase of unnecessary and unjustified interventions in a physiological process with repercussions on health [30].

With the general objective of improving the quality of care while maintaining safety levels, the EAPN considered four strategic lines [28]:

(1) To promote clinical practices based on the best available scientific evidence. To this end, a comprehensive review of the scientific evidence was carried out allowing the publication of various clinical practice guidelines on childbirth, breastfeeding and neonatal care, amongst others. This process allowed the updating of clinical practices, questioning those routinely performed, replacing them by evidence based practices and eliminating some unjustified habits and their consequences.

(2) To encourage the participation of women users in decision-making. This strategic line establishes the set of recommendations aimed at promoting the active and protagonist role of women in the process, and to make health professionals aware of women's role importance.
(3) Training of professionals (specialization and continuous training), especially in the areas of obstetrics-gynaecology and paediatrics. This strategic line stands out in its recommendations the importance of updating, in its theoretical and practical aspects, the knowledge and skills of professionals, both during the training of specialists as in continuing education.
(4) Research, innovation, and dissemination of good practices. This strategic line raises in its recommendations: the need to promote the investigation of those aspects that require more knowledge; innovation that enables revision and modifying certain habits and routines; and institutional learning through good practices, sharing experiences of health centers that carry out successful innovative practices to facilitate the transfer of knowledge and its dissemination throughout the NHS.

It was, therefore, a multifactorial strategy aimed at professionals, women, and health organizations. Although the ultimate objective of the EAPN is to ensure quality care at childbirth so that women receive the best care, participate actively, and are informed in the process, its specific objectives and recommendations include "implementing programs for the rationalization of caesarean section rates and the decrease in their unjustified variability". Moreover, the EAPN indicates that, according to the available knowledge, the development and advancement of its recommendations should lead to fewer instrumental deliveries and caesarean sections. The final document of the EAPN was approved in 2007; however, in 2006, funding and activities already began to pursue the objective of the EAPN.

This research will try to contribute to the literature by answering the following questions. First, has the EAPN been effective in reducing caesarean sections since 2007? Second, has EAPN maintained safety levels in terms of perinatal mortality? Third, what has been the associated cost or economic savings? Finally, can the existence of other supply and demand factors that influence the reduction or increase in caesarean sections in a hospital be derived from the analysis (resources, staff, etc.)?

The reasons why it is pertinent to answer these questions can be justified as follows: we believe that it is mandatory that every public policy be evaluated to know if it has been effective in achieving the objectives for which it was designed. Therefore, the main contribution of this research is to show a quantitative evaluation of the impact of a public policy as the EAPN, whose causal effect on the percentage of caesarean sections is unknown up to now. It is also interesting to know the direct economic savings that the EAPN may have entailed, since caesarean sections are associated with longer hospital stays and, therefore, higher healthcare costs in public hospitals. Additionally, this research can help to verify that the EAPN has maintained safety levels in terms of perinatal deaths and to identify other variables of supply and demand that influence the frequency of caesarean section use, such as the type of hospital financing. As derived from the above, the results of this work may be useful for decision making in health policies in the future.

Moreover, according to OECD [32], caesarean section rates by countries have followed a general increasing trend over the last decades and only some countries have managed to stop this trend in the past years. During the 2000′s, cesarean section rates in Spain were in a very intermediate position compared to other European countries. Nevertheless, Spain was one of the two first countries in Europe, together with Italy, succeeding to stop the increasing trend, even in the long term, making the Spanish case an interesting case to extract conclusions that could be generalized.

In the empirical analysis of this research, micro data have been used at the hospital level from the Specialized Care Information System (SIAE) published by the Ministry of Health for the period 2002−2011. The analysis considers public hospitals belonging to the NHS and all private for-profit hospitals, which attended a total of four million deliveries during the period 2002–2011. To assess the impact of EAPN on caesarean section rates and perinatal mortality, impact assessment techniques of double differences have been used with two analysis groups, one treatment group made up of public hospitals belonging to the NHS to which the EAPN is directed and a control group made up of private for-profit hospitals to which the EAPN is not directed. This technique is used by comparing both groups ex ante of the measure (2002−2005) and two ex post periods (2007−2010 and 2008−2011) of the initiation of the health policy, which we place in 2006.

2. Materials and methods

2.1. Review of the literature

There is no known work that evaluates quantitatively the causal impact of the EAPN in Spain. However, there are studies that have evaluated its degree of implantation in Catalonia [5] or have identified the factors that facilitate the reduction of caesarean sections in some hospitals in Andalusia that participated in the EAPN [6]. In addition, a report of the Ministry of Health [29] has monitored the main indicators of the EAPN at the national level.

Benet et al. [5] evaluated the scope of the implementation of two reproductive health programs in Catalonia, the EAPN and the ENSSR (Estrategia Nacional de Salud Sexual y Reproductiva). This study analysed the implementation of both strategies in the daily activities of the services and the transformation of the practices of professionals and users; as such, it was not, therefore, a quantitative evaluation of the impact of the EAPN. The authors found that the transformation of practices could be seen in the incorporation of new attitudes, new sensitivities, and praxis, especially in the care of physiological childbirth, but the more technical spaces were less permeable to change.

On the other hand, Bermúdez-Tamayo et al. [6] identified factors that facilitated the change in 20 hospitals of the Andalusian NHS that participated in the EAPN program to reduce caesarean sections, as well as the barriers that made change difficult. amongst the factors that favoured the reduction of caesarean sections, they found better coordination with other departments (pediatrics and emergencies) and training for professionals, with a focus on a less interventionist practice. amongst the barriers, they found a limited influence of institutional politics and a low perceived political commitment, as well as an inadequate reorganization of the competencies of obstetricians/midwives.

Finally, the "Report on attention to childbirth in the National Health System" carried out by the Ministry of Health provided monitoring of the EAPN in the NHS [29]. This report offered an overview of the EAPN situation in 2012, showing the results of 19 indicators collected at the state level on childbirth care. This report indicated a caesarean section rate of 22% in NHS hospitals, above the standard advocated by the WHO (< 15%) [39]. On the other hand, the prevalence of vaginal deliveries after previous caesarean section showed 42%, far from the expected standard of 60–80%. The report concluded that there is wide room for improvement and recommended putting the EAPN recommendations into practice and including these recommendations by updating hospital protocols. It was not, therefore, an evaluation of the effect of the EAPN, but rather a monitoring of its main indicators.

