Trends in caesarean delivery by country and wealth quintile: cross-sectional surveys in southern Asia and sub-Saharan Africa

Francesca L Cavallaro,[a] Jenny A Cresswell,[a] Giovanny VA França,[b] Cesar G Victora,[b] Aluísio JD Barros[b] & Carine Ronsmans[a]

Objective To examine temporal trends in caesarean delivery rates in southern Asia and sub-Saharan Africa, by country and wealth quintile.
Methods Cross-sectional data were extracted from the results of 80 Demographic and Health Surveys conducted in 26 countries in southern Asia or sub-Saharan Africa. Caesarean delivery rates were evaluated – as percentages of the deliveries that ended in live births – for each wealth quintile in each survey. The annual rates recorded for each country were then compared to see if they had increased over time.
Findings Caesarean delivery rates had risen over time in all but 6 study countries but were consistently found to be lower than 5% in 18 of the countries and 10% or less in the other eight countries. Among the poorest 20% of the population, caesarean sections accounted for less than 1% and less than 2% of deliveries in 12 and 21 of the study countries, respectively. In each of 11 countries, the caesarean delivery rate in the poorest 40% of the population remained under 1%. In Chad, Ethiopia, Guinea, Madagascar, Mali, Mozambique, Niger and Nigeria, the rate remained under 1% in the poorest 80%. Compared with the 22 African study countries, the four study countries in southern Asia experienced a much greater rise in their caesarean delivery rates over time. However, the rates recorded among the poorest quintile in each of these countries consistently fell below 2%.
Conclusion Caesarean delivery rates among large sections of the population in sub-Saharan Africa are very low, probably because of poor access to such surgery.

Abstracts in عربي, 中文, Français, Русский and Español at the end of each article.

Introduction

Caesarean sections, when adequately indicated, can prevent poor obstetric outcomes and be life-saving procedures for both the mother and the fetus.[1] However, at a time when the caesarean delivery rate – as a percentage of live births – has been rising globally,[1] there is growing concern about unnecessary caesarean sections.[2] Unnecessary caesarean sections can increase the risk of maternal morbidity, neonatal death and neonatal admission to an intensive care unit.[2] At the same time, there is also concern that – in low-income countries in general and among the poorer sections of the populations in such countries in particular – caesarean sections are not always accessible, even when they are clearly indicated.[3]

There is no consensus on the "optimal" rate of caesarean delivery at the population level. Although values between 5% and 15% of live births have been suggested, the basis on which these thresholds have been proposed is not clear.[4] Some historical studies indicate that low maternal mortalities can be achieved when the caesarean delivery rate is far below 15% of live births. In the Netherlands, for example, maternal mortality had fallen below 20 deaths per 100 000 live births by 1950, when caesarean sections were associated with less than 2% of live births.[5,6] The results of some ecological studies indicate not only that no further reductions in mortality occur when caesarean delivery rates increase above 10%, but also that rates above 15% may be associated with additional mortality.[7,8] The World Health Organization (WHO) has suggested that a caesarean delivery rate of 15% should be taken as a threshold that should not be exceeded – rather than a target to be achieved.[4]

The lower threshold for an "acceptable" rate of caesarean delivery has received much less attention than the upper threshold. Extremely low rates are indications that access to surgical care is poor and that, in consequence, women, fetuses and neonates are dying unnecessarily. As 1 to 2% of all births are associated with conditions that absolutely require caesarean sections to save the mothers' lives – such as obstructed labour and complete placenta praevia – caesarean delivery rates of less than 1% or less than 2% are thought to reflect a real deficit in access to life-saving obstetric care and to be associated with excess maternal mortality.[9–12] Rates of at least 5% are thought to be necessary to save the greatest numbers of both mothers and neonates, although there is little evidence to support such a cut-off.[4]

National rates of caesarean delivery can mask substantial within-country variation in the rates of such surgery. For example, urban rates are consistently found to be higher than rural rates[13] and the rates for the poorest sections of the population often fall well below the national mean. In a retrospective analysis of data from Demographic and Health Surveys (DHSs) conducted in 42 developing countries, caesarean delivery rates were often found to fall below 1% either in the poorest quintile of the population (20 countries) or in all but the richest quintile (six countries).[3] Only in five countries included in this analysis did the rate of caesarean delivery in the poorest quintile exceed 5% of live births.[3]

With Millennium Development Goals (MDGs) 4 and 5 nearing their target date of 2015, it is timely and necessary to assess recent progress in improving access to caesarean sections. In this paper we analyse trends in caesarean delivery rates in southern Asia and sub-Saharan Africa over the past 15 years. We focused on countries in southern Asia and sub-Saharan Africa because such countries account for 85% of all maternal deaths[14] and 73% of all intrapartum neonatal deaths

[a] London School of Hygiene & Tropical Medicine, Keppel Street, London WC1E 7HT, England.
[b] Postgraduate Program in Epidemiology, Federal University of Pelotas, Pelotas, Brazil.
Correspondence to: Francesca L Cavallaro (e-mail: francesca.cavallaro@lshtm.ac.uk).
(*Submitted: 24 January 2013 – Revised version received: 30 May 2013 – Accepted: 20 June 2013 – Published online: 9 August 2013*)

globally.[15] We examined caesarean delivery rates over time and by wealth quintile and estimated, for each country, how many and which of the five wealth quintiles were experiencing caesarean delivery rates below 1%, 2% and 5%.

Methods

All of the data that we analysed – retrospectively – came from DHSs, which are nationally representative cross-sectional household surveys in which detailed birth histories for women of reproductive age are collected. All of the datasets that we used were downloaded from the MEASURE DHS website.[16] In such surveys, socioeconomic status is evaluated – using principal components analysis – as a relative wealth index that is based on household assets. These indices then allow each surveyed household to be assigned to one of five wealth quintiles. The data that we used came from the countries in southern Asia or sub-Saharan Africa that were included in the "Countdown to 2015" initiative,[17] although only data from the 26 countries where there had been at least two DHSs were analysed. The countries that we investigated were categorized into three regions – eastern and southern Africa, southern Asia, and western and central Africa – according to the classification of the United Nations Children's Fund.[18]

We merged all available surveys for each country and pooled the data for all deliveries associated with a live birth in the 5 years preceding each survey whenever possible. In a few surveys, data on deliveries were only collected for the 3 or 4 years preceding the survey. We investigated the mode of delivery for each singleton birth and for the neonate who was born last in each multiple birth.

