

## Costs analysis of hospital care for vaginal delivery and elective caesarean section for usual risk pregnant women in the Brazilian Unified National Health System

Aline Piovezan Entringer (<https://orcid.org/0000-0003-4639-6197>)<sup>1</sup>

Marcia Ferreira Teixeira Pinto (<https://orcid.org/0000-0001-7568-5014>)<sup>1</sup>

Maria Auxiliadora de Souza Mendes Gomes (<https://orcid.org/0000-0001-5908-1763>)<sup>1</sup>

**Abstract** *This study estimated the costs of vaginal delivery and elective cesarean section without clinical indication, for usual risk pregnant women from the perspective of the Brazilian Unified Health System. Data was collected from three public maternity hospitals located in the south-east region of Brazil through visits and interviews with professionals. The cost components were human resources, hospital supplies, capital cost and overhead, which were identified, quantified and valued through the micro-costing method. The costs with vaginal delivery, elective cesarean section and daily hospital charge in rooming for the three maternity hospitals were identified. The mean cost of a vaginal delivery procedure was R\$ 808.16 and ranged from R\$ 585.74 to R\$ 916.14 between hospitals. The mean cost of elective cesarean section was R\$ 1,113.70, ranging from R\$ 652.69 to R\$ 1,516.02. The main cost component was human resources for both procedures. When stay in rooming was included, the mean costs of vaginal delivery and cesarean were R\$ 1,397.91 (R\$ 1,287.50 - R\$ 1,437.87) and R\$ 1,843.87 (R\$ 1,521.54 - R\$ 2,161.98), respectively. Cost analyses of perinatal care contribute to the management of health services and are essential for cost-effectiveness analysis.*

**Key words** *Cost and cost analysis, Health management, Cesarean section, Natural childbirth*

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<sup>1</sup> Instituto Nacional de Saúde da Mulher, da Criança e do Adolescente Fernandes Figueira. Av. Rui Barbosa 716, Flamengo. 22250-020 Rio de Janeiro RJ Brasil.alineentringer@gmail.com

## Introduction

A growing tendency for cesarean delivery has been observed worldwide, and the concern with this increase is highlighted in Brazil since there are no signs of a decline in surgical delivery in the country<sup>1</sup>. The rate of cesarean sections in Brazil reached 57% in 2014<sup>1</sup>. The Midwest, South and Southeast regions recorded rates above the national average, with 63%, 62%, and 61%<sup>1</sup>, respectively, which shows a significant disparity between the regions. Disparities in cesarean rates are also identified when comparing the care performed in the Unified Health System (SUS) and supplementary health. The rate of cesarean section, when divided into supplementary health and SUS, is 90% and 45%, respectively<sup>2</sup>. The World Health Organization (WHO) indicates that a rate of cesarean sections above 15% does not contribute to a lower maternal and perinatal morbimortality<sup>3,4</sup>, although this baseline rate was adjusted to 25–30% for the Brazilian population due to its characteristics<sup>5</sup>.

Currently, an emerging demand for vaginal delivery in both SUS and supplementary health has been observed, through the support of practices that increase parturient satisfaction, such as diet, privacy, comfort, roaming, relaxation, freedom to choose the position in the second period, restricted use of episiotomy, in-hospital delivery centers, introduction of obstetric nursing in public and private services, and the establishment of on-call staff to support normal delivery in the supplementary network<sup>6</sup>. However, this demand has not been met at an intensity that will positively affect the reduction of cesarean rates<sup>1</sup>.

Elective cesarean delivery without clinical indication negatively impacts maternal and neonatal health outcomes, leading to increased rates of hysterectomy, blood transfusion, hospitalization in the ICU and even higher neonatal mortality<sup>7–10</sup>.

A WHO study analyzing the frequency of cesarean sections in 137 countries (95% of global births in 2008) showed that about 40% of the countries included had a cesarean rate of less than 10%, and were considered countries requiring cesarean sections. The cost of cesarean sections required in these countries would be US\$ 432 million. However, over 6.2 million surgeries were recorded in half of the countries studied, which corresponded to a cost five times higher (US\$ 2.32 billion) than the cost of cesarean sections. Brazil and China accounted for 50% of excess cesarean sections. However, this study did not indicate costs with vaginal delivery and whether

there were savings if it replaced unnecessary cesarean sections.<sup>11</sup> A study carried out in a federal hospital in Minas Gerais in 2009 identified that vaginal delivery and cesarean section procedure had a cost of R\$ 954.58 and R\$ 1,244.99<sup>12</sup>, respectively. A few cost studies are comparing these procedures from the SUS perspective. It should be noted that cost analyses contribute to the organization and management of health services and are fundamental for the planning of public policies and decision-making regarding the choice between the different health technologies.