Regarding international studies that evaluate programs similar to the EAPN, Cookson and Laliotis [13] evaluated the impact of the 2008 "Rapid Improvement Program" in England, a program similar to the EAPN, whose objective was to promote normal birth and reduce caesarean section rates in England. They found, using quantitative impact evaluation techniques (double difference and matching), that the impact of the program was small, significant, and of short duration on the reduction of caesarean section rates, in particular between 1 and 1.6 percentage points. Johri et al. [22] evaluated whether a program aimed at healthcare professionals (based on audits and follow-up) in Quebec (Canada) in the years 2008 to 2011 reduced the rates of caesarean sections compared to usual care. They estimated a double difference model with two objective variables (caesarean section rates and costs), concluding that the caesarean section rates were reduced without adverse effects on the mother or the neonate, being the effect statistically significant, but small. They also found that there was significant cost savings.

In a meta-analysis carried out by Chaillet and Dumont [12] with the aim of evaluating the effectiveness of programs to reduce caesarean sections and the impact of this reduction on maternal and perinatal mortality and morbidity, they found a significant reduction in caesarean section rates in different studies. They concluded that different clinical, audit and follow-up, and multifactorial strategies were effective in reducing the frequency of caesarean section use.

Finally, Betrán et al. [8] analysed the effectiveness of the strategies used by different countries to reduce caesarean sections. They classified the existing strategies into clinical and non-clinical and showed an overview of the effects found. They concluded that some clinical interventions (such as limiting the interventions to which women and their babies are sometimes exposed) can reduce the frequency of caesarean section use, although for a significant reduction, it is necessary to combine clinical and non-clinical strategies. Thus, non-clinical strategies, such as continuous monitoring and care directed by midwives, have been associated with higher proportions of physiological deliveries, which are safer and have lower costs, as well as with positive maternal experiences in developed countries. They also concluded that it is essential to invest in the training of health professionals, addressing their beliefs, eliminating financial incentives, and reducing the fear of litigation, as well as in the training and implementation of clinical guidelines based on scientific evidence.

2.2. Database and variables

To analyse the effect of the EAPN on caesarean rates[1] and on the perinatal mortality rate on hospitals belonging to the NHS, hospital microdata from the Specialized Care Information System (SIAE) are used. SIAE information is published by the Ministry of Health for the period 2002−2011 and considers two different statistics: the ESCRI statistic until 2009 and, from 2010 on, the Statistics on Specialized Healthcare Centres, which is an actualization of the former statistic. It is important to note that the statistical data used register of all hospitals in Spain, and each observation corresponds to a hospital with all its characteristics, so in this analysis, all the existing public hospitals of the NHS will be considered in the treatment group and all private for-profit hospitals will be considered in the control group. Private for-profit hospitals are in the group of hospitals with the highest number of births attended (around 18−20% of the births during 2002−2011) after the NHS hospitals (where around 67% of the total births were attended in 2002−2011).

The variables used in the analysis are described in Table A1 (see appendix). All the variables are available in the SIAE database except "the percentage or rate of caesarean sections in a hospital", "the number of multiple births (proxy 1)"," the number of multiple births (proxy 2), "perinatal mortality rate " and "household disposable income per capita" that were calculated and added to the database.[2] The disposable income of households (per capita) is the only one that is not derived from the SIAE microdata. For the years 2010 and 2011, the same variables described in the ESCRI are used, but developed by the Statistics on Specialized Healthcare Centres (which replaces the ESCRI from 2009 on), except for two variables: first, the variable "dependency code" that is not published in the new statistics, so that for the years 2010 and 2011, each hospital has been assigned the dependency code assigned in 2009 with the ESCRI and second, the variable "perinatal deaths" that is no longer included in the new statistics and, since its imputation is not possible, this information is not available in 2010 and 2011.[3]

Table 1 shows the descriptive variables of the treatment group (public NHS hospitals) and control (private for-profit hospitals) in the ex-ante (2002−2005) and ex-post (2008−2011) period. It can be observed, in the first four columns, that the average number of obstetricians, midwives, delivery rooms, incubators, low birth weight live births, deliveries, and multiple deliveries are slightly higher in the treatment group (public hospitals of the NHS) than in the control (private for-profit hospitals), before and after the implementation of the EAPN. On the other hand, health expenditure per capita and household disposable income per capita are slightly higher in the control group than in the treatment group in both periods. Table 1 shows, in the last column, the double difference test for each explanatory variable of the treatment and control group for both periods. There is no statistically significant difference in the explanatory variables before and after the implementation between control and treatment groups. Therefore, we expect that no external factor (variables) will explain any difference in the results of the treatment and control groups since they have similar basic characteristics before and after the intervention.

2.3. Econometric model

To study the effect of the EAPN, impact evaluation (IE) techniques were used [23, 18]. IE techniques aim to answer a very specific question: What is the effect of a policy or program on a variable of interest (Y)? In our case, the question is: What is the effect of EAPN on caesarean rates or on perinatal mortality rate? The causal impact of a program (T) on Y is the difference between the result of variable Y with the program or policy ($T = 1$) and the result of variable Y without the program or policy ($T = 0$). This basic formula for impact evaluation is valid for any unit (hospital in our case) that is being affected or not by a program or intervention. However, a hospital cannot be observed simultaneously in two different states (with and without a program). This is the so-

[1] Unfortunately, the only information about the type of birth that is registered in the statistics used in this study is the distinction between vaginal birth and caesarean section. Therefore, it is not possible to analyze the impact of the EAPN on different caesarean section types.

[2] Although there probably exist maternal demographic differences between public and private hospitals in Spain, unfortunately, we are not able to control women's demographic differences by hospital as no such variables are registered at hospital level in the database used in this study and we can't link the existing information in other statistics to our dataset. Therefore, we need to rely on the validity of the assumption of "parallel trends" to account for the unobserved variables.