Deliveries that had been recorded as caesareans even though they had occurred in locations where caesarean sections were implausible – such as homes, dispensaries and health posts – were recoded as vaginal deliveries.[19] The data on deliveries in higher-level facilities were excluded if information on mode of delivery was missing. However, the proportion of deliveries included in a survey that had missing information on mode of delivery never exceeded 3.3% – recorded in a survey in the United Republic of Tanzania in 1996 – and generally fell below 1%. The response rate in each of the surveys that we investigated was at least 90%.

We used three types of analysis. All analyses took account of sampling weights, in addition to clustering and stratification where appropriate. First, we calculated caesarean delivery rates by country and survey year. These rates were calculated as percentages of the deliveries that ended in live births – excluding, in multiple births, the deliveries of all but the last born neonates. We tested for time trends in these rates by using a binomial log–linear regression model[20] to calculate annual rates of increase – as crude risk ratios (RRs) per year. Since caesarean sections are no longer a rare outcome in several of the countries that we investigated, odds ratios obtained with logistic regression would have overestimated the RRs. For each study country, annual rates of increase in caesarean deliveries were calculated for all the women and for the women who fell in the two lowest wealth quintiles combined – that is, for the poorest 40% of the women in the country. We also calculated caesarean delivery rates by wealth quintile and survey year within each country.

Finally, we categorized each delivery according to whether the mother lived in a rural or urban area and whether her household's wealth index fell above the national median value – indicating that the mother was "richer" – or below it – indicating that the woman was "poorer". This allowed us to evaluate caesarean delivery rates separately for relatively poor and wealthy urban women and relatively poor and wealthy rural women. All of the data analyses were performed using Stata SE version 12 (StataCorp LP, College Station, United States of America).

Results

Data were available for 80 surveys, which had been conducted in four countries in southern Asia, 11 countries in western and central Africa and 11 countries in eastern and southern Africa. The median number of surveys per country was three, with a range of two to four. In the surveys, data on births in the previous 5 years ($n = 68$), 4 years ($n = 1$) or 3 years ($n = 11$) had been collected. The total sample consisted of 686 789 deliveries – each of which had ended in a live birth – that had occurred between 1985 and 2011.

Table 1 presents the caesarean delivery rates recorded in the 3 to 5 years preceding each survey, by country and survey year, and the corresponding annual rates of increase. Statistically significant increases in caesarean delivery rates – varying from 2 to 19% per year – were observed in seven of the 11 study countries in western and central Africa, nine of the 11 study countries in eastern and southern Africa and all four of the study countries in southern Asia. However, only 12 of the study countries – three in western and central Africa, five in eastern and southern Africa and the four in southern Asia – showed evidence of an increase in caesarean delivery rates among the two lowest wealth quintiles. The crude RRs for the annual rates of increase in these 12 countries varied from 1.03 in Madagascar to 1.30 in Bangladesh. We were not able to calculate an annual rate of increase for the poorest 40% in Chad because caesarean deliveries had only been reported in one year in the surveys from Chad that we investigated.

Caesarean delivery rates were found to be very low in the sub-Saharan African study countries. In the most recent survey for each country, for example, 10 of the study countries in sub-Saharan Africa had national rates of less than 2% and only five countries – Ghana, Kenya, Lesotho, Rwanda and Uganda – had national rates of more than 5%. The corresponding rates recorded in the most recent survey in each of three of the study countries in southern Asia were much higher. Nepal was the only southern Asian study country in which the most recently recorded, national, caesarean delivery rate was less than 5%.

Table 2 (available at: http://www.who.int/bulletin/volumes/91/12/13-117598) and Fig. 1 present the caesarean delivery rates stratified by wealth quintile and survey. The rates were extremely low among the poorest quintile in every survey. In the most recent survey for each country, for example, the caesarean delivery rates among the poorest quintile were less than 1% in 12 of the study countries – all in sub-Saharan Africa – and they were less than 2% in all of the study countries except Lesotho, Malawi, Rwanda, Uganda and Zimbabwe. Caesarean delivery rates among the richest quintile were much higher in all of the study countries but exceeded 15% only in Bangladesh, India and Pakistan.

In the most recent survey for each of 17 of the study countries, caesarean delivery rates increased monotonically

Table 1. **Caesarean delivery rates and mean annual increases in such rates, by country and survey year, southern Asia and sub-Saharan Africa, 1990–2011**

Country	Survey period								Annual increase[b]	
	Before 1997		1997–2001		2002–2006		2007–2011		All women	Women in two poorest quintiles
	Year	Rate[a] (%)	Year	Rate[a] (%)	Year	Rate[a] (%)	Year	Rate[a] (%)	% (95% CI)	% (95% CI)
Southern Asia										
Bangladesh	–	–	2000	2.37	2004	3.38	2007	7.52	1.19 (1.16–1.22)	1.30 (1.19–1.42)
India	1992	2.40	1999	6.82	2006	8.37	–	–	1.09 (1.08–1.10)	1.09 (1.07–1.11)
Nepal	1996	0.83	2001	0.82	2006	2.63	2011	4.59	1.15 (1.12–1.17)	1.13 (1.05–1.21)
Pakistan	1991	2.30	–	–	2006	7.15	–	–	1.08 (1.06–1.10)	1.11 (1.05–1.17)
Western and central Africa										
Benin	1996	1.94	2001	3.20	2006	3.43	–	–	1.05 (1.03–1.07)	1.03 (0.99–1.08)
Burkina Faso	1993	1.08	1999	1.06	2003	0.64	2010	1.81	1.04 (1.02–1.06)	1.03 (0.98–1.09)
Cameroon	1991	1.87	1998	2.17	2004	1.94	–	–	1.00 (0.97–1.03)	0.94 (0.87–1.01)
Chad	–	–	1997	0.38	2004	0.44	–	–	0.99 (0.91–1.06)	–[c]
Côte d'Ivoire	1994	0.42	1999	1.91	2005	4.66	–	–	1.18 (1.12–1.23)	1.17 (1.09–1.26)
Ghana	1993	3.79	1998	3.69	2003	3.69	2008	6.46	1.04 (1.02–1.06)	1.06 (1.01–1.10)
Guinea	–	–	1999	1.50	2005	1.66	–	–	1.01 (0.96–1.06)	0.97 (0.84–1.09)
Mali	1996	0.30	2001	0.90	2006	0.91	–	–	1.07 (1.03–1.11)	1.08 (0.99–1.17)
Niger	–	–	1998	0.50	2006	0.97	–	–	1.07 (1.02–1.12)	1.11 (0.95–1.27)
Nigeria	1990	1.85	–	–	2003	1.66	2008	1.73	1.00 (0.98–1.01)	0.94 (0.91–0.97)
Senegal	–	–	–	–	2005	2.87	2011	4.75	1.05 (1.01–1.09)	1.11 (1.04–1.17)
Eastern and southern Africa										
Ethiopia	–	–	2000	0.63	2005	0.97	2011	1.44	1.08 (1.05–1.11)	1.10 (0.99–1.21)
Kenya	1993	4.31	1998	5.40	2003	3.93	2009	5.81	1.02 (1.00–1.03)	1.00 (0.97–1.03)
Lesotho	–	–	–	–	2004	5.05	2009	6.54	1.06 (1.02–1.10)	1.02 (0.95–1.09)
Madagascar	–	–	1997	0.47	2004	1.01	2009	1.42	1.07 (1.03–1.12)	1.02 (0.91–1.13)
Malawi	1992	3.14	2000	2.71	2004	2.95	2010	4.53	1.03 (1.02–1.05)	1.03 (1.01–1.05)
Mozambique	–	–	1997	1.96	2003	1.83	–	–	1.00 (0.93–1.07)	0.85 (0.62–1.09)
Rwanda	1992	1.39	2000	2.09	2005	2.94	2010	6.94	1.11 (1.10–1.13)	1.12 (1.10–1.15)
Uganda	1995	2.11	2000	2.52	2006	3.02	2011	5.22	1.06 (1.05–1.08)	1.06 (1.03–1.09)
United Republic of Tanzania	1996	2.14	1999	2.83	2004	3.10	2010	4.25	1.05 (1.03–1.07)	1.05 (1.01–1.08)
Zambia	1996	1.73	–	–	2002	1.97	2007	2.82	1.04 (1.02–1.07)	1.07 (1.01–1.12)
Zimbabwe	1994	5.55	1999	6.79	2005	4.70	2010	4.44	0.98 (0.97–0.99)	0.95 (0.92–0.98)

