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Maternal Health Costs

Evidence Summary

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Purpose of the Document

The document present brief summary of evidences on costs of maternal health services. Aim of this evidence review is two-fold to identify cost of maternal health services and understand major drivers of costs. The review considers costs from low, middle and high-income countries.

The summary is based on review of latest evidences. It is intended for operational readership: for policy makers, health planners, health care managers and other actors interested maternal health service planning.

More detailed information could be accessed at <http://curatiofoundation.org/pip/>

Full resources are available - https://www.zotero.org/groups/maternal_health_costs

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Background

Increasing costs accompanied with higher rates of interventions result in higher economic costs. To meet increasing demand for better health services within constrained financing the policy-makers face challenges to improve efficiency of health services. Therefore understanding of the full costs of health services is critical for adequate policy decisions.

In the current evidence review maternal health services include antenatal and obstetric services (such as normal vaginal delivery, instrumental vaginal delivery and caesarean section). In some studies neonatal care costs were considered alongside maternal care costs. The document presents also a brief review of cost-containment methods proposed to reduce high costs. Noteworthy that the current review did no aim to study this topic particularity but given its high policy relevance brief overview was included in the document.

Current evidence review draws on findings of review papers since 2000 and on primary studies, policy brief and other grey literature published since the latest review. The comprehensive review of maternal health care was undertaken by Borghi in 2001 that looks at costs of providing maternal health services in 16 developing countries in Africa, Central and south America, South and South East Asia (Borghi, 2001). In 2001 Henderson et al conducted a systematic review of all previous scientific studies in economic aspects of alternative modes of delivery (Henderson et al, 2001). In 2013 Fahy et al reviewed thirty scientific studies relating to the economic costs of childbirth published between 2000-2012 (Fahy et al. 2013).

Main Findings

The reviews suggest limitations of the studies that makes it difficult to compare costs between the countries. The limitations include not clear indication of calculation methods, poor disaggregation of data collected and presented (Borghi, 2001). Fahy et al similarly indicate that comparisons of costs across studies are difficult because of differences in the methods used to evaluate costs. Different methodologies were used to assessing the costs such as cohort studies, administrative data sources, hospital utilisation costs, decision modelling and cost-effective analysis.

One major methodological limitation highlighted is a failure to analyze the overall cost structure of childbirth, including antenatal care, delivery and postnatal care costs and outcomes of both the mother and child. Due to lack of internationally acceptable childbirth cost and clinical outcome classification system comparisons across different delivery modes is challenging (Fahy et al. 2013).

The costs for antenatal and obstetric services derived from the reviewed literature are summarised in Annex 1. The costs are presented by level of care and intervention types, whenever available cost categories and share of costs are presented as well. As comparison between the costs due to methodological variations is challenging its interpretation should be done with caution.

The evidence review suggests that costs of interventions vary considerably across the countries. While comparing costs from the developing countries Borghi identified cost per antenatal visit from \$2.21 per visit in a public health centre in Uganda to \$42.41 in maternity hospital in Argentina. Higher costs in Argentina were caused by higher labour costs (>70% of total), with drugs and medical supplies representing a much smaller proportion (27%). Costs were generally lower at lower level facilities, however some exceptions were observed such as lower cost at hospital level in Argentina and Ghana due to high volume of services. Higher cost estimates of a normal vaginal delivery (in Argentina) were associated with obstetricians involved in delivery rather than midwives contrary to other countries. The cost of Caesarean Section (CS) was found to be on average three times greater than that of normal vaginal delivery. Range from \$46.71 in Uganda to \$525.57 in Argentina. On average drugs and medical supplies represented 49,2% of the total cost (Borghi, 2001).

The majority of existing studies estimate CS costs. Increasing focus on CS over the other modes of delivery is motivated by the rising caesarean rates worldwide.

Later reviews also suggest that CS is the most costly mode of delivery. The studies show that type of funding and volume of birth attended by obstetricians have a significant effect on

incidence of caesarean section (Hanifin, 2014). It was concluded that increase in CS rate in non-urgent and non strictly indicated cases unnecessarily increase resource use and pose additional risk to safety of the mother and child. NICE guidelines indicate that CS typically has higher costs and CS without medical indication has worse maternal and infant outcomes (NICE, 2011). The WHO data find that caesarean rates higher than 10% are not associated with further reductions in infant or maternal mortality (WHO, 2015).