[3] The statistic used in this paper does not contain other variables that would have allowed us to confirm or complement the results found with the variable "perinatal deaths". Apgar scores are not in the database and, although the Neonatal Intensive Care Unit (NICU) stays are registered in the statistic, they are not fully reliable for the purpose of this paper, since some of the NICU admissions come from other hospitals, not being possible to distinguish whether the NICU admissions relate to a birth attended in that same hospital.

Table 1
Statistics descriptive of the treatment (NHS public hospitals) and control group (private for-profit hospital), ex-ante and ex-post period. 2002–2011.

	Ex ante (2002–2005)		Ex post (2008–2011)		Differences		DID
Variables	Control group (1)	Treatment group (2)	Control group (3)	Treatment group (4)	Diff (3)-(1)	Diff (4)-(2)	Diff(4)-(2))-(Diff(3)-(1))
Number of obstetricians	16	18.9	16.8	19.8	0.8	0.9	0.06
Number of midwives	4.6	15.4	6.2	18.8	1.6**	3.3**	1.7
Delivery rooms in operation	1.5	2.5	1.8	2.8	0.2**	0.3**	0.06
Incubators in operation	2.7	12.5	3.4	12.3	0.7**	−0.1	−0.8
Low birth weight live newborns	27.2	154.3	34.7	150.1	7.5**	−4.3	−11.7
Births	586.7	1909.8	757.1	1898	170.4**	−11.7	−182.1
Multiple births (proxy 2)	7.2	29.6	9.5	31.4	2.3	1.8	−0.6
Health expenditure per inhabitant	602.8	582.6	786.5	774.4	183.7**	191.8**	8.1
Household disposable income per capita	15,670.4	14,891.6	15,761.7	14,982.6	91.3	91.0	−0.3
Number of hospitals (obsv.)	564	618	512	680			

Note: ** significance at 5% and *** significance at 1%.

called counterfactual problem in IE, and precisely the most complicated issue is how to estimate an appropriate counterfactual: Which value would the outcome variable Y (caesarean deliveries rates) have taken in an individual (hospital) affected by the program (EAPN) in the absence of the program? To answer this question, an IE technique known as double differences or differences in differences (DID) will be used. The DID technique [1] is appropriate in our case since we have observed data for each hospital (affected or not by the program) before and after the year of implementation of the EAPN. The effect of the program can be measured with the DID technique from the estimation of a model with the following specification:

$$Y_i = \beta_0 + \beta_1 R_i + \beta_2 T_i + \beta_3 R_i T_i + \beta_4 X_i + \varepsilon_i \quad (1)$$

where Y_i is the outcome variable (in our case, caesarean rates) for hospital i. T_i is the dummy variable that indicates whether hospital i has benefited from the program (in our case, it takes the value 1 if the public hospital belongs to the NHS, being the treatment group, and 0 for a private for-profit hospital, which is the control group). R_i is another dummy variable that takes the value 1 when the program has come into effect (in our case, it will take the value 1 after 2006 on -ex post period- and it will take the value 0 in the period prior to the measurement, before 2006, ex ante period). X_i represents the vector of exogenous supply variables (number of obstetricians, number of midwives, number of delivery rooms, number of incubators, number of deliveries attended in the hospital, expenditure per inhabitant) as well as other demand variables (such as disposable income of households per capita) and others that are included to control the risk in the deliveries attended (number of low birth weight newborns and indicators of the number of multiple deliveries). ε_i is the error term of the model.

In the estimation of the model, β_0 is the mean effect on the dependant variable (caesarean rates) of the control group in the ex-ante period to the intervention (2002−2005); $\beta_0 + \beta_2$ captures the mean effect on the dependant variable of the treatment group in the ex-ante period; β_2 is the first difference between the treatment and control groups in the ex-ante period; $\beta_0 + \beta_1$ is the mean effect of the control group in the period after the intervention; $\beta_0 + \beta_1 + \beta_2 + \beta_3$ is the mean effect on the dependant variable for the treatment group after the intervention, ex post period; $\beta_2 + \beta_3$ is the difference between the treatment and control groups in the ex post period. Finally, the DID effect of the program is captured by the parameter β_3, the double difference between $(\beta_2 + \beta_3)$ - $\beta_2 = \beta_3$. This parameter measures the change in the evolution of caesarean rates in public hospitals of the NHS (treatment group) with respect to private for-profit hospitals (control group) after the intervention (EAPN) compared to changes in the evolution of caesarean rates (and perinatal mortality) of NHS hospitals compared to private for-profit hospitals before the EAPN.

The validity of the assumption of "parallel trends" is key for the correct identification of the model and the validity of the estimator of DID (β_3). This assumption indicates that, in the absence of the program (EAPN), the differences in the results between the treatment and control group would have to evolve in parallel; that is, the results or effects would increase or decrease at the same rate in both groups. Unfortunately, there is no contrast to show that NHS and private for-profit hospitals would have evolved in parallel in the absence of the EAPN intervention (the counterfactual cannot be observed). To justify this assumption, the behaviour of the treatment group (NHS hospitals) and the control group (private for-profit hospitals) was compared before the EAPN program. To this end, Fig. 1A (see appendix) presented in the annex allows us to observe that the trends of the outcome variable (caesarean rates) in the treatment group (public hospitals of the NHS) and control (private for-profit hospitals) have very similar evolutions during the ex-ante period, so we can assume that the assumption of parallel trends may be fulfilling. Additionally, to verify that the EAPN has maintained safety levels in terms of perinatal deaths, a model equivalent to the one presented will be estimated, in which the dependant variable will be the perinatal mortality rate per hospital, a variable that also fulfils the assumption of parallel trends in the ex-ante period (see Fig. 2A in the appendix). An alternative way to test the assumption of equal trends would be to carry out a placebo test, a device that serves to gain confidence that the caesarean rates would have continued to move parallel before the date of the intervention. To do this test, we perform an additional DID estimation using a “fake” pre-EAPN intervention. We have used data from years 2002 and 2005, pretending that 2004 and 2005 is the post-EAPN period and 2003 and 2004 the pre-EAPN period. Table A2 shows the results. Reassuringly, we do not observe any significant treatment effect using data on either the pre-EAPN years (see DID parameter in column 1). Therefore, we provide additional evidence of the lack of differential time trends between the treated and control groups before the intervention.