CI, confidence interval.

[a] Caesarean delivery rates are expressed as percentages of the deliveries that ended in a live birth, excluding all but the last born of the neonates delivered in each multiple birth. These rates take into account sampling weights.

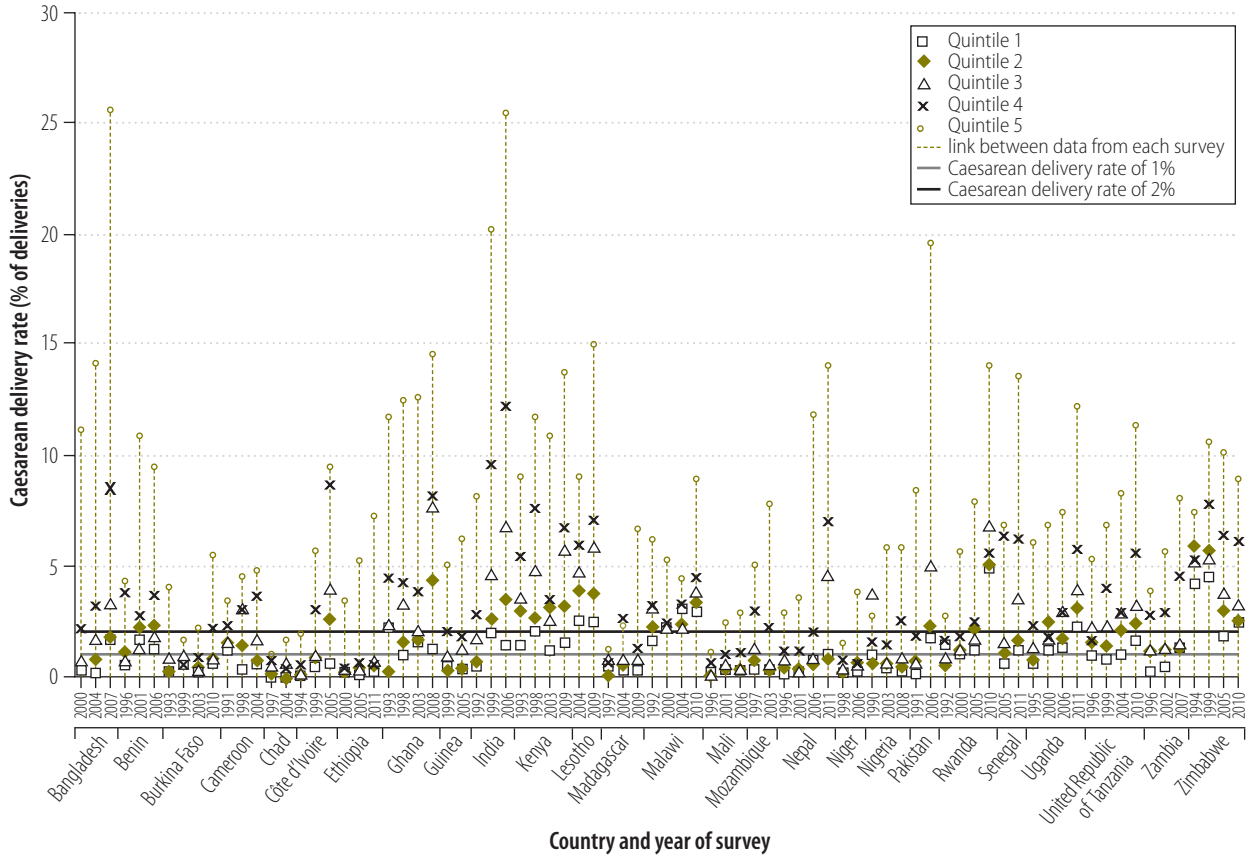
[b] The 95% CIs take into account sampling clusters, strata and sampling weights.

[c] In the Demographic and Health Surveys that have been conducted in Chad, only two caesarean deliveries have ever been recorded among women in the lowest two percentiles for wealth, both of them in 1992.

from the lowest quintile for wealth to the highest (Table 2). In the other nine study countries, the between-quintile variation in the rates was very small. In 10 of the study countries in sub-Saharan Africa – seven in western and central Africa and three in eastern and southern Africa – caesarean delivery rates of less than 1% had been recorded among the poorer 40% or 60% of women. In eight of these countries – Chad, Ethiopia, Guinea, Madagascar, Mali, Mozambique, Niger and Nigeria – the poorer 80% of women had caesarean delivery rates of less than 1%. The poorest quintile in three of the study countries in southern Asia had caesarean delivery rates of more than 1%. In Nepal, however, the corresponding rate for the two lowest quintiles for wealth combined was less than 1%. In seven of the eight study countries that had national rates above 5%, the overall rate for the three lowest wealth quintiles combined was less than 5%.