There is increasing evidence that model of care and types of health care professionals determine intervention costs. For low risk women delivery costs differ among midwifery-led and consultant-led deliveries, with higher costs associated with consultant-led groups (Begley, 2009).

The costing study conducted in Tanzania looked at costs of providing antenatal and childbirth services in rural facilities and analysed determining factors of service provision efficiency. Among cost categories personnel costs contributed to 44% of the total costs. The study found that number of staff and process quality (quality of care given to women identified through observation) had negative influence on unit costs. On the other hand, structural quality (infrastructure availability) and women's perceived quality of ANC care had positive effect on unit costs. In emergency obstetric care increase in structural and process quality were correlated with lower unit costs and population-staff ratio, availability of infrastructure for basic emergency obstetric care services had significant positive influence on unit costs. The study suggests that improvement in quality of care is vital for efficiency (Saronga et al. 2014).

The study in England that analysed maternal costs in four different alternative settings found that overheads and staffing costs were the key drivers of the costs (Schroeder et a. 2012).

The international Federation of Health Plans publishes comparative prices for health interventions in several high-income countries. The report shows variation in costs across the countries with US reporting the highest costs. E.g. normal delivery cost ranges from \$1,271 in South Africa to \$10,808 in US while CS costs ranges from \$2,192 to \$16,106 in South Africa and US respectively (IFHP, 2015 report). See Annex 2.

Significant cost variations were found in US hospitals. The costs were estimated among low-risk women without comorbidities and obstetric risk factors in hospitals performing more than 100 births per year (Xiao Xu et al. 2016). Average estimated facility cost per maternity stay ranged from \$1,189 to \$11,986 (median: \$4,215). Estimated facility costs were higher at hospitals with higher rates of caesarean delivery or serious maternal morbidity. Hospitals having government or nonprofit ownership; being a rural hospital; and having relatively low volumes of childbirths, low proportions of childbirths covered by the government scheme, and long stays also had

significantly higher costs. Caesarean delivery rates among low-risk childbirths varied widely across hospitals (median 10.6% range: 2.0%–39.0%). The authors suggested that the safe reduction of caesarean deliveries might help reduce facility costs and cost variation for childbirth-related hospitalizations.

The recent study in California showed higher rates of maternal infection in hospitals with caesarean delivery rates that were below or above expected confidence intervals than in hospitals with rates that were within expected confidence intervals (Bailit et al. 2006).

Additional costs in any healthcare settings are associated with the provision of care and associated with negligence. The NHS Litigation Authority (2012) in its report on 10 years of maternity claims in the NHS, identified the most frequent categories of claim as management of labour (14.05%) and caesarean section (13.24%);

Because of concerns associated with high CS rates and its safety to mothers and children the American College of Obstetricians and Gynaecologists called for safe reduction of primary caesarean sections (ACOG, 2014). In the absence of standard classification system for caesarean section that would allow the comparison of caesarean section rates across different facilities, cities, countries or regions the WHO proposes to use of Robson classification system to establish a common starting point for comparing maternal and perinatal data (WHO, 2015).

Cost reduction strategies

The review identified strategies proposed and implemented mainly in US to control high costs associated with excessive CS rates. Several strategies have been considered such as establishing standardized definitions and management guidelines for common indications for caesarean delivery; Regular review, feedback, and improvement of care processes at the hospital and physician level (Main EK, 2012); Patient education about the short- and long-term consequences of early elective deliveries and caesarean deliveries and public reporting of information about maternity care services—including rates of caesarean delivery (Joint Commission, 2013).

The rising costs are forcing innovations in payment methods. Complementing the quality improvement initiatives, a number of states in US have implemented reimbursement policies that deny payment for deliveries before 39 weeks gestation without documentation of medical necessity. North Carolina reported that this approach, along with provider and patient education, has decreased rates of early deliveries and NICU admissions. (Lally, 2013).