3. Results

3.1. Effects on caesarean delivery rates

Table 2 shows the estimation results of model [1] of DID by ordinary least squares to measure the impact of EAPN on the outcome variable of caesarean rates, both excluding the explanatory

Table 2
Estimations of the EAPN impact on caesarean birth rates. Treatment (NHS public hospitals) and control group (private for-profit hospital). Period 2002–2011.

	2007–2010		2008–2011	
	(A)	(B)	(C)	(D)
T	−12.96***	−11.19***	−12.96***	−11.07***
	(0.650)	(0.694)	(0.647)	(0.691)
R	3.012***	6.082***	2.867***	6.086***
	(0.679)	(0.795)	(0.679)	(0.809)
DID	−2.191**	−2.037**	−2.162**	−1.997**
	(0.921)	(0.902)	(0.918)	(0.899)
Number of obstetricians		0.0669***		0.0723***
		(0.0144)		(0.0148)
Number of midwives		−0.128***		−0.137***
		(0.0421)		(0.0409)
Delivery rooms in operation		−0.608***		−0.679***
		(0.231)		(0.217)
Incubators in operation		0.170***		0.138***
		(0.0477)		(0.0475)
Low weight live newborns		0.00696***		0.0153***
		(0.00251)		(0.00383)
Births		−0.00236***		−0.00286***
		(0.000451)		(0.000477)
Multiple births(proxy)		0.0111*		0.00986*
		(0.00629)		(0.00599)
Health expenditure per inhabitant		−0.0156***		−0.0144***
		(0.00263)		(0.00258)
constan t	35.65***	46.16***	35.65***	45.65***
	(0.470)	(1.631)	(0.468)	(1.605)
N	2371	2371	2374	2374
adj. R^2	0.284	0.323	0.284	0.326

Coefficients and standard errors in brackets
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

variables (columns A) and including them (columns B). The results of the estimations show that the EAPN has reduced the caesarean delivery rates of the NHS hospitals by 2.1 percentage points compared to the private for-profit hospitals in the periods analysed when explanatory variables are not included (columns A). When these are included (columns B), the impact is very similar and close to 2 percentage points in the two ex post periods considered.

Regarding the effect of the explanatory variables included in the estimates (columns B), we observe in our analysis that a greater number of delivery rooms in operation in hospitals, of midwives, of deliveries attended in the hospital, and a higher health expenditure per inhabitant explain the lower rates of caesarean deliveries. On the contrary, the variables that explain an increase in caesarean rates are a greater number of incubators in operation, obstetricians, multiple births, and low weight new-borns.

3.2. Effects on the perinatal mortality rate

Table 3 presents the estimation results of the DID method from equation [1] to measure the impact of the EAPN intervention on the perinatal mortality rate. The perinatal mortality rate has been defined as the number of "perinatal deaths" over the total number of live births and perinatal deaths multiplied by 100. As previously mentioned above, the variable number of perinatal deaths is not available in the statistics based on 2010; therefore, only the years 2008−2009 have been considered as an ex post period in our analysis and the years 2004−2005 as an ex ante period. These estimates include the specifications as in the previous table. The results of the estimates show that the EAPN has contributed to reducing perinatal deaths by 0.08 percentage points in the NHS hospitals compared to the private for-profit hospitals in the 2008−2009 period. These effects are similar when explanatory variables are included in the estimates.

Table 3
Estimations of the EAPN impact on the perinatal mortality rate. Treatment (NHS public hospitals) and control group (private for-profit hospital) Period 2004–2009.

	2004–2009	
	(A)	(B)
T	0.384***	0.314***
	(0.0271)	(0.0283)
R	0.0146	−0.00399
	(0.0282)	(0.0314)
DID	−0.0776**	−0.0759**
	(0.0382)	(0.0364)
Number of obstetricians		0.00160***
		(0.000556)
Number of midwives		0.00135
		(0.00167)
Delivery rooms in operation		−0.0146
		(0.00925)
Incubators in operation		0.00465**
		(0.00195)
Low weight live newborns		0.000236*
		(0.000135)
Births		−0.0000412**
		(0.0000185)
Multiple births(proxy2)		0.00134***
		(0.000371)
Health expenditure per inhabitant		0.000117
		(0.000109)
constant	0.156***	0.0648
	(0.0197)	(0.0705)
N	1189	1189
adj. R^2	0.216	0.295

Coefficients and standard errors in brackets.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

Table 4
Calculation of the savings that EAPN in 2008 for the NHS regarding 2005 for each 100.000 s. Euros Real prices 2019.

	Caesarean				Vaginal births			
	% Caesarean deliveries (1)	Number of caesareans by 100,000 s (2) = (1) x 100.000	Caesarean Average cost(€) (3)	Caesarean cost by 100.000 births (million€) (4) = (2) x (3)	Number of vaginal births by 100,000 births (5) = (100 - (1)) x 100.000	Vaginal average cost (€) (6)	Vaginal cost by 100.000 births (million €) (7) = (5) x (6)	Saving cost by 100.000 births (million €) (8) = (4) + (7)
Ex ante period (2005)								
Treatment (A)	22.3	22,306	2894	64.5	77,694	1913	148.6	213.2
Control (C)	35.0	35,045	2894	101.4	64,955	1913	124.2	225.6
Ex post period (2008)								
Treatment (B)	21.8	21,839	3112	68.0	78,161	1702	133.0	201.0
Control (D)	35.6	35,581	3112	110.7	64,419	1702	109.7	220.4
Diff. Treatment – Control								
Ex ante (A-C)	−12.7	−12,740	0	−36.9	12,740	0	24.4	−12.5
Ex post (B-D)	−13.7	−13,743	0	−42.8	13,743	0	23.4	−19.4
Diff. Ex post – Ex ante								
Treatment (B-A)	−0.5	−467	218	3.4	467	−211	−15.6	−12.1
Control (D-C)	0.5	536	218	9.3	−536	−211	−14.6	−5.3
Difference-in-difference								
DID ((B-A)-(D-C))	−1.0	−1003,0	0,0	−5.9	1003,0	0,0	−1.0	−6.9