The decision by type of delivery includes health outcomes, professional and women's issues, and economic issues due to the cost difference between procedures, increased length of hospital stay, and clinical complications related to elective cesarean without clinical indication. However, there is a shortage of Brazilian economic evaluation studies on these procedures for the SUS. This study aimed to perform a cost analysis of hospital care for vaginal delivery and elective cesarean section for usual risk pregnant women in the SUS perspective.

## Material and methods

A direct cost analysis was performed comparing vaginal delivery and elective cesarean section, without clinical indication. The target population was of usual risk pregnant women, whose births could occur both by vaginal delivery and cesarean section. We considered usual risk pregnant women those without any clinical and obstetric complications at delivery, with a single, cephalic, term fetus. The perspective adopted was that of the SUS provider.

Costing included three public maternity hospitals, two of them under the management of the Municipal Health Secretariat of Rio de Janeiro (SMS/RJ) (maternity hospitals A and B) and the other located in Belo Horizonte, Minas Gerais (maternity hospital C). The three maternity hospitals included have adequate physical structure, with a pre-delivery, delivery and postpartum room (PPP room), screening with risk classification, non-pharmacological measures for pain relief and roaming space. Also, these maternities have fetal and infant mortality monitoring system<sup>13</sup>.

Maternity hospital A is managed directly by the SMS/RJ and is responsible for about 500 monthly deliveries. The cesarean rate is 35%. Of the vaginal deliveries, 27% are performed by obstetric nursing. This maternity hospital has two

rooms for cesarean delivery and other surgeries in the surgery ward and seven PPP rooms for vaginal delivery in the obstetric center. Maternity employees are mostly civil servants.

Maternity hospital B is also managed by a Social Organization, its employees work under the Brazilian Work Law (CLT) rules and the maternity carries out about 380 monthly deliveries. The rate of cesarean section is 36% and obstetric nursing has significant participation, accounting for most usual risk vaginal deliveries (70% of vaginal deliveries). The maternity hospital is equipped with a surgical center with four rooms and an obstetric center with seven PPP rooms.

Maternity hospital C is non-profit, exclusively SUS, reference for the population of two districts of Belo Horizonte and performs on average 950 monthly deliveries. All employees work under the CLT rules. The rate of cesarean section is 25% and obstetric nursing also has significant participation, accounting for 78% of vaginal deliveries. Maternity has two normal birth centers (CPN) and an intra-hospital CPN with five PPP rooms was included in this study. The surgery ward consists of two rooms.

The cost items included in the analysis were: human resources, hospital supplies, administrative and capital costs. The items used from admission to delivery (first delivery period for vaginal delivery and entry into the surgical center for elective cesarean section), procedure, postpartum, provision of care to the newborn in the delivery room and lodging of the mother, baby and companion in rooming. Visits were undertaken to the three maternity hospitals and health professionals were interviewed to identify the number and evaluation of each included item. The costs with the implementation of physical structure, maintenance and property depreciation were not considered.

Due to the lack of a hospital cost center in maternity hospitals A and B, a survey of the items was carried out through a mixed approach that includes micro-costing and top-down techniques<sup>14-17</sup>. We used four scripts to collect information, one for each unit studied (obstetric center, surgical center and rooming) and one of administrative information (electricity, telephony, internet and water). The first three routes of the facilities were divided into: i. General information on the sector (number of beds, occupancy rate, number of hospitalizations/births per year, number of telephone and internet extensions, sector footage), ii. Physical structure (number of equipment), iii. Human resources (descrip-

tion of the number of professionals in the sector, workload, work schedule, monthly remuneration obtained through the medical and nursing coordinator of the sectors and the human resources department), iv. Medicines and materials (identification and quantification). The administrative cost script included the mean value of electricity, water, internet and telephone bills for the last year, hospital footage, number of telephone extensions and number of internet points for the entire hospital. These scripts facilitated the identification and quantification of items necessary for the accomplishment of the procedures, as described below.