In the most recent surveys, caesarean delivery rates were highest among the "urban richer" in all 26 study countries and lowest among the "rural poorer" in 18 of the study countries (Table 3). In all four study countries in southern Asia, the caesarean delivery rate was higher among the "rural richer" than among the "urban poorer"; the absolute difference ranged from 2.6% in Nepal (95% confidence interval, CI: −2.0 to 7.2) to 10.2% in Bangladesh (95% CI: 7.7 to 12.7).

Fig. 1. **Caesarean delivery rates[a] by country, survey year and wealth quintile, southern Asia and sub-Saharan Africa, 1990–2011**



[a] As percentages of the deliveries that ended in live births.
Note: The wealth quintile to which each surveyed household belonged was categorized as 1, 2, 3, 4 or 5. Quintile 1 comprised the poorest 20% of households and Quintile 5 comprised the richest 20%.

Of the study countries in sub-Saharan Africa, however, only Ghana and Kenya had markedly higher caesarean delivery rates in the "rural richer" than in the "urban poorer" – with absolute differences of 5.0% (95% CI: –0.3 to 10.3) and 6.7% (95% CI: 3.0 to 10.4), respectively. In six western African and two eastern African countries, the rural women – whether "richer" or "poorer" – had caesarean delivery rates of less than 2%.

Discussion

Although caesarean delivery rates have been rising in almost all of the countries that we investigated in southern Asia and sub-Saharan Africa, they remain astonishingly low. In our analysis, 18 countries still had national rates of less than 5% recorded in their most recent surveys, and none of the study countries had a national rate above 10%. Caesarean sections were extremely rare among the poor: they were below 1% for the poorest 20% of the population in each of 12 countries, the poorest 40% in 11 countries and the poorest 80% in eight countries. They fell below 2% for the poorest 20% in each of 21 countries. Over the study period, the study countries in southern Asia experienced a much greater rise in caesarean delivery rates than the countries that we investigated in sub-Saharan Africa. Nevertheless, in the most recent surveys that we included in our analysis, the rates among the poorest 20% of the populations remained below 2% in all four of the southern Asian study countries.

The low rates of caesarean delivery in sub-Saharan Africa are presumably a reflection of very low levels of access to caesarean sections, which are themselves associated with extremely poor access to emergency surgical care in general.[21,22] A recent study in Ghana, Kenya, Rwanda, Uganda and the United Republic of Tanzania – five countries included in our study – revealed massive gaps in the infrastructure for emergency surgical care.[23] Fewer than 50% of the hospitals surveyed had dependable running water and electricity, and only 19–50% of the hospitals provided 24-hour emergency care.[23] Countries in sub-Saharan Africa generally have few skilled workers able to perform surgery – including caesarean sections – and most of their qualified doctors live in urban areas.[22,24] In the present study, caesarean delivery rates were extremely low among both the richer and poorer women who lived in rural areas, where structural and workforce constraints may be the most important barriers to access.

A household's ability to pay for the surgery is thought to be an important determinant of caesarean deliveries.[25,26] The cost of emergency caesarean sections can be catastrophic for households.[25,26] Although user fee exemptions have been one of the key strategies to increase access to delivery care in sub-Saharan Africa,[27] their impact on caesarean delivery rates has yet to be rigorously evaluated. While such fee exemptions may have contributed to the rises seen in caesarean delivery rates in countries such as Ghana and Senegal,[28,29] such rises cannot be categorically attributed to the exemptions. Furthermore, a household's

Table 3. **Caesarean delivery rates among richer and poorer women in urban and rural areas, southern Asia and sub-Saharan Africa, 2003–2011**

Country	Caesarean delivery rate[a]				Absolute difference[b] (95% CI)
	Rural poorer	Rural richer	Urban poorer	Urban richer	
Southern Asia					
Bangladesh	2.29	11.52	1.32	20.37	10.19 (7.73 to 12.65)
India	3.59	15.23	5.99	21.75	9.25 (7.44 to 11.05)
Nepal	1.51	7.03	4.40	17.24	2.63 (–1.97 to 7.23)
Pakistan	2.00	10.50	1.65	14.97	8.85 (6.53 to 11.18)
Western and central Africa					
Benin	1.76	3.00	1.78	7.23	1.22 (0.26 to 2.19)
Burkina Faso	0.76	1.48	3.23	6.11	–1.75 (–3.35 to –0.16)
Cameroon	0.51	1.79	1.75	4.11	0.04 (–1.46 to 1.53)
Chad	0.18	0.33	0.00	1.53	0.33 (–0.19 to 0.84)
Côte d'Ivoire	1.39	7.17	4.04	7.30	3.13 (–9.19 to 15.44)
Ghana	3.22	9.50	4.49	10.80	5.01 (–0.27 to 10.30)
Guinea	0.38	1.77	0.71	4.76	1.06 (–0.71 to 2.83)
Mali	0.27	0.69	1.41	2.39	–0.72 (–2.23 to 0.79)
Niger	0.34	0.37	1.93	4.60	–1.57 (–5.66 to 2.53)
Nigeria	0.35	2.49	0.67	4.05	1.82 (0.99 to 2.66)
Senegal	1.37	2.89	2.62	9.77	0.28 (–2.15 to 2.70)
Eastern and southern Africa					
Ethiopia	0.39	0.63	1.17	8.38	–0.54 (–2.20 to 1.12)
Kenya	3.21	9.41	2.69	11.16	6.72 (3.02 to 10.43)
Lesotho	3.35	7.71	8.23	11.50	–0.52 (–12.36 to 11.32)
Madagascar	0.32	2.08	1.62	5.89	0.46 (–1.87 to 2.80)
Malawi	3.23	4.96	2.94	8.44	2.02 (–1.31 to 5.34)
Mozambique	0.32	1.14	0.94	5.99	0.20 (–1.10 to 1.51)
Rwanda	5.01	6.70	7.51	17.53	–0.81 (–5.72 to 4.09)
Uganda	2.76	5.91	7.55	13.96	–1.63 (–8.02 to 4.76)
United Republic of Tanzania	2.30	4.55	0.95	9.96	3.60 (1.70 to 5.51)
Zambia	1.22	3.25	0.00	5.90	3.25 (1.79 to 4.70)
Zimbabwe	2.88	3.68	2.67	8.19	1.01 (–2.72 to 4.74)

CI, confidence interval.