3.3. Economic savings of the EAPN

To conclude our analysis, Table 4 presents a calculation of the cost reduction that the EAPN supposes for the public hospitals of the NHS, showing the cost associated with 100,000 births in NHS hospitals (treatment groups) and private for-profit hospitals (control group). The calculation is made for a year prior to the implementation of the EAPN (2005) and another year after (2008). Columns (1) to (4) contain the analysis for caesarean deliveries and columns (5) to (7) show the analysis for vaginal deliveries. Column (1) shows information on the percentage of caesarean deliveries, column (2) shows the number of caesarean deliveries per 100,000 deliveries, column (3) shows the average cost per caesarean deliveries (in euros), and column (4) shows the cost of total caesarean deliveries per 100,000 (in millions of euros). Column (5) shows the total number of vaginal births attended per 100,000 deliveries, column (6) the average cost per vaginal births (in euros), and column (7) the cost of the total vaginal births attended per 100,000 births (in millions of euros). Finally, column (8) shows the total cost per 100,000 births as a sum of columns (4) and (7) as well as total savings (in millions of euros). The first four rows of Table 4 show the information for the group of NHS hospitals (treatment group) and private for-profit hospitals (control group) before and after the EAPN. The next four rows show the differences of the corresponding indicator between groups and periods. The last row shows the double differences between groups and periods.

The results suggest that the total cost per 100,000 births of the NHS hospitals (treatment group) before the EAPN in 2005 was 213.2 million euros (64.5 million came from caesarean deliveries and 148.6 million from vaginal) and 201 million euros after the EAPN in 2008 (68 million came from caesarean deliveries and 133 million from vaginal births). These figures imply a reduction in total costs of 12.1 million euros. This amount is obtained by comparing the before (2005) and after (2008) total cost of the treatment group (B-A). It is important to note that this figure would be a false counterfactual if what we want to estimate is the impact of the EAPN on costs. The correct methodology involves calculating the double differences, calculating the impact as the change in total cost before and after EAPN for the treatment group (B-A) and for the control group (D-C). Applying these double differences, the estimated impact was a savings of 6.9 million euros per 100,000 deliveries. If we look at the cost of caesarean deliveries, the savings were 5.9 million euros for every 100,000 births and a savings of one million euros in vaginal births for every 100,000 births. As in 2008, there were 346,356 births attended by NHS hospitals; therefore, the EAPN represented a total savings of 23.9 million euros that year. This same analysis was repeated for the years 2009 to 2011 to know the savings that the EAPN has produced in those years. The cost reduction in births was 7.2 million euros for every 100,000 births in 2009 (See Table A3 in appendix), 14.1 million euros in 2010, and 13 million euros in 2011(tables for years 2010 a 2011 are available upon request to the authors). Considering the number of births in those years, the EAPN intervention reduced birth costs around 23.6 million euros in 2009, 44.6 million euros in 2010, and 39.1 million euros in 2011.

4. Discussion

The total increase in the use of caesarean deliveries in recent decades, together with evidence that shows the health repercussions when these interventions are performed without a medical indication, have caused concern and various reactions amongst civil society and health organizations for many years. The factors that lead to the increase in its use are very diverse and, in many countries, actions and strategies have been carried out to reduce the use of unnecessary caesarean deliveries. In Spain, responding to the social, professional, and institutional demand caused by the progressive medicalization of birth and an increase in unnecessary and unjustified interventions in a physiological process with repercussions on health, actions were initiated in 2006 that culminated in the creation of the EAPN in 2007, a strategy approved by the Ministry of Health that was aimed at the hospitals of the NHS. Its recommendations included the implementation of programs to rationalize caesarean rates and reduce their unjustified use. Moreover, the EAPN indicated that, according to the available evidence, the development and advancement of its guidelines and recommendations should lead to fewer caesarean sections.

This work assesses the impact of EAPN on reducing caesarean rates in NHS hospitals, its related cost savings and on reducing perinatal mortality, as well as identifying other supply and demand

factors that explain the use of caesarean deliveries. For this purpose, we have used the DID technique, in which the intervention is evaluated by comparing results between two analysis groups, a control group formed by private for-profit hospitals and a treatment group formed by the NHS public hospitals, during two periods, before (2002−2005) and after (2007−2010 and 2008−2011) the beginning of this health policy. This is the first study to analyse the impact of the EAPN for Spain.

The results indicate that the EAPN has a significant effect on the reduction, by two percentage points, in the rates of caesarean deliveries of the NHS hospitals compared to the private for-profit hospitals in both post-periods 2007−2010 and 2008−2011. This is consistent with the results obtained in other similar investigations [13, 22]. On the other hand, the results show that the EAPN has not only maintained perinatal safety levels but has also reduced perinatal mortality by 0.08 percentage points in the 2008−2009 period. Additionally, the results suggest that, as a consequence of the reduction in the caesarean section rates, there has been a direct savings of 24 million euros per year in 2008, the same amount in 2009, and increasing up to 44.6 million euros per year in 2010 and 39.1 million euros per year in 2011. With respect to other explanatory variables included, the rates of caesarean deliveries are reduced with a higher health expenditure per inhabitant, a greater number of delivery rooms in operation, of midwives, and of births attended by hospitals. On the contrary, having a greater number of obstetricians and incubators per hospital, multiple deliveries, and low weight new-borns is associated with higher rates of caesarean deliveries. The explanatory variable results are consistent with those shown in other studies [7].

5. Conclusion

In general, it might be concluded that the health policy that has been evaluated in this research has been effective in reducing caesarean delivery rates in the NHS hospitals while also reducing perinatal mortality. However, the degree of the effect is not enough for the NHS hospitals to fall within the range indicated by the WHO of 10−15%, nor below 20%, as in other European countries with better results in terms of perinatal mortality, such as the Nordic countries [17]. It seems that the EAPN has served to slow down and stabilize what until 2006 had been an unstoppable increase in caesarean rates, but it has not achieved a substantial decrease that brings NHS hospitals closer to the standards advocated by the WHO.