Two types of calculation were performed to gauge human resources, depending on the permanence in the sector. A survey was made of the number of professionals in the sector for sector-exclusive professionals (nurses, nursing technicians, anesthesiologist and cleaning professional), multiplied by the annual salary plus labor benefits and divided by the number of patient-days attended for the period. For professionals with a shift in more than one sector, as with obstetricians and pediatricians, we considered the time spent with each procedure, obtained through consultation with professionals and experts in the field, multiplied by the hourly rate. The time of one hour of two obstetricians was assumed for an elective cesarean section, without clinical interurrences. A period of an exclusive dedication of 4.8 hours per delivery was considered for the vaginal delivery conducted by the obstetrician. This information was obtained from the professionals of the participating hospitals. The cost of the obstetrician was included only in the proportion of deliveries by physicians in each maternity hospital, considering that the study included only the perspective of hospital care for usual risk deliveries. Concerning the care of the newborn in the delivery room, we considered 40 minutes of the pediatrician, also identified by consultation with professionals. All the professionals consulted (doctors and coordinating nurses or daycare workers) were specialists in the field and had more than 10 years of experience in birth and delivery care.

The salary of maternity hospital A professionals was obtained from the salary scale of SMS/RJ and those of maternity hospitals B and C through information from maternity hospitals. Table 1 shows the mean hourly remuneration of professionals.

The average of supplies used in each type of delivery and the stay in rooming was identified

**Table 1.** Mean hourly remuneration of health professionals by professional category. Rio de Janeiro and Belo Horizonte, 2015, in Brazilian Reals.

Professional Category	Maternity Hospital	Maternity Hospital	Maternity Hospital
	A (R\$)	B (R\$)	C (R\$)
Obstetric nurse	34.30*	38.70	32.00
Assistance nurse	34.30*	26.40	23.00
Obstetrician	42.80**	85.0	106.00
Anesthesiologist	42.80	85.0	116.00
Pediatrician	42.80	85.0	103.00
Cleaning service	9.30	8.0	10.00
Nursing Technician	25.90	14.70	12.00

\* Table of remuneration of the SMS / RJ does not differentiate assistance and obstetric nurse. \*\* In Maternity A, the value shown for obstetrician refers to the public servant working relationship. Half of the obstetricians have a scholarship with hourly remuneration of R\$ 71.00 and were included in the analysis because they are part of the medical staff.

Source: Own elaboration based on maternity data and remuneration table of the SMS/RJ.

and quantified by consulting the professionals of each maternity hospital and the institutional protocols. We requested the coordinating nurses and diarists of each sector, through the routine and protocols established in maternity wards, to identify and quantify the materials and medications used for vaginal delivery, cesarean section delivery, care for the newborn in the delivery room and one-day rooming stay for pregnant women and newborns without clinical and obstetric interurrences and a companion. When necessary, obstetricians, anesthesiologists and pediatricians also participated in the identification of supplies. Medical and hospital supplies, medications, mother and companion diet, laboratory tests and medical gases were included, besides the costs of analgesia, anesthesia (spinal for cesarean), episiotomy, laceration (types II, III and IV) and oxytocin were included. For maternity hospital B, the episiotomy use rate was 30% in medical deliveries and is not performed by the obstetric nurse.

The rate of laceration (type II, III and IV) was 5% and oxytocin use in labor was 29%. In the maternity hospital A, data were only provided for obstetric nursing. Rates were 0.3% for episiotomy, 5.7% for laceration II, III and IV and 41% for labor oxytocin, and we assumed them for all vaginal deliveries, due to the lack of obstetricians. Analgesia is not performed in vaginal deliveries in this maternity hospital. In the maternity hospital C, the rate of analgesia in vaginal delivery is 31.1% and 3.1% for episiotomy.

The supplies were evaluated through the Health Price Database (BPS)<sup>18</sup> of the Ministry of

Health, and Comprasnet<sup>19</sup>. Laboratory tests, such as the VDRL (Venereal Disease Research Laboratory), HIV testing and blood typing were evaluated through the Management System of the Table of Procedures, Medications and Orthosis, Prosthesis and Special Materials (SIGTAP) of the SUS<sup>20</sup>. Food cost was based on information from the SMS/RJ, which showed a mean cost of each meal intended for the patient and companion.

The presence of a companion in the postpartum period was also accounted for in the daily cost, and food cost was included in this cost. Other companion costs, such as human resources and electricity and water use were included in the patient's cost. We did not include structure and physical space costs since we consider them sunk costs<sup>21</sup>.

In this study, it was observed that, in one of the maternity hospitals, it was not always possible for pregnant women to have companions in rooming during hospitalization, and, according to the maternity staff, this was due to infrastructure issues, such as physical space, and privacy of other pregnant women. Thus, the cost with the companion was only included in this maternity unit for 40% of the pregnant women, which was the rate of mothers who had companions (only adolescent mothers). The presence of the companion was possible for all pregnant women/puerperae in the other two maternity hospitals.