[a] Caesarean delivery rates are expressed as percentages of the deliveries that ended in a live birth, excluding all but the last born of the neonates delivered in each multiple birth. They take into account sampling weights. The corresponding CIs take into account sampling weights, clustering and stratification. Women who lived in households that had wealth indices that fell above the national median value were considered to be "richer", whereas other women were categorized as "poorer".

[b] The caesarean delivery rate for the rural richer minus the corresponding rate for the urban poorer.

Note: The data presented come from the most recently published Demographic and Health Survey in each country.

ability to pay for surgery may not be the main barrier to caesarean sections in settings where the necessary health facilities are sparsely distributed.[30]

The rapid rises seen in caesarean delivery rates in southern Asia over our study period are somewhat surprising, given that most births in this region still take place at home. In the latest DHSs for Bangladesh, India, Nepal and Pakistan, for example, only 15%, 39%, 37% and 35% of the recorded deliveries occurred in a health facility, respectively (data not shown). However, many of these deliveries probably took place in private hospitals,[30] where obstetricians and general practitioners are available to lead delivery care and the incentives to perform caesarean sections may be relatively greater.[31] This may explain why such large proportions of the women who delivered in health facilities in Bangladesh, India, Nepal and Pakistan – 51%, 22%, 12% and 20%, respectively – had caesarean sections (data not shown). In the present analysis, caesarean delivery rates in the richest quintile were found to be more than 15% in Bangladesh, India and Pakistan, and the rates among the "rural richer" in all four study countries in southern Asia were found to be substantially higher than those among the "urban poorer".

In every country that we investigated, caesarean delivery rates among the women in the richest quintile were much higher than the rates seen in the poorest quintile. This difference was particularly noticeable in Bangladesh, India and Pakistan, where the poorest quintile probably receives fewer caesarean sections than are indicated, while the richest quintile receives too many – increasing maternal and neonatal morbidity.[32] In general – as postulated by the "inverse equity hypothesis" – the wealthy are more likely to adopt new medical interventions than the poor, often leading to increased health inequalities – at least in the short term.[33] In southern Asia, however, the richest mothers appear to be receiving more caesarean sections than are warranted, with potentially adverse effects.

Our analysis has several limitations. First, we only had data for 26 of the 48 countries in sub-Saharan Africa and southern Asia that were included in the "Countdown to 2015" initiative.[17]. Second, the dates of the most recently published survey varied substantially between countries, and some countries may have made more progress since their most recent survey. The last available survey data for seven of the 11 study countries in western and central Africa were collected before 2007. Third, the caesarean delivery rates estimated in household surveys – generally from the statements of women of reproductive age – tend to be higher than the rates estimated from the records of the corresponding health facilities where caesarean deliveries may be performed.[19] However, the facility-derived estimates tend to fall within the 95% CIs of the corresponding household survey estimates.[19] Fourth, the wealth index used in the DHSs has several inherent biases that require careful scrutiny. The type of household assets investigated varies between the surveys, and the wealth index – which represents a household's wealth relative to other households in one particular country at the time of the survey – should not be used to compare absolute levels of wealth between surveys. The association between household wealth and residence in an urban or rural area may be complex.[34] Although those who live in urban areas are typically richer than their rural counterparts, the intrinsic meaning of the underlying wealth associated with many assets differs according to the area. We used national wealth indices – rather than urban- and rural-specific wealth indices – to enable direct comparisons between the richer and poorer halves of the populations in rural and urban areas. We were unable to analyse caesarean delivery rates according to wealth quintiles separately for urban and rural residents because the sample was too small, particularly in terms of the number of women from "urban poorer" households. Fifth, some women may have contributed more than one birth to the sample. However, restricting the analysis to only one birth per woman did not alter our findings (data not shown). Lastly, when computing annual rates of increase, we assumed that caesarean delivery rates increased in log–linear fashion. Our conclusions were, however, unaltered when RRs for the increases were calculated by comparing one survey to the next (data not shown).

Programmes to reduce maternal and neonatal mortality should have clear indicators to identify need, monitor implementation and change the course of action, as required.[4] There has been a reluctance to include caesarean delivery rates as a core indicator for the monitoring of safe motherhood programmes, partly because the thresholds for "acceptable" or target rates are so uncertain, and partly because such an indicator may be perceived as promoting the unnecessary medicalization of obstetric care. However, this reluctance is unjustified, particularly when very low thresholds are set for the minimum rate. While caesarean delivery rates cannot be a substitute for the measurement of levels of maternal mortality, caesarean rates among the poor should be a key indicator for measuring progress towards achieving MDG 5.[35] In the post-2015 health agenda – where the focus is shifting towards measuring the coverage for essential interventions – rates of caesarean delivery among the poor will be critical indicators of access to emergency obstetric care. In addition, as general childhood mortality is reduced, neonatal deaths become relatively more important and access to caesarean sections – when indicated to save the fetus – increases in relative importance as well. Although estimates of the caesarean delivery rate required for indications related to the fetus are imprecise,[7] this rate is unlikely to be less than 5% of all births.

Despite the encouraging progress made in increasing national rates of caesarean delivery, large sections of the population in sub-Saharan Africa still lack access to life-saving caesarean sections, and women and children – particularly poor women and their children – are dying as a consequence. Improvements in access to caesarean sections will require massive investments in health system strengthening, particularly in terms of addressing shortages in the health workforce and the infrastructure gaps in rural hospitals.[36] The human resource challenge could be partly addressed by allowing clinical officers to perform caesarean deliveries,[37] although the sustainability of this strategy when implemented on a large scale remains uncertain. However, as long as hospitals lack the core infrastructure to perform surgery safely – including access to water and electricity – one cannot begin to address the emergency obstetric needs of pregnant women in sub-Saharan Africa. ■

Acknowledgements

We thank the Pelotas Equity Center for help in preparing the datasets and the Department of Infectious Disease Epidemiology at the London School of Hygiene & Tropical Medicine for input on the statistical analyses.

Funding: This study was funded by the Bill & Melinda Gates Foundation, The World Bank and the Governments of Australia, Brazil, Canada, Norway, Sweden and the United Kingdom of Great Britain and Northern Ireland. FC was funded by a PhD studentship from the United Kingdom's Economic and Social Research Council, via grant ES/I903224/1.

Competing interests: None declared.

ملخص

الاتجاهات في الولادة القيصرية حسب البلد والشريحة الخمسية الأغنى: استقصاءات مقطعية في جنوب آسيا وأفريقيا جنوب الصحراء الكبرى

الغرض بحث الاتجاهات المؤقتة في معدلات الولادة القيصرية في جنوب آسيا وأفريقيا جنوب الصحراء الكبرى، حسب البلد والشريحة الخمسية الأغنى.