Payment reforms such as “Bundled payment model” have shown promising results in US. Unlike fee-for-service reimbursement, which compensates providers for each service, bundled payment combines all the services provided during a defined episode of care into a single, fixed

rate. Payments are developed using historical claims data and are based on the resources needed to provide care that is consistent with established clinical guidelines. Combining all costs into a single, episode-based payment creates financial incentives for providers and hospitals to be more accountable for efficiency and coordination across care settings. If a provider's costs are lower than the bundled payment rate or a predetermined threshold, providers may share the savings. However, if a provider's costs are higher than the bundled payment rate or a predetermined threshold, they may suffer a loss. Paying one fixed fee to multiple providers who deliver services during an episode of care incentivizes providers to work together. They are jointly responsible for the total cost of care and jointly accountable for the outcomes produced. The bundled model piloted in Pennsylvania led to both cost reductions and quality improvements in maternity care. The preliminary results of the pilot have shown improvements in nearly all of the 103 measures identified. Neonatal intensive care admissions have decreased; primary caesarean rates decreased from 30% to 24% (Lally, 2013).

To accelerate adoption and dissemination of the bundled payment method with a primary aim to sustain quality and cost-effective health services recently Clinical Episode Payment (CEP) Work Group was established in US. CEP developed a White Paper, "Accelerating and Aligning Clinical Episode Payment Models: Maternity Care" that proposes a framework for clinical episode payment for maternity services. The goal of using this method is to improve the value of maternity care by reducing costs and improving outcomes, as well as the experience of care, for the woman and her baby (CEP, 2016).

In summary the maternal health costs vary significantly between various health systems and within the country between levels of care and health care facilities. Comparison and interpretation of data should be done with caution due to methodological limitations to analyse cost structure and due to absence of standard classification system. Applying of activity-based classification system would allow generation of comparable data both clinically and economically.

Annex 1 Costs of perinatal services

Source	location (country) and year	Care (ANC, obstetrics, neonatal care)	Level of care	Activities included	Cost categories & type: Average Cost (AC)	Unit costs (range)	Marginal cost ¹ (%AC)
Josephine Borghi, 2001²	Review paper: 16 countries: 7 Africa; 5 Central and south America; 4 South and South East Asia; 2001	ANC, Obstetrics	Public Hospital, Public health center, Private maternity home (service provided by a private midwife),at home.	Activities³	Categories⁴		
(Borghi et al. 2000)	Argentina 1998	Obstetrics	Public Hospital	Episiotomy	Categories ⁵	\$ 6.01	
(Borghi et al.	Argentina 1998	ANC	Public Hospital	Antenatal	AC (Labor cost	\$ 28.75 (24.40; 42.51)	7.90

¹ Marginal cost: materials (drug and medical supply).

² This review considers costs to the provider of providing maternal health services, Estimated costs of Maternal Health Services of current practice in specific countries or regions

³ Basic Obstetric Services: Preventative Interventions; ANC (Ultrasound, Maternal Tetanus Immunization, Iron and Folic Supplementation, Management of Maternal Anaemia), Postnatal Care, Normal Vaginal Delivery (Episiotomy). Comprehensive Obstetric Services: Caesarean Section, Management of Complications (Post-Operative Infection, Postpartum Haemorrhage, Pre-eclampsia, Eclampsia, Sepsis), Abortion Service Delivery-Alternative Methods of Abortion (Manual Vacuum Aspiration, Surgical (dilation and curettage)), Management of Post-Abortion Complications. Essential Obstetric Care Packages.

⁴ The method of allocating joint costs: Joint costs are the costs of resources which are shared across more than one activity (a typical example are 'overhead' costs). Indirect costs (These are the costs associated with impaired ability to work or to engage in leisure activities due to morbidity and lost economic productivity due to death) and opportunity costs (The opportunity cost is the value of time in its next best alternative use death. A typical example is the valuation of volunteer worker's time).