The equipment required to perform cesarean delivery and vaginal delivery were incorporated into the cost from the depreciation of the equipment. Based on Resolution No. 36, dated June 3, 2008<sup>22</sup>, which establishes the technical regula-

tion for the operation of obstetric and neonatal care services, we have identified the necessary equipment and made a detailed inventory of the quantity available in each sector through visits to maternity hospitals. The evaluation was carried out from the Support System for the Elaboration of Health Investment Projects (SOMASUS)<sup>23</sup> and the Procurement Portal of the Federal Government (Comprasnet)<sup>19</sup>. Depreciation was calculated considering a useful life of 15 years<sup>24</sup> and a discount of 5%<sup>14</sup>. Depreciation was added to the value of 10% per annum related to equipment maintenance. Concerning the obstetric center, depreciation per annum was divided by the number of vaginal births in 2015 performed in each facility. Regarding the surgical center, the division was performed by the number of surgical procedures in the same year, and active beds were considered for rooming since the occupancy rate of this sector approaches 100% in all maternity hospitals.

We included costs with electricity, water, telephone and internet, which we call in this study administrative costs, calculated from the information of hospital accounts. These accounts were distributed by sector and the number of active beds in rooming, the number of vaginal deliveries in the obstetric center and the number of surgical procedures in the surgical center were considered for the distribution of costs. The apportionment per square meter of useful area was used for electricity and water contracts; regarding telephone, we considered the number of extensions used throughout the hospital and those used by each sector and, for the internet, the number of points available in the hospital and each sector. We were unable to obtain data on the administrative costs of Hospital A.

Maternity Hospital C has a hospital absorption costing service by cost center and the same data obtained from Maternity Hospitals A and B were selected for analysis. Regarding cesarean supplies, we used the surgical kit with the description of the supplies provided by the maternity hospital. Antiseptics, degermants, personal protective equipment and laboratory tests were added to the kit since these items were considered for other maternity hospitals. Thus, standardization of information of the three included maternity hospitals was ensured.

We calculated the total cost of the procedures by multiplying the daily hospital charge by the mean time of postpartum stay in rooming of 2.1-day for vaginal delivery and 2.6 days after elective cesarean section<sup>1</sup>. Costs were expressed in reais

(R\$) and refer to 2015 and no discount and inflation adjustment rate were applied. The Microsoft Office Excel® 2013<sup>25</sup> was used to store data and calculate daily hospital charge.

The study was approved by the Research Ethics Committees of all institutions involved.

## Results

The mean cost of vaginal delivery was R\$ 808.16 in the three maternity hospitals and there was a significant variation between them, and the lowest cost was recorded in Maternity Hospital C (R\$ 585.74). Human resources cost was the primary driver of cost, which accounted for 89% of the total cost of the procedure. The mean daily accommodation rate was R\$ 280.85. The mean total cost of vaginal delivery, with a 2.1 days rooming stay, was R\$ 1,397.91 (Table 2).

The elective cesarean section mean cost was R\$ 1,113.70, of which 81% referred to the cost of human resources. Maternity Hospital C was also the unit with the lowest cost of the procedure (R\$ 652.69), about 50% less than the cost of Maternity Hospital B (R\$ 1,516.02). Concerning the length of hospital stay of 2.6 days, the mean total cost of cesarean section was R\$ 1,843.87, which is 32% higher than vaginal delivery (Table 2).

## Discussion

The study showed that the cesarean section has a 38% higher cost than vaginal delivery and that the primary cost driver in both procedures was human resources (89% of vaginal delivery cost and 81% in cesarean section). Regarding the total cost (procedure and rooming stay), this cost remains higher for cesarean section, since the procedure requires a more extended hospital stay.

It is essential to consider the difference between the costing method used and the specificities of hospital care among different health services to compare this study with other cost analyses. A study carried out in two public hospitals in the city of São Paulo in 2009 estimated the cost of the low-risk normal delivery procedure, including hospital supplies and human resources, at R\$ 717.44 (76.5% of human resources). This study did not include costs with surgical delivery<sup>26</sup>. The vaginal delivery cost analysis from the care protocol of a birth center in Rio de Janeiro for 2012 estimated the normal childbirth procedure at R\$ 352.50 (98% of the costs corresponded to human

**Table 2.** Cost of vaginal delivery and cesarean section in maternity hospitals of Rio de Janeiro and Belo Horizonte, 2015, in Brazilian Reals.