الطريقة تم استخلاص البيانات المقطعية من نتائج 80 مسحاً ديمغرافياً وصحياً تم إجراؤها في 26 بلداً في جنوب آسيا وأفريقيا جنوب الصحراء الكبرى. وتم تقييم معدلات الولادة القيصرية – كنسب مئوية للولادات التي انتهت بمواليد أحياء – لكل شريحة خمسية أغنى في كل مسح. وبعد ذلك، تم مقارنة المعدلات السنوية المسجلة لكل بلد لمعرفة ما إذا كانت قد زادت بمرور الزمن.

النتائج ازدادت معدلات الولادة القيصرية بمرور الوقت في كل

بلد من بلدان الدراسة ولكنها كانت بشكل متسق أقل من 5 ٪ في 18 بلداً من البلدان و10 ٪ أو أقل في البلدان الثماني الأخرى. ومن بين 20 ٪ الأفقر من السكان، مثلت العمليات القيصرية أقل من 1 ٪ وأقل من 2 ٪ من الولادات في 12 و21 بلداً من بلدان الدراسة على التوالي. وفي كل بلد من البلدان الإحدى عشر، ظل معدل الولادة القيصرية في نسبة 40 ٪ الأفقر من السكان أقل من 1 ٪. وفي تشاد وأثيوبيا وغينيا ومدغشقر ومالي وموزمبيق والنيجر ونيجيريا، ظل المعدل أقل من 1 ٪ في نسبة 80 ٪ الأفقر. وبالمقارنة مع الاثني عشر بلداً أفريقياً من بلدان الدراسة، شهدت أربع بلدان من بلدان الدراسة في جنوب آسيا زيادة أكبر بكثير في معدلات الولادة القيصرية فيها بمرور الوقت. وعلى الرغم من ذلك، فإن المعدلات المسجلة بين الخمس الأفقر في كل بلد من هذه البلدان قد انخفضت بشكل ثابت دون 2 ٪.

الاستنتاج معدلات الولادة القيصرية بين قطاعات كبيرة من السكان في أفريقيا جنوب الصحراء الكبرى منخفضة للغاية، ويعود ذلك على الأرجح إلى ضعف إمكانية الوصول لهذه الجراحة.

摘要

从国家和财富五分位看剖腹产趋势：南亚和撒哈拉以南非洲横断面调查

目的 通过国家和财富五分位考查南亚和撒哈拉以南非洲剖腹产率的时间趋势。

方法 从在南亚和撒哈拉以南非洲 26 个国家执行的 80 个人口统计和健康调查的结果中提取横断面数据。评估每项调查中每个财富五分位的剖腹产率（占活产出生的百分比）。然后与每个国家记录的年剖腹产率进行比较，观察是否随时间增长。

结果 每个研究国家的剖宫产率都随时间上升，但在 18 个国家中始终低于5%，在其他 8 个国家中不超过 10%。在最贫困的 20% 人口中剖腹产术占分娩数 1% 和2% 以下的研究国家分别有 12 个和 21 个。在 11 个国家中，每个国家较穷的 40% 人口的剖腹产率保持在 1% 以下。在乍得、埃塞俄比亚、几内亚、马达加斯加、马里、莫桑比克、尼日尔和尼日利亚，较穷的 80% 人口中这个比例保持在不到 1%。较之 22 个非洲研究国家，在南亚的四个研究国家剖腹产率随时间增长明显得多。但是，这些国家中每个国家最贫穷的五分位人口记载的比例始终低于2%。

结论 撒哈拉以南非洲人口众多区域剖腹产率非常低，可能是因为做不起这样的手术。

Résumé

Tendance de l'accouchement par césarienne par pays et quintile de richesse: études transversales en Asie du Sud et en Afrique sub-saharienne

Objectif Examiner les tendances temporelle des taux d'accouchement par césarienne en Asie du Sud et en Afrique sub-saharienne, par pays et quintile de richesse.

Méthodes Les données transversales ont été extraites des résultats de 80 Enquêtes Démographiques et Sanitaires menées dans 26 pays en Asie du Sud ou en Afrique sub-saharienne. Les taux d'accouchement par césarienne ont été évalués – sous forme de pourcentages des accouchements qui ont abouti à une naissance vivante – pour chaque quintile de richesse dans chaque enquête. Les taux annuels enregistrés pour chaque pays ont alors été comparés pour voir s'ils avaient augmenté au fil du temps.

Résultats Les taux d'accouchement par césarienne ont augmenté au fil du temps dans chaque pays étudié mais ils sont systématiquement inférieurs à 5% dans 18 des pays et inférieurs ou égaux à 10% dans 8 autres pays. Parmi la couche des 20% les plus pauvres de la population, les césariennes représentaient moins de 1% et moins de 2% des accouchements dans, respectivement, 12 et 21 pays étudiés. Dans chacun des 11 pays, le taux d'accouchement par césarienne dans la couche des 40% les plus pauvres de la population est resté sous 1%. Au Tchad, en Éthiopie, en Guinée, à Madagascar, au Mali, au Mozambique, au Niger et au Nigéria, le taux est resté sous 1% dans la couche des 80% les plus pauvres. Si l'on compare avec les 22 pays africains étudiés, les 4 pays étudiés en Asie du Sud ont connu une plus grande augmentation de leur taux d'accouchement par césarienne au fil du temps. Cependant, les taux enregistrés au sein du quintile le plus pauvre dans chacun de ces pays chute systématiquement sous 2%.

Conclusion Les taux d'accouchement par césarienne au sein de larges couches de la population en Afrique sub-saharienne sont très faibles, probablement à cause du manque d'accès à un tel acte chirurgical.

Резюме

Тенденции принятия родов посредством кесарева сечения в зависимости от страны и уровня благосостояния: перекрестное исследование в Южной Азии и странах Африки южнее Сахары

Цель Изучить временные тенденции частоты принятия родов посредством кесарева сечения в Южной Азии и странах Африки южнее Сахары в зависимости от страны и уровня благосостояния.

Методы Данные для перекрестного исследования были получены из результатов 80 демографических и медицинских обследований, проведенных в 26 странах Южной Азии и странах Африки южнее Сахары. В каждом исследовании производилась оценка частоты принятия родов посредством кесарева сечения как процентного показателя родов, которые завершились рождением живого ребенка, по отношению к уровню благосостояния. Затем производилось сравнение годовых показателей, полученных для каждой страны, с целью выявления повышения количества таких операций.