On the other hand, the EAPN has generated direct cost savings in the NHS derived from the reduction in the rates of caesarean deliveries, which are almost twice as expensive compared to vaginal births. However, the cost analysis that has been carried out does not consider the indirect costs derived from the medium and long-term implications of a caesarean delivery for women and new-borns. A comprehensive study should consider all the costs and impact associated with a caesarean delivery on women's health (a higher prevalence of maternal mortality and morbidity or an increased risk of uterine rupture, ectopic pregnancy, foetal death and preterm in subsequent pregnancies and deliveries) and new-borns (impaired immune development, a higher probability of allergy, atopy and asthma, as well as greater respiratory problems and obesity). Taking all these associated costs into consideration could translate into considerably greater savings.

Therefore, not only from a health perspective, but also from an economic and gender equality perspective, it is essential to continue promoting the EAPN in its four strategic lines: bringing to reality clinical practices based on the best available knowledge; respecting women's autonomy, integrity, and ability to make informed decisions about their reproductive health; training and updating knowledge and skills of professionals; and promoting research, innovation, and dissemination of good practices. It is equally essential to extend the scope of the EAPN to private healthcare, precisely where more unnecessary interventions are carried out. This would be consistent with the general recommendation of the WHO, which calls on the Ministries of Health to establish specific norms on the appropriate technology for birth in the public and private sectors [39]. A total commitment by the Spanish regions is necessary to fully implement the EAPN since there are Spanish regions that double in caesarean rates compared to others, and to comply with the total incorporation of the EAPN recommendations in 100% of the protocols of their hospitals and regional health plans.

Finally, it is advisable to follow the international recommendations of the WHO to reduce unnecessary caesarean deliveries, especially those for which there is a high degree of scientific evidence, such as combining the implementation of clinical practice guidelines based on scientific evidence with a mandatory second opinion for the indication of caesarean delivery or with audit and follow-up [43]. The WHO recommendation to use the Robson classification system [42] as a global standard for evaluating and comparing caesarean delivery rates and monitoring health facilities throughout the year and amongst them should be followed, as claimed by the WHO when pointing out the need for a universal classification system [41]. On the other hand, taking into account the results of the analysis and in keeping with the general recommendation of the WHO that indicates the midwife as the appropriate professional to attend a normal delivery, it would be desirable to provide hospitals with a greater number of midwives and reinforce their autonomy [39]. It is essential that the indicators of the main obstetric procedures at the hospital level are public and accessible to the population, as recommended by the WHO for decades [39].

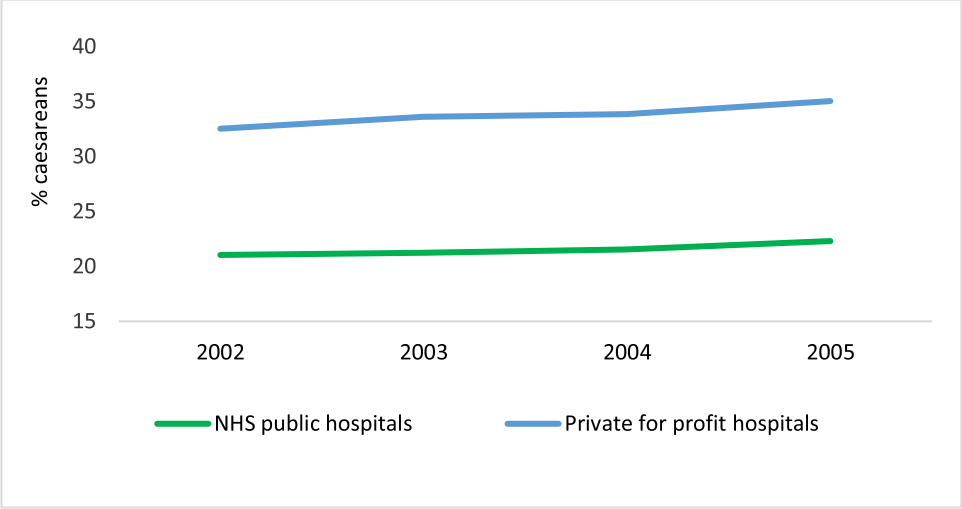
Source of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors

Declaration of Competing Interest

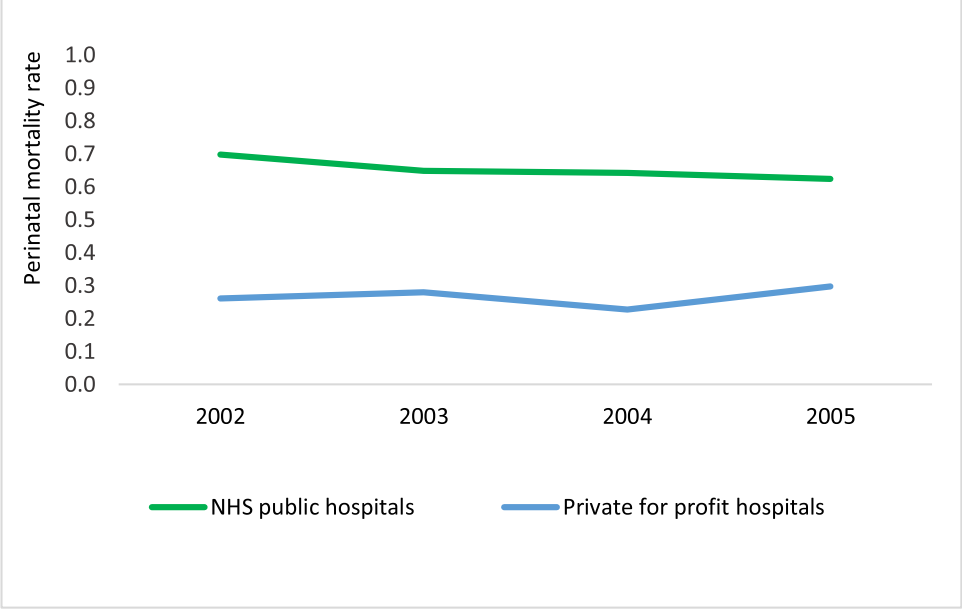
None.

Appendix



Source: ESCRI

Fig. 1. A. Evolution of caesarean rates by type of hospital. Years 2002–2005
Source: ESCRI.



Source: ESCRI.

Fig. 2. A. Evolution of perinatal mortality rate by type of hospitals. Years 2002–2005
Source: ESCRI.

Table A1
Description of variables included in the analysis.