	Maternity hospital A		Maternity hospital B		Maternity hospital C		Mean	
	R\$	%	R\$	%	R\$	%	R\$	%
Rooming								
Human resources	146.54	58.0%	117.23	47.2%	262.10	78.4%	175.29	62.4%
Supplies	105.50	41.8%	121.99	49.1%	64.47	19.3%	97.32	34.7%
Depreciation	0.62	0.2%	0.62	0.2%	1.80	0.5%	1.01	0.4%
Administrative	-	-	8.67	3.5%	5.80	1.7%	7.23	2.6%
Total daily hospital charge	252.65	100.0%	248.5	100.0%	334.17	100.0%	280.85	100.0%
Vaginal delivery								
Human resources	826.44	92.2%	799.93	87.3%	532.28	90.9%	719.55	89.0%
Supplies	59.47	6.6%	56.05	6.1%	29.44	5.0%	48.32	6.0%
Depreciation	9.99	1.1%	16.28	1.8%	14.47	2.5%	13.58	1.7%
Administrative	-	-	43.87	4.8%	9.54	1.6%	26.71	3.3%
Total procedure	895.90	100.0%	916.14	100.0%	585.74	100.0%	808.16	100.0%
Total procedure + hospital stay*	1,426.46	-	1,437.87	-	1,287.50	-	1,397.91	-
Cesarean section								
Human resources	977.68	85.1%	1,276.26	84.2%	467.05	71.6%	907.00	81.4%
Supplies	149.20	13.0%	178.97	11.8%	113.84	17.4%	147.34	13.2%
Depreciation	22.34	1.9%	14.54	1.0%	71.70	11.0%	36.20	3.2%
Administrative	-	-	46.25	3.1%	0.10	0.0%	23.17	2.1%
Total procedure	1,149.22	100.0%	1,516.02	100.0%	652.69	100.0%	1,113.70	100.0%
Total procedure + hospital stay*	1,806.11	-	2,161.98	-	1,521.54	-	1,843.87	-

\* Hospital stay in rooming of 2.1 days for vaginal delivery and 2.6 days for cesarean section.  
Source: Own elaboration.

resources)<sup>27</sup>. Supply-related costs are lower in the birthing room than in hospital care for vaginal delivery<sup>26,27</sup>. These studies did not compare with elective cesarean section.

By employing the activity-based costing system (ABC), Souza *et al.*<sup>28</sup> calculated the 2013 costs of normal and cesarean delivery procedures in a private hospital located in the Metropolitan Region of Belo Horizonte and estimated unit costs of R\$ 483.91 and R\$ 703.27 for normal and cesarean delivery, respectively. The study did not include costs related to maternal and neonatal complications and length of hospital stay. Another study using the same ABC methodology calculated the cost in 2009 for a federal hospital in Minas Gerais of R\$ 954.58 and R\$ 1,244.99 for normal delivery and cesarean delivery, respectively<sup>12</sup>. The study estimated the costs from admission to hospital discharge but did not include clinical complications.

In the international context, Allen *et al.*<sup>29</sup> compared different types of delivery in Canada from a cohort from 1985 to 2002 that included

27,613 deliveries ranging from 37 to 42 weeks of gestational age without maternal or fetal complications. The cost was US\$ 1,340 for normal vaginal delivery, US\$ 1,594 for assisted vaginal delivery, US\$ 2,137 for cesarean delivery with labor, and US\$ 1,532 for casual cesarean delivery. In Germany, a retrospective study identified a higher cost for cesarean section (€384.90) compared to normal delivery (€737.34) for 2003<sup>30</sup>. In contrast, through the follow-up of 186 cesareans and 141 normal deliveries in the US in 2004, Kazanjian *et al.*<sup>31</sup> found a cost of US\$ 13,805.47 and US\$ 17,624.38 for normal and cesarean deliveries, respectively. The study also considered costs associated with the hospitalization of newborns in the NICU, which justifies the much higher cost in both types of delivery.