Результаты Во всех исследуемых странах был отмечен рост количества приема родов методом кесарева сечения, но выявленные показатели были стабильно ниже 5% в восемнадцати странах и 10% или менее в остальных восьми странах. Среди самых бедных 20% населения принятие родов методом проведения кесарева сечения составило менее 2% родов в 21 исследуемой стране и менее 1% родов в остальных 12 исследуемых странах. В 11 странах частота принятия родов методом кесарева сечения в 40% беднейшей части населения

составляла менее 1%. В Республике Чад, Эфиопии, Гвинее, Мадагаскаре, Мали, Мозамбике, Нигере и Нигерии количество кесаревых сечений составляло менее 1% для 80% беднейшей части населения. В сравнении с 22 исследуемыми африканскими странами в четырех исследуемых странах Южной Азии с течением времени было отмечено значительное увеличение количества родов, принимаемых с помощью кесарева сечения. Тем не менее, частота проведения этой операции в самых бедных слоях населения этих стран стабильно составляла менее 2%.

Вывод Частота приема родов методом кесарева сечения для больших групп населения стран Африки южнее Сахары является очень низкой, вероятно, из-за низкой доступности таких операций.

Resumen

Tendencias en el parto por cesárea por país y quintil de riqueza: encuestas transversales en Asia meridional y África subsahariana

Objetivo Analizar las tendencias temporales de las tasas de parto por cesárea en Asia meridional y África subsahariana, por país y por quintil de riqueza.

Métodos Se obtuvieron datos transversales de los resultados de 80 encuestas de demografía y salud realizadas en 26 países de Asia meridional y África subsahariana. Se evaluaron las tasas de parto por cesárea, como porcentaje de los partos que terminaron en nacimientos vivos, en cada quintil de ingresos en cada encuesta. Se compararon las tasas anuales registradas de cada país para comprobar si habían aumentado con el tiempo.

Resultados Las tasas de parto por cesárea han aumentado con el tiempo en todos los países de estudio, excepto seis. Sin embargo, se halló que las tasas son sistemáticamente inferiores al 5% en 18 de los países y al 10% o menos en los otros ocho países. Entre el 20% de la población más pobre, las cesáreas representaron menos del 1% y menos del 2% de los partos en 12 y 21 de los países de estudio, respectivamente. En cada uno de los 11 países, la tasa de parto por cesárea del 40% de la población pobre se mantuvo por debajo del 1%. En el Chad, Etiopía, Guinea, Madagascar, Malí, Mozambique, Níger y Nigeria, la tasa se mantuvo por debajo del 1% en el 80% de la población pobre. En comparación con los 22 países africanos de estudio, los cuatro países de estudio de Asia meridional experimentaron un mayor aumento en sus tasas de parto por cesárea a lo largo del tiempo. Sin embargo, las tasas registradas en el quintil más pobre de cada uno de estos países se redujeron de forma constante por debajo del 2%.

Conclusión Las tasas de parto por cesárea en amplios sectores de la población del África subsahariana son muy bajas, probablemente debido a la falta de acceso a este tipo de cirugía.

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Table 2. **Caesarean delivery rates by wealth quintile and survey year, southern Asia and sub-Saharan Africa, 1990–2011**

Region, country and wealth quintile[a]	Caesarean delivery rate[b] (%)				Cumulative rate[c] (%)	Quintiles with cumulative rate of:[d]		
	1990–1996	1997–2001	2002–2006	2007–2011		< 1%	< 2%	< 5%
Southern Asia								
Bangladesh						None	1 and 2	1–4
1	–	0.26	0.08	1.75	1.75			
2	–	0.46	0.84	1.87	1.81			
3	–	0.58	1.58	3.34	2.28			
4	–	2.13	3.17	8.52	3.71			
5	–	11.31	14.23	25.69	7.52			
India						None	1	1–3
1	0.44	1.97	1.51	–	1.51			
2	0.79	2.43	3.43	–	2.41			
3	1.69	4.67	6.84	–	3.70			
4	2.70	9.57	12.30	–	5.51			
5	8.16	20.18	25.54	–	8.37			
Nepal						1 and 2	1 and 2	1–5
1	0.00	0.16	0.80	0.98	0.98			
2	0.42	0.27	0.54	0.85	0.92			
3	0.76	0.17	0.86	4.61	2.05			
4	1.07	1.07	1.97	7.09	3.07			
5	2.72	3.56	11.81	14.04	4.59			
Pakistan						None	1 and 2	1–4
1	0.00	–	1.75	–	1.75			
2	0.84	–	2.15	–	1.94			
3	0.63	–	4.96	–	2.87			
4	1.79	–	10.75	–	4.58			
5	8.43	–	19.61	–	7.15			
Western and central Africa								
Benin						None	1–3	1–5
1	0.66	1.65	1.28	–	1.28			
2	1.18	2.14	2.21	–	1.72			
3	0.86	1.25	1.85	–	1.76			
4	3.85	2.58	3.70	–	2.23			
5	4.37	10.82	9.59	–	3.43			
Burkina Faso						1–3	1–5	1–5
1	0.28	0.61	0.20	0.74	0.74			
2	0.28	1.63	0.43	0.95	0.85			
3	0.81	0.96	0.21	0.90	0.86			
4	0.54	0.55	0.70	2.07	1.16			
5	4.10	1.71	2.23	5.51	1.81			
Cameroon						1–3	1–5	1–5
1	1.03	0.34	0.52	–	0.52			
2	1.36	1.28	0.65	–	0.58			
3	1.32	2.91	1.60	–	0.89			
4	2.18	2.91	3.46	–	1.44			
5	3.36	4.52	4.72	–	1.94			
Chad						1–5	1–5	1–5
1	–	0.00	0.00	–	0.00			
2	–	0.13	0.00	–	0.00			
3	–	0.31	0.56	–	0.19			
4	–	0.64	0.29	–	0.22			
5	–	0.92	1.44	–	0.44			

(*continues. . .*)