VARIABLES	DESCRIPTION
Dependency code	Classification of hospitals according to their dependency (public/private for profit)
Number of obstetricians	Includes those hired or habitual collaborators in this speciality
Number of midwives	Includes the midwives hired or usual collaborators
Number of vaginal deliveries	Number of vaginal deliveries attended in hospitals
Number of caesarean deliveries	Number of caesarean deliveries attended in hospitals
Number of live newborns	Do not have to coincide with the number of deliveries due to the existence of multiple deliveries and mortality before delivery
Low birth weight live newborns	Newborns below 2500 gs
perinatal deaths	foetal deaths plus deaths of live births less than 7 days old
Delivery rooms in operation	Number of delivery rooms in operation
Incubators in operation	Number of incubators in operation
Health expenditure per inhabitant	Records operating expenses of hospitals and dependant centres, including personnel expenses, purchases of pharmaceutical products, material health, etc., according to each Spanish Region
The percentage or rate of caesarean sections in a hospital	Calculated with the quotient between the number of caesarean sections and the total number of vaginal deliveries and caesarean sections multiplied by 100
The number of multiple births (proxy 1)	Calculated as the number of live newborns plus perinatal deaths minus the number of births (multiple births, proxy variable 1). It can only be calculated until 2009
The number of multiple births (proxy 2)	The number of live newborns minus the number of births (multiple births, proxy variable 2). It excludes perinatal deaths, and can also be calculated for the years 2010 and 2011
Perinatal mortality rate	Calculated as "the number of perinatal deaths" over the total number of live newborns and perinatal deaths multiplied by 100
Household disposable income per capita	Available by Spanish regions and years in National Accounts publications

Table A2
Estimations of the EAPN impact on caesarean birth rates. Placebo tests A (2002–2005). Treatment (NHS public hospitals) and control group (private for-profit hospital).

	Placebo A
T	−11.95***
	(0.957)
R	3.091***
	(0.984)
DID	−2.110
	(1.361)
Constant	34.14***
	(0.687)
N	1182
adj. R^2	0.239

Coefficients and standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. We have included all the explanatory variables included in estimations of table 4.

Table A3
Calculation of the savings that EAPN in 2009 for the NHS regarding 2005 for each 100.000 s. Euros Real prices 2019.

	Caesarean				Vaginal births			
	% Caesarean births (1)	Number of caesarean by 100,000 births (2) = (1) x 100.000	Caesarean Average cost(€) (3)	Caesarean cost by 100.000 births (million€) (4) = (2) x (3)	Number of vaginal births by 100,000 births (5) = (100 - (1)) x 100.000	Vaginal average cost (€) (6)	Vaginal cost by 100.000 births (million €) (7) = (5) x (6)	Saving cost by 100.000 births (million €) (8) = (4) + (7)
Ex ante period (2005)								
Treatment (A)	22,3	22.306	2.894	64,5	77.694	1.913	148,6	213,2
Control (C)	35,0	35.045	2.894	101,4	64.955	1.913	124,2	225,6
Ex post period (2009)								
Treatment (B)	22,1	22.122	3.146	69,6	77.878	1.724	134,3	203,9
Control (D)	36,0	35.976	3.146	113,2	64.024	1.724	110,4	223,6
Diff. Treatment – Control								
Ex ante (A-C)	−12,7	−12.740	0	−36,9	12.740	0	24,4	−12,5
Expost (B-D)	−13,9	−13.854	0	−43,6	13.854	0	23,9	−19,7
Diff. Ex post – Ex ante								
Treatment (B-A)	−0,2	−184	252	5,0	184	−189	−14,3	−9,3
Control (D-C)	0,9	930	252	11,8	−930	−189	−13,9	−2,1
Difference-in-difference								
DID ((B-A)-(D-C))	−1,1	−1.114,6	0,0	−6,7	1.114,6	0,0	−0,5	−7,2