In this study, we found essential cost differences between the three maternity hospitals. Maternity hospital B showed a higher total cost for cesarean section, especially for the cost of health professionals, which is higher in this unit compared to other maternity hospitals. Mater-

nity hospital C showed the lowest cost for both procedures, also defined by the lower cost of human resources. This maternity hospital has a dominant performance of obstetric nursing in vaginal deliveries (about 80%). Furthermore, the nursing work scale in Maternity Hospital C is 44 weekly hours, whereas 30 and 40 weekly hours' scale prevail in Maternity Hospitals A and B, which influences the hourly remuneration of professionals. While nursing professionals in Maternity Hospital C have lower remuneration, the availability of hours compared to the number of deliveries is much lower when compared to the other two Maternity Hospitals. It is also possible to observe a lower cost of supplies used in vaginal delivery in Maternity Hospital C, which can be justified by the reduced frequency of invasive practices such as episiotomy and oxytocin use. It is worth mentioning that the number of deliveries in Maternity Hospital C is much higher than in the other two Maternity Hospital units (950 monthly births). Despite the low percentage of cesarean section, the use of the surgical block is higher than in other maternities, due to the higher absolute number of cesarean sections and other surgical procedures. This high productivity contributed to the lower cost of the cesarean than in Maternity Hospitals A and B and also a lower cost of human resources when compared to the vaginal delivery of the maternity itself. Another factor that may influence cost measurement is the total availability of medical and nursing hours in maternity hospitals.

It is worth highlighting some limitations of this work. The first refers to the service scale. In Maternity Hospitals A and B, the data provided on the monthly medical scale was limited, since only the total number of obstetricians, monthly salary and workload was reported. There is no specific scale of obstetricians in each sector. Obstetricians attend various sectors, such as surgical center, obstetric center, admission and prenatal care. Thus, we did not obtain the percentage of workload provided in each sector. Thus, it was necessary to apportion for each procedure per the time allocated to the procedure, and this information was obtained from the specialists, which may underestimate the value of professionals for each procedure. Regarding the other professional categories, such as nurses and nursing technicians, anesthesiologist and cleaning professionals, we were able to apportion by procedure considering the number of professionals assigned to the sector, mean monthly salary and day-patients attended in the same period.

Another limitation was the difficulty in obtaining all the information for the study. Maternity Hospitals A and B do not have hospital costs management and, therefore, it was necessary to collect and aggregate data from different sectors and sources. The information was not always readily available, as was the case of Maternity Hospital A hospital bills, which were not provided and thus not shown in this study. We were also unable to obtain obstetrical stay days for Maternity Hospitals A and B, and we had to use SINASC information. However, there was a need to use the SUS Pricing list to evaluate the laboratory tests performed, due to the unavailability of these figures in other sources. We reinforce the importance of including a cost system in hospitals, which would be crucial for better management of services. It should be noted that the cost items included here are those that most impact the cost package of the procedures.

We also chose to use expert consultation for the identification and measurement of hospital supplies, a valid tool for economic evaluations<sup>32</sup>. We have included nurses and doctors, coordinators and day-laborers, specialists with more than 10 years of experience in the field, qualified professionals to carry out this identification in this consultation, since they are present daily in the performance of the procedures and organization of the sectors, such as the replacement of materials, kits for the procedures and the establishment of routines and protocols.

The SUS provider was used as a perspective of this cost analysis and three maternity hospitals with different management systems (public, administration by Social Organization and non-profit) were included in the attempt to contextualize the care process of normal delivery and cesarean section in the SUS.

We decided to present the health resources and supplies used in each procedure to support other research. Also, this cost analysis described the cost of performing the procedures exclusively, and while we have not conducted a complete economic and cost-effectiveness evaluation, the results detailed here, together with the comparative effectiveness data of the procedures, can serve as a basis for research that aims to carry out cost-effectiveness studies.

We must consider that costs among the various regions of the country may differ from those shown here, according to the remuneration of professionals, hospital management and care protocols. However, the figure found here differs greatly from the that of the procedure of the

SUS<sup>20</sup> Pricing List, which is R\$ 545.73 for cesarean section and R\$ 443.40 for vaginal delivery.

Although for the SUS provider, the SIGTAP<sup>20</sup> table is only one way of financing the system, the distance between the cost of the procedure and the value of the table should trigger reflections and research efforts in managers and researchers to investigate more appropriate ways of financing labor. For SUS providers that are not managed directly by the SUS (covenanted with the SUS), and particularly the non-philanthropic ones,

who use this unique source of funding, the implementation of an appropriate model of care, as recommended by Brazilian protocols is challenging in the face of the financial imbalance between cost and revenue.

Finally, delivery and childbirth care cost analyses provide data that can support managers in decision-making for the organization of care services and networks and contribute to broader knowledge in the field of economic evaluation in Brazil.