Region, country and wealth quintile[a]	Caesarean delivery rate[b] (%)				Cumulative rate[c] (%)	Quintiles with cumulative rate of:[d]		
	1990–1996	1997–2001	2002–2006	2007–2011		< 1%	< 2%	< 5%
Côte d'Ivoire						1	1 and 2	1–5
1	0.00	0.59	0.66	–	0.66			
2	0.12	0.87	2.39	–	1.55			
3	0.12	1.01	3.83	–	2.24			
4	0.43	3.00	8.54	–	3.79			
5	1.92	5.66	9.47	–	4.66			
Ghana						None	1	1–3
1	2.12	1.00	1.53	1.24	1.24			
2	0.21	1.57	1.61	4.64	2.82			
3	2.23	3.20	1.96	7.77	4.22			
4	4.42	4.32	3.88	8.22	5.12			
5	11.80	12.40	12.58	14.57	6.46			
Guinea						1–4	1–5	1–5
1	–	0.40	0.33	–	0.33			
2	–	0.31	0.38	–	0.35			
3	–	0.75	1.15	–	0.60			
4	–	2.04	1.82	–	0.86			
5	–	5.10	6.29	–	1.66			
Mali						1–5	1–5	1–5
1	0.08	0.39	0.35	–	0.35			
2	0.00	0.36	0.32	–	0.33			
3	0.00	0.61	0.31	–	0.33			
4	0.48	0.98	1.04	–	0.50			
5	1.06	2.46	2.83	–	0.91			
Niger						1–5	1–5	1–5
1	–	0.13	0.14	–	0.14			
2	–	0.14	0.56	–	0.34			
3	–	0.27	0.34	–	0.34			
4	–	0.68	0.32	–	0.34			
5	–	1.52	3.84	–	0.97			
Nigeria						1–4	1–5	1–5
1	1.07	–	0.55	0.25	0.25			
2	0.76	–	0.68	0.40	0.32			
3	3.78	–	0.68	0.84	0.47			
4	1.62	–	1.48	2.43	0.89			
5	2.73	–	5.87	5.85	1.73			
Senegal						None	1 and 2	1–5
1	–	–	0.58	1.20	1.20			
2	–	–	1.02	1.71	1.45			
3	–	–	1.46	3.68	2.11			
4	–	–	6.34	6.25	3.07			
5	–	–	6.77	13.56	4.75			
Eastern and southern Africa								
Ethiopia						1–4	1–5	1–5
1	–	0.06	0.03	0.13	0.13			
2	–	0.08	0.28	0.44	0.28			
3	–	0.13	0.15	0.64	0.40			
4	–	0.15	0.43	0.49	0.42			
5	–	3.42	5.28	7.21	1.44			

(*continues. . .*)

Region, country and wealth quintile[a]	Caesarean delivery rate[b] (%)				Cumulative rate[c] (%)	Quintiles with cumulative rate of:[d]		
	1990–1996	1997–2001	2002–2006	2007–2011		< 1%	< 2%	< 5%
Kenya						None	1	1–4
1	1.52	2.07	1.21	1.59	1.59			
2	3.21	2.80	2.92	2.98	2.22			
3	3.62	4.90	2.42	5.69	3.22			
4	5.41	7.59	3.11	6.70	3.98			
5	9.07	11.75	10.94	13.74	5.81			
Lesotho						None	None	1–4
1	–	–	2.51	2.50	2.50			
2	–	–	3.94	3.83	3.12			
3	–	–	4.74	5.75	3.92			
4	–	–	5.87	7.07	4.73			
5	–	–	9.04	14.97	6.54			
Madagascar						1–4	1–5	1–5
1	–	0.35	0.14	0.17	0.17			
2	–	0.00	0.32	0.53	0.34			
3	–	0.67	0.61	0.59	0.41			
4	–	0.54	2.76	1.20	0.57			
5	–	1.09	2.22	6.61	1.42			
Malawi						None	None	1–5
1	1.66	2.23	3.04	2.93	2.93			
2	2.20	2.09	2.35	3.45	3.19			
3	3.03	2.16	2.16	3.92	3.43			
4	3.05	2.32	3.23	4.53	3.68			
5	6.16	5.22	4.50	8.93	4.53			
Mozambique						1–4	1–5	1–5
1	–	0.41	0.28	–	0.28			
2	–	0.81	0.23	–	0.26			
3	–	1.27	0.59	–	0.37			
4	–	2.82	2.15	–	0.72			
5	–	4.98	7.73	–	1.83			
Rwanda						None	None	1 and 2
1	1.32	1.01	1.27	4.80	4.80			
2	0.60	1.30	2.13	5.08	4.93			
3	1.01	1.24	1.70	6.78	5.50			
4	1.50	1.80	2.48	5.61	5.53			
5	2.72	5.59	7.84	13.99	6.94			
Uganda						None	None	1–4
1	0.68	1.22	1.41	2.19	2.19			
2	0.83	2.27	1.76	3.21	2.69			
3	1.21	1.63	2.94	3.91	3.07			
4	2.26	1.71	2.89	5.79	3.66			
5	6.08	6.80	7.27	12.14	5.22			
United Republic of Tanzania						None	1 and 2	1–5
1	0.97	0.80	0.99	1.64	1.64			
2	1.38	1.28	2.06	2.28	1.98			
3	2.14	2.21	2.88	3.24	2.40			
4	1.46	4.07	2.87	5.57	3.09			
5	5.29	6.88	8.19	11.30	4.25			

(*continues. . .*)

Region, country and wealth quintile[a]	Caesarean delivery rate[b] (%)				Cumulative rate[c] (%)	Quintiles with cumulative rate of:[d]		
	1990–1996	1997–2001	2002–2006	2007–2011		< 1%	< 2%	< 5%
Zambia						None	1–4	1–5
1	0.24	–	0.53	1.20	1.20			
2	1.01	–	1.01	1.22	1.21			
3	1.10	–	1.18	1.37	1.26			
4	2.82	–	2.86	4.53	1.99			
5	3.89	–	5.63	8.12	2.82			
Zimbabwe						None	None	1–5
1	4.24	4.54	1.87	2.46	2.46			
2	5.98	5.63	2.94	2.57	2.51			
3	5.31	5.35	3.80	3.30	2.75			
4	5.34	7.85	6.47	6.15	3.61			
5	7.39	10.52	10.08	8.95	4.44			

[a] The wealth quintile to which each surveyed household belonged was categorized as 1, 2, 3, 4 or 5. Quintile 1 comprised the poorest 20% of households and Quintile 5 comprised the richest 20%.

[b] Caesarean delivery rates are expressed as percentages of deliveries that ended in a live birth, excluding all but the last born of the neonates delivered in each multiple birth. They take into account sampling weights.

[c] The caesarean delivery rate – in this and any poorer quintiles cumulatively – in the most recent survey included in the analysis.

[d] Values from the most recent survey included in the analysis.

Bull World Health Organ 2013;91:914–922D | doi: http://dx.doi.org/10.2471/BLT.13.117598