References

[1] Abadie A. Semiparametric difference-in-differences estimators. Rev Econ Stud 2005;72(1):1–19.
[2] Al Rifai RH. Trend of caesarean deliveries in Egypt and its associated factors: Evidence from national surveys. 2005–2014. BMC Pregnancy and Child 2017;17(1):417.
[3] Allen VM, O'Connell CM, Baskett TF. Cumulative economic implications of initial method of delivery. Obstetrics & Gynecology 2006;108(3):549–55.
[4] Belizán JM, Showalter E, Castro A, Bastian H, Althabe F, Barros FC, et al. Rates and implications of caesarean sections in Latin America: Ecological study. BMJ 1999;319(7222):1397–402.
[5] Benet M, Escuriet R, Alcaraz-Quevedo M, Ezquerra S, y Pla M. Alcance de la implementación en Cataluña de las estrategias de salud reproductiva (2008-2017)". Gac Sanit 2020;33:472–9.
[6] Bermúdez-Tamayo C, Ruiz EF, Moreno GP, Maroto-Navarro G, Garcia-Mochon L, Perez-Ramos FJ, et al. Barriers and enablers in the implementation of a program to reduce cesarean deliveries. Reprod Health 2017;14(1):1–13.
[7] Bernal E, Aibar C, Villaverde MV, Abadía MB, Martinez N, Librero J, y Ridao M. "Variaciones en la utilización de cesárea en los hospitales públicos del sistema nacional de salud". Zaragoza: Instituto Aragonés De Ciencias De LaSalud (I CS); 2010.
[8] Betrán AP, Temmerman M, Kingdon C, Mohiddin A, Opiyo N, Torloni MR, et al. Interventions to reduce unnecessary caesarean sections in healthy women and babies. Lancet North Am Ed 2018;392(10155):1358–68.
[9] Betrán AP, Ye J, Moller A, Zhang J, Gülmezoglu AM, Torloni MR. The increasing trend in caesarean section rates: Global, regional and national estimates: 1990-2014". PLoS One 2016;11(2):e0148343.
[10] Blustein J, Liu J. Time to consider the risks of caesarean delivery for long term child health. BMJ 2015;350:h2410.
[11] Boerma T, Ronsmans C, Melesse DY, Barros AJ, Barros FC, Juan L, et al. Global epidemiology of use of and disparities in caesarean sections. Lancet North Am Ed 2018;392(10155):1341–8.
[12] Chaillet, N.; & Dumont, A. (2007): "Evidence-based strategies for reducing cesarean section rates: A meta-analysis", 34(1), 53–64.
[13] Cookson G, Laliotis I. Promoting normal and reducing caesarean section rates: An evaluation of the rapid improvement programme. Health Econ 2018;27(4):675–89.
[14] Council of Europe (2019): Resolution 2306 (2019) Obstetrical and gynecological violence.
[15] Dekel S, Ein-Dor T, Berman Z, Barsoumian IS, Agarwal S, Pitman RK. Delivery mode is associated with maternal mental health following childbirth. Archiv Women's Mental Health 2019;22(6):817–24.
[16] Dweik D, Girasek E, Mészáros G, Töreki A, Keresztúri A, Pál A. Non-medical determinants of cesarean section in a medically dominated maternity system. Acta Obstet Gynecol Scand 2014;93(10):1025–33.
[17] Euro-Peristat Project (2018): "European Perinatal Health Report. Core indicators of the health and care of pregnant women and babies in Europe in 2015". Available www.europeristat.com.
[18] GERTLER PJ, PREMAND P, VERMEERSCH CM. La evaluación de impacto en la práctica. Banco Mundial; 2011.
[19] Gibbons L, Belizan JM, Lauer JA, Betran AP, Merialdi M, Althabe F. Inequities in the use of cesarean section deliveries in the world. Am J Obstet Gynecol 2012;206(4):331 e1-331. e19.
[20] Gruber, J.; & Owings, M. (1994): "Physician financial incentives and cesarean section delivery", (No. w4933).
[21] Hoxha I, Syrogiannouli L, Braha M, Goodman DC, Da Costa BR, Jüni P. Caesarean sections and private insurance: Systematic review and meta-analysis. BMJ Open 2017;7(8):e016600.
[22] Johri M, Ng ES, Bermudez-Tamayo C, Hoch JS, Ducruet T, Chaillet N. A cluster-randomized trial to reduce caesarean delivery rates in Quebec: Cost-effectiveness analysis. BMC Med 2017;15(1):96.
[23] Khandker, S.B. Koolwal, G.; & Samad, H. (2009): Handbook on impact evaluation: Quantitative methods and practices The World Bank.
[24] Lauer JA, Betrán AP, Merialdi M, Wojdyla D. Determinants of caesarean section rates in developed countries: Supply, demand and opportunities for control. World Health Report 2010;29:1–22.
[25] Litorp H, Mgaya A, Mbekenga CK, Kidanto HL, Johnsdotter S, Essén B. Fear, blame and transparency: Obstetric caregivers' rationales for high caesarean section rates in a low-resource setting. Soc Sci Med 2015;143:232–40.
[26] Mazzoni A, Althabe F, Liu NH, Bonotti AM, Gibbons L, Sánchez AJ, et al. Women's preference for caesarean section: A systematic review and meta-analysis of observational studies. BJOG 2011;118(4):391–9.
[27] McCourt, C.; Weaver, J.; Statham, H.; Beake, S.; Gamble, J.; & Creedy, D.K. (2007): "Elective cesarean section and decision making: A critical review of the literature", 34(1), 65–79.
[28] Ministerio de Sanidad y Consumo Estrategia de atención al parto normal en el sistema nacional de salud, ministerio de sanidad y consumo. Centro de Publicaciones; 2008. https://www.mscbs.gob.es/organizacion/sns/planCalidadSNS/pdf/equidad/estrategiaPartoEnero2008.pdf.
[29] Ministerio de Sanidad, Servicios Sociales e Igualdad (2012): Informe sobre la atención al parto y nacimiento en el sistema nacional de salud. https://www.mscbs.gob.es/organizacion/sns/planCalidadSNS/pdf/InformeFinalEAPN_revision8marzo2015.pdf
[30] Ministerio de Sanidad. Servicios Sociales e IgualdadEstrategia de atención al parto normal en el sistema nacional de salud. Versión esquemática mayo; 2014. 2014 https://www.mscbs.gob.es/organizacion/sns/planCalidadSNS/pdf/Version_Esquematica_EAPN.pdf .
[31] Murray SF. Relation between private health insurance and high rates of caesarean section in Chile: Qualitative and quantitative study. BMJ 2000;321(7275):1501–5.
[32] OECD (2021): Caesarean sections (indicator), available at https://data.oecd.org/healthcare/caesarean-sections.htm (Accessed on 03 September 2021).
[33] Sakai-Bizmark R, Ross MG, Estevez D, Bedel LE, Marr EH, Tsugawa Y. Evaluation of Hospital Cesarean Delivery–Related Profits and Rates in the United States. JAMA Netw Open 2021;4(3) e212235-e212235.
[34] Sandall J, Tribe RM, Avery L, Mola G, Visser GH, Homer CS, et al. Short-term and long-term effects of caesarean section on the health of women and children. Lancet North Am Ed 2018;392(10155):1349–57.
[35] Šimonović, D. (2019). "Report of the special rapporteur on violence against women, its causes and consequences on a human rights-based approach to mistreatment and violence against women in reproductive health services with a focus on childbirth and obstetric violence". https://undocs.org/en/A/74/137
[36] Villarmea S, Olza I, y Recio A. El parto es nuestro: El impacto de una asociación de usuarias en la reforma del sistema obstétrico de España. Dilemata 2015(18):157–83.
[37] Visser GH. Women are designed to deliver vaginally and not by cesarean section: An obstetrician's view. Neonatology 2015;107(1):8–13.
[38] Visser GH, Ayres-de-Campos D, Barnea ER, De Bernis L, Di Renzo GC, Vidarte MFE, et al. FIGO position paper: How to stop the caesarean section epidemic. Lancet North Am Ed 2018;392(10155):1286–7.
[39] World Health OrganizationAppropriate technology for birth. Lancet 1985;2:436–7.
[40] Word Health Organization The prevention and elimination of disrespect and abuse during facility-based childbirth. WHO statement; 2014.
[41] World Health Organization WHO statement on caesarean section rates. World Health Organization; 2015. 2015.
[42] World Health Organization Robson classification. Implementation manual; 2017.
[43] World Health Organization WHO recommendations non-clinical interventions to reduce unnecessary caesarean sections. World Health Organization; 2018.