### **Collaborations**

AP Entringer, MFT Pinto and MASM Gomes participated in the design of the project, data analysis and interpretation, paper drafting and approval of the final version to be published.



## References

1. Brasil. Ministério da Saúde (MS). Departamento de Informática do SUS (DATASUS). *Indicadores de Saúde*. [acessado 2013 Ago 20]. Disponível em: <http://www2.datasus.gov.br/DATASUS/index.php?area=0205>.
2. Domingues RMSM, Dias MAB, Nakamura-Pereira M, Torres JA, d'Orsi E, Pereira APE, Schilithz AOC, Leal MC. Processo de decisão pelo tipo de parto no Brasil: da preferência inicial das mulheres à via de parto final. *Cad Saude Publica* 2014; 30(Supl. 1):S101-S116.
3. World Health Organization. Appropriate technology for birth. *Lancet* 1985; 2(84532):436-467.
4. Ye J, Betran AP, Guerrero Vela M, Souza JP, Zhang J. Searching for the optimal rate of medically necessary cesarean delivery. *Birth* 2014; 41(3):237-244.
5. Brasil. Ministério da Saúde (MS). *Diretrizes de Atenção à Gestante: a operação cesariana*. Brasília: MS; 2016. [acessado 2016 september 16]. Disponível em: [http://conitec.gov.br/images/Consultas/Relatorios/2016/Relatorio\\_Diretrizes\\_Cesariana\\_N179.pdf](http://conitec.gov.br/images/Consultas/Relatorios/2016/Relatorio_Diretrizes_Cesariana_N179.pdf)
6. Mendes MA. Compromisso com a mudança. *Cad Saude Publica* 2014; 30(Supl. 1):S41-S2.
7. Geller EJ, Wu JM, Jannelli ML, Nguyen TV, Visco AG. Neonatal outcomes associated with planned vaginal versus planned primary cesarean delivery. *J Perinatol* 2010; 30(4):258-264.
8. Geller EJ, Wu JM, Jannelli ML, Nguyen TV, Visco AG. Maternal outcomes associated with planned vaginal versus planned primary cesarean delivery. *Am J Perinatol* 2010; 27(9):675-683.
9. Larsson C, Saltvedt S, Wiklund I, Andolf E. Planned vaginal delivery versus planned caesarean section: short-term medical outcome analyzed according to intended mode of delivery. *JOGC* 2011; 33(8):796-802.
10. Liu S, Liston RM, Joseph KS, Heaman M, Sauve R, Kramer MS, ; Maternal Health Study Group of the Canadian Perinatal Surveillance System. Maternal mortality and severe morbidity associated with low-risk planned cesarean delivery versus planned vaginal delivery at term. *CMAJ* 2007; 176(4):455-460.
11. Gibbons L, Belizán JM, Lauer JA, Betrán AP, Merialdi M, Althabe F. The global numbers and costs of additionally needed and unnecessary caesarean sections performed per year: overuse as a barrier to universal coverage. *World Health Report* 2010; Background Paper, Nº 30.
12. Paixão EM. *Custo do parto normal e cesárea: replicação do custeio ABC com estudo de caso no hospital das clínicas da Universidade Federal de Minas Gerais* [monografia]. Belo Horizonte: Universidade Federal de Minas Gerais; 2010.
13. Prefeitura do Rio de Janeiro. Secretaria Municipal de Saúde. *Mortalidade Infantil*. [acessado 2016 Nov 1]. Disponível em: <http://www.rio.rj.gov.br/web/sms/exibeconteudo?id=1368679>.
14. Drummond MF, O'Brien B, Stoddart GL, Torrance GW. *Methods for the economic evaluation of health care programmes*. 3<sup>th</sup> ed. New York: Oxford University Press; 2005.
15. Luce BR, Manning WG, Siegel JE, Lipscomb J. Estimating Costs in Cost-Effectiveness Analysis. In: Gold MR, Siegel JE, Russel LB, Weinstein MC, editors. *Cost-Effectiveness in Health and Medicine*. 2<sup>nd</sup> ed. New York: Oxford University Press; 1996. p. 176-213.
16. Silva EN, Silva MT, Pereira MG. Identificação, mensuração e valoração de custos em saúde. *Epidemiol Serv Saude* 2016; 25(2):437-439.