⁵ Including cost of suturing and anaesthetic

Source	location (country) and year	Care (ANC, obstetrics, neonatal care)	Level of care	Activities included	Cost categories & type: Average Cost (AC)	Unit costs (range)	Marginal cost ¹ (%AC)
				visits	70% of AC)		
(Borghi et al. 2000)	Argentina 1998	ANC	Public Health centre	Antenatal visits	AC per visit	\$ 33.46 (26.44; 31.06)	1.65
(Borghi et al. 2000)	Argentina 1998	Obstetrics	Public Hospital	vaginal delivery	AC	\$ 105.61 (70.81; 140.41)	5.41
(Borghi et al. 2000)	Argentina 1998	Obstetrics	Public Hospital	Caesarean section	AC	\$ 525.57 (452.56; 598.58)	80.28
Galvez et al. 2000)	Cuba	ANC	Public Hospital	Antenatal visits	AC per visit	\$ 12.15 (8.85; 15.46)	4.15
Galvez et al. 2000)	Cuba	Obstetrics	Public Hospital (Average cost (AC))	Vaginal delivery	AC	\$ 21.32 (16.45; 26.20)	5.83
Galvez et al. 2000)	Cuba	Obstetrics	Public Hospital (Average cost (AC))	Caesarean section	AC	\$ 113.98(70.12; 157.83)	43.73
(Thinkamrop et al. 2000)	Thailand	ANC	Public Hospital	Antenatal visits	AC per visit	\$ 6.20 (5.33; 7.06)	1.46
(Thinkamrop et al. 2000)	Thailand	Obstetrics	Public Hospital	Vaginal delivery	AC	\$ 27.25 (22.01; 32.50)	5.54
(Thinkamrop et al. 2000)	Thailand	Obstetrics	Public Hospital	Caesarean section	AC	\$ 83.00	46.14
(Jinabhai et al. 2000)	South Africa	ANC	Public Health center	Antenatal visits	AC	\$ 9.05 (7.47; 10.62)	0.95
(Jinabhai et al. 2000)	South Africa	ANC	Public Health center	Antenatal visits	AC	\$ 7.24 (5.78; 8.70)	0.42
(Jinabhai et al. 2000)	South Africa	Obstetrics	Public Hospital	Vaginal delivery	AC	\$ 81.40 (74.49; 88.30)	5.38

Source	location (country) and year	Care (ANC, obstetrics, neonatal care)	Level of care	Activities included	Cost categories & type: Average Cost (AC)	Unit costs (range)	Marginal cost ¹ (%AC)
(Jinabhai et al. 2000)	South Africa	Obstetrics	Public Hospital	Caesarean section	AC	\$ 140.60 (105.71; 175.48)	24.91
Schroeder et al (2012) ⁶	UK	Obstetrics	Home	births planned at home for low risk women	Cost category ⁷ (unadjusted AC)	€ 1,274	
Schroeder et al (2012)	UK	Obstetrics		freestanding midwifery units for low risk women	unadjusted AC	€ 1,715	
Schroeder et al (2012)	UK	Obstetrics		alongside midwifery units for low risk women	unadjusted AC	€ 1,747	
Schroeder et al (2012)	UK	Obstetrics		obstetric wards for low	unadjusted AC	€ 1,950	

⁶ The paper estimates cost effectiveness of alternative planned places of birth based on data collected by the research program

⁷ Detailed unit costs (Homebirth delivery packs; NHS reimbursement for midwifery travel; some forms of pain relief; alternative modes of delivery; active management of the third stage of labor; suturing for episiotomy; suturing third and fourth degree perineal tears; manual removal of the placenta; blood transfusions; and care after a stillbirth or neonatal death), Overhead cost per place of birth per hour (Unit overheads were estimated through the same finance departments for all settings and covered management and administrative costs, operational costs (including heating and lighting, training, building maintenance), indirect overheads (including personnel and finance functions), and capital costs based on the new build and land requirements of NHS facilities, accounting for unit occupancy rates.). Midwifery staffing and attributable on-costs; Drug costs; Costs per day for each level of neonatal care, dependency or intensive care for the mother.

Source	location (country) and year	Care (ANC, obstetrics, neonatal care)	Level of care	Activities included	Cost categories & type: Average Cost (AC)	Unit costs (range)	Marginal cost ¹ (%AC)
				risk women			
Fahy et al (2013)⁸	Review paper	Obstetrics					
Henderson et al (2001)	UK, 2001	Obstetrics		planned vaginal delivery		€ 768–1,585	
Bellanger and Or (2008)	Nine European countries	Obstetrics		spontaneous vaginal first delivery for mothers aged 25–34 years	AC for nine countries	€ 1,512–4,337	
Bellanger and Or (2008)	Hungary	Obstetrics		spontaneous vaginal first delivery for mothers aged 25–34 years	AC	€ 350	

⁸ The paper reviews all existing scientific studies in relation to the economic costs of alternative modes of childbirth delivery and to highlight deficiencies in the existing scientific research