17. Ribeiro RA, Neyeloff JL, Itria A, Santos VCC, Vianna CMM, Silva EN, Elias FTS, Wichmann RM, Souza KM, Cruz LN, Azeredo-da-Silva ALF. Diretriz metodológica para estudos de avaliação econômica de tecnologias em saúde no Brasil. *J Bras Econ Saúde* 2016; 8(3):174-184.
18. Brasil. Ministério da saúde (MS). *Banco de preço em saúde*. [acessado 2016 July 12]. Disponível em: <http://aplicacao.saude.gov.br/bps/login.jsf>.
19. Brasil. Ministério do Planejamento, orçamento e gestão. *COMPTRASNET: Portal de compras do Governo Federal*. [acessado 2012 Nov 6]. Disponível em: <http://www.comprasnet.gov.br/>.
20. Brasil. Ministério da Saúde (MS). *SIGTAP - Sistema de Gerenciamento da Tabela de Procedimentos, Medicamentos e OPM do SUS*. [acessado 2016 september 16]. Disponível em: <http://sigtap.datasus.gov.br/tabela-unificada/app/sec/inicio.jsp>.
21. Iunes RF. A Concepção Econômica de Custos. In: Piola SF, Vianna SM, organizadores. *Economia da Saúde: Conceitos e Contribuições para a Gestão da Saúde*. Brasília: IPEA; 1995. p. 227-248.
22. Agência Nacional de Vigilância Sanitária (Anvisa). Resolução Nº 36, de 3 de junho de 2008. Dispõe sobre Regulamento Técnico para Funcionamento dos Serviços de Atenção Obstétrica e Neonatal. *Diário Oficial da União* 2008; 4 jun.
23. Brasil. Ministério da Saúde (MS). *Sistema de Apoio à Elaboração de Projetos de investimentos em saúde (SOMASUS)*. [acessado 2015 Out 20]. Disponível em: [http://portal.saude.gov.br/portal/saude/profissional/area.cfm?id\\_area=1258](http://portal.saude.gov.br/portal/saude/profissional/area.cfm?id_area=1258).
24. Estado do Rio de Janeiro. Secretaria de Estado de Fazenda. Contadoria Geral do Estado. Portaria CGE nº 189, de 15 de abril de 2015. [acessado 2017 Mar 17]. Disponível em: [http://www.fazenda.rj.gov.br/sefaz/content/conn/UCMServer/path/Contribution%20Folders/site\\_fazenda/legislacao/financeira/portarias/cge/2015/Portaria%20CGE%20N%C2%BA%20189.pdf](http://www.fazenda.rj.gov.br/sefaz/content/conn/UCMServer/path/Contribution%20Folders/site_fazenda/legislacao/financeira/portarias/cge/2015/Portaria%20CGE%20N%C2%BA%20189.pdf)
25. Microsoft MOE, Versão SP1: *Programa de Planilha Eletrônica de Cálculo Escrito*. [S.l.]. Microsoft Corporation, CD, 2013.
26. Melo MCL. *Estudo sobre custos dos modelos de assistência ao parto normal de baixo risco no Brasil - uma análise exploratória* [dissertação]. São Paulo: Universidade de São Paulo; 2009.
27. Oliveira FA, Progianti JM, Peregrino AAF. Custos diretos do parto envolvidos com a prática obstétrica de enfermagem em Casa de Parto. *Esc Anna Nery Rev Enferm* 2014; 18(3):421-427.
28. Souza AA, Lara CO, Lima LCM, Pavione CSSN, Xavier AG. Análise de Custos em Hospitais: Comparação dos Custos dos Partos Normal e Cesáreo e os Valores Repassados por um Plano de Saúde. *Revista de Administração e Contabilidade da FAT* 2013; 5(1):50-61.
29. Allen VM, O'Connell CM, Farrell SA, Baskett TF. Economic implications of method of delivery. *Am J Obstet Gynecol* 2005; 193(1):192-197.

30. Heer IM, Kahlert S, Rummel S, Kumper C, Jonat W, Strauss A. Hospital treatment - Is it affordable? A structured cost analysis of vaginal deliveries and planned caesarean sections. *Eur J Med Res* 2009; 14(11):502-506.
31. Kazandjian VA, Chaulk CP, Ogunbo S, Wicker K. Does a Cesarean section delivery always cost more than a vaginal delivery? *J Eval Clin Pract* 2007; 13(1):16-20.
32. Weinstein MC, O'Brien B, Hornberger J, Jackson J, Johannesson M, McCabe C, Luce BR; ISPOR Task Force on Good Research Practices--Modeling Studies. Principles of good practice for decision analytic modeling in health-care evaluation: report of the ISPOR Task Force on Good Research Practices--Modeling Studies. *Value Health* 2003; 6(1):9-17.

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