Source	location (country) and year	Care (ANC, obstetrics, neonatal care)	Level of care	Activities included	Cost categories & type: Average Cost (AC)	Unit costs (range)	Marginal cost ¹ (%AC)
Bellanger and Or (2008)	Germany and France	Obstetrics		spontaneous vaginal first delivery for mothers aged 25–34 years	AC	€ >2,000	
Heer et al. (2009)	Germany, 2008	Obstetrics		vaginal delivery	total cost	€ 1,737	
Heer et al. (2009)	Germany, 2008	Obstetrics		planned CS	total cost	€ 2,385	
Petrou and Glazener (2002)	Scotland	Obstetrics		instrumental vaginal delivery		€ 2,406	
Petrou and Glazener (2002)	Scotland	Obstetrics		Planned CS		€ 3,572	
Saronga HP (2014)	Tanzania, 2009	ANC	private and public health center and dispensaries	Antenatal care	Cost categories ⁹ ; Per capita costs by catchment area population.	\$ 7.0	44% personnel costs

⁹ Indirect, intermediate and direct cost

Source	location (country) and year	Care (ANC, obstetrics, neonatal care)	Level of care	Activities included	Cost categories & type: Average Cost (AC)	Unit costs (range)	Marginal cost ¹ (%AC)
Saronga HP (2014)	Tanzania, 2009	Antenatal care	private and public health center and dispensaries	Antenatal visit	Cost per visit	\$ 16.42	
Saronga HP (2014)	Tanzania, 2009	Obstetrics and neonatal care	private and public health center and dispensaries	Childbirth and neonatal	Cost per childbirth	\$ 79.78	
Dalaba et al. 2013	Ghana	ANC	Health center	Antenatal visit	Per visit	\$18.4	
Dalaba et al. 2013	Ghana	Obstetrics	Health center	Spontaneous delivery		\$ 63.2	
Begley et al. (2009) ¹⁰	Ireland, 2009	Obstetrics	midwife-led unit	childbirth for low risk women		£ 574.3	
Begley et al. (2009)	Ireland, 2009	Obstetrics	consultant-led unit	vaginal delivery for low risk women		£ 631.64	
Begley et al. (2009)	Ireland, 2009	Obstetrics	consultant-led unit	elective caesarean section for low		£ 1,041.3	

¹⁰ The paper presents cost-effectiveness analysis as part of a randomized trial comparing costs and clinical outcomes for midwife-led and consultant-led care in a group of low-risk women

Source	location (country) and year	Care (ANC, obstetrics, neonatal care)	Level of care	Activities included	Cost categories & type: Average Cost (AC)	Unit costs (range)	Marginal cost ¹ (%AC)
				risk women			
Begley et al. (2009)	Ireland, 2009	Obstetrics	consultant-led unit	emergency caesarean section for low risk women		£ 1,482.2	
Sonfield, A. and Kost, K. (2013) ¹¹	USA, 2008	ANC, Obstetrics, Neonatal Care		prenatal care, labor and delivery, postpartum care and one year of care for the infant		\$ 12,613	
Xiao Xu et. A. (2016) ¹²	USA, 2011	Obstetrics	649 hospitals across the United States with at least 100 low-risk childbirths	child birth costs in mothers aged 16-34 who did not have any of maternal comorbidities and obstetric	AC (range)	\$4,215 (1,189 -11,986)	

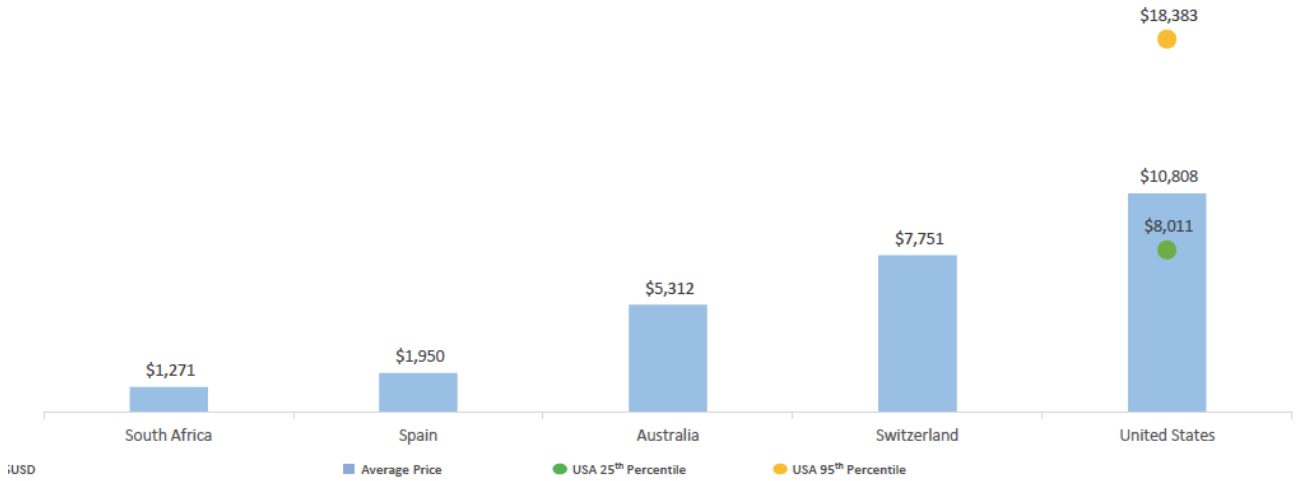
¹¹ The cost of publicly funded births resulting from unintended pregnancies to estimate cost of low-risk childbirths

¹² The study aimed to characterize variation in estimated facility costs for maternity care during childbirth hospitalizations among US hospitals

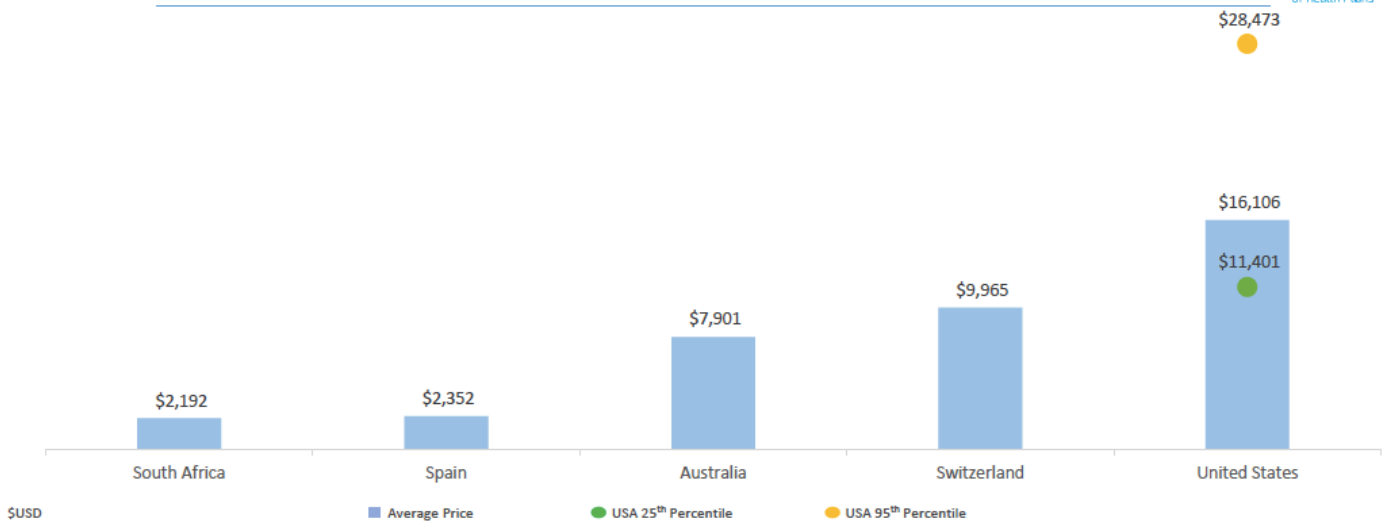
Source	location (country) and year	Care (ANC, obstetrics, neonatal care)	Level of care	Activities included	Cost categories & type: Average Cost (AC)	Unit costs (range)	Marginal cost ¹ (%AC)
				risk factors			
Xiao Xu et. A. (2016)	USA, 2011	Obstetrics		Vaginal deliveries	AC (range)	\$ 3,960 (1,183–11,819)	
Xiao Xu et. A. (2016)	USA, 2011	Obstetrics		Cesarean deliveries	AC (range)	\$ 6,499 (1,249–13,688)	

Annex 2 Medical and Hospital Prices based on 2014 claims, International Federation of Health Plans (2015 report)

Total Hospital and Physician: Normal Delivery



Total Hospital and Physician: C-Section



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