


BMJ Open Caesarean sections and health financing: a global analysis

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ABSTRACT

Objectives The objective of this study is to explore the association of health financing indicators with the proportion of births by caesarean section (CS) across countries.

Design Ecological cross-country study.

Setting This study examines CS proportions across 172 countries.

Main outcome measures The primary outcome was the percentage excess of CS proportion, defined as CS proportions above the global target of 19%. We also analysed continuous CS proportions, as well as excess proportion with a more restrictive 9% global target. Multivariable linear regressions were performed to test the association of health financing factors with the percentage excess proportions of CS. The health financing factors considered were total available health system resources (as percentage of gross domestic product), total contributions from private households (out-of-pocket, compulsory and voluntary health insurance contributions) and total national income.

Results We estimate that in 2018 there were a total of 8.8 million unnecessary CS globally, roughly two-thirds of which occurred in upper middle-income countries. Private health financing was positively associated with percentage excess CS proportion. In models adjusted for income and total health resources as well as human resources, each 10 per cent increase in out-of-pocket expenditure was associated with a 0.7 per cent increase in excess CS proportions. A 10 per cent increase in voluntary health insurance was associated with a 4 per cent increase in excess CS proportions.

Conclusions We have found that health system finance features are associated with CS use across countries. Further monitoring of these indicators, within countries and between countries will be needed to understand the effect of financial arrangements in the provision of CS.

INTRODUCTION

Caesarean section (CS) rates have been increasing rapidly over the past decades at the global scale, with remarkable variation both within and between countries.^{1–15} Such medical practice variation, in general, implies inefficient use of resources, that is, patients may not get what they need (underuse) or will get medically unnecessary care (overuse).^{16 17} Empirically, CS rates between 9 to 19 per cent have been associated with improved health outcomes for mother and babies.^{5 18–20} As

Strengths and limitations of this study

- Our study benefits from a large sample size, using information from 172 countries.
- The ecological nature of our study means that we cannot make definitive statements about causality in considering the relationship between the variables of interest.
- Although we used some of most reliable internationally available data sources, the quality of such data may not be entirely uniform across countries included in the analysis.
- We have been able to adjust only for some confounders in our statistical models. There are other macro level factors that do play a role that we could not account for in our analysis.

such, rates below 9 per cent are likely to represent underuse, while rates above 19 per cent likely represent overuse and may cause more harm than benefits to mothers and children, leaving aside the substantial additional cost and burden to the health system.^{1 5 6 21 22} Overuse of procedures like CS is likely to take away resources that could be used for other beneficial procedures and care.

As with all healthcare utilisation measures, overuse of delivery-related resources is a manifestation of the effect of a range of factors influencing health system performance, including health system structure and financing, medical practice patterns and patient preferences and behaviours.^{1 23} On the supply side, it can be a manifestation of availability of resources, that is, supply sensitive care,¹⁷ where more resources available mean more care provided, and/or provider behaviour, that is, supplier induced demand.²⁴ Recent studies have highlighted the relevance of financing and incentives to the overuse of CS.^{25–27} In many settings, payment mechanisms or reimbursement systems provide a financial incentive for providers to deliver by CS rather than vaginally.^{25–27} For example, hospitals incentivise, via time-pressures^{28 29} or scheduling policies,^{30 31} insurers via payment models like fee for service^{32–34} or higher

reimbursements rates for CS.^{35 36} In developing countries, this can also happen via informal rewards.³⁷

Health sector financing approaches are complex and highly heterogeneous across countries, ranging from full government financing to mandatory insurance contribution and direct out-of-pocket payments. Modalities through which health sectors are financed affect how resources are spent, and how care is delivered. It is also likely that patients have more influence on provider behaviour in settings where the majority of healthcare costs are paid out-of-pocket than in settings where the entire health sector is centrally controlled and paid by government resources. In this paper, we explore the association of health financing indicators with caesarean proportions across countries using the most recent data on CS proportions and financial indicators. Our primary hypothesis was that reliance on private payment mechanisms would increase pressure on providers to use CS through one of two main mechanisms: first, by reducing governmental control over the services provided and second, by increasing entitlement and relative bargaining power of patients who may have personal preferences for CS.

METHODS

Data

We used data from several sources including Global Health Expenditure Database and Global Health Observatory (GHO) data from the WHO as well as the World Bank Open Data. The Global Health Expenditure Database of the WHO provides data on health spending for close to 190 member countries from 2000 to 2018. This is an annually updated database where the WHO works collaboratively with member countries. The GHO is also a WHO gateway to health-related statistics for its 194 member countries. GHO country data includes all country statistics and health profiles that are available within the WHO. The World Bank's data catalogue provides access to over 3000 data sets and 14000 indicators and includes microdata, time series statistics and geospatial data. A list of all data sources is provided in the online supplemental appendix.

Outcome variable

The primary outcome variable was the percentage excess of CS. Based on the most recent estimates,⁵ we used a CS proportion of 19 per cent as our reference, and considered all births delivered via CS above this level as excess. Specifically, we coded percentage excess CS (the proportion of deliveries in 2019 that exceeded 19% CS) as zero if a country has a proportion ≤ 19 per cent, and as the actual proportion minus 19 per cent when the proportion exceeds this target. We also analysed percentage excess of CS using a 9 per cent benchmark²⁰ and (continuous) CS proportions as secondary outcomes.

Exposure variables

Our primary exposure variables of interest are private contributions to health financing. Private contributions

comprise three types of private health-related expenditures: (1) mandatory contributions to health insurance schemes; (2) voluntary contributions to (additional) insurance schemes and (3) out-of-pocket payments. We first considered a variable that combines all three variables, and thus measured total private contributions as percentage of total current health expenditure. In a second step, we analysed each of these three components separately, that is, included separate variables for mandatory contributions, voluntary contributions and out-of-pocket payments, all expressed as per cent of total current health expenditure. Mandatory contributions to health insurance are the primary source of health financing in insurance-based systems such as the ones in Germany, Switzerland or the USA, and most typically directly collected through employers in high-income settings. Voluntary insurance schemes are largely absent in countries such as Cuba, Jordan or Norway, but play a significant role in other settings. In many European countries such as Austria and Switzerland, voluntary insurance covers between 5 and 10 per cent of health expenditure—in Brazil, voluntary insurance contracts cover over one-third of total expenditure. Voluntary insurance generally covers premium services (such as fast access to doctors and private rooms) but in some cases can also reduce out-of-pocket co-payments. Out-of-pocket payments exist in all countries but range from less than 1 per cent in Kiribati and Nauru to close to 80 per cent in Armenia and Azerbaijan. The full data used in the analysis is provided in the online supplemental appendix.

Statistical analysis

We started by presenting the global distribution of CS proportions graphically. In a second step, we showed CS proportions as well as the estimated total CS percentage excess relative to the 19 and 9 per cent targets. Following the World Bank's country classification, we divided countries into high, upper middle, lower middle and low income countries and separately computed excess shares and number for each country-income group. In a third step, we examined the association of CS percentage excess with health financing mechanisms. We first estimated ordinary least squares regression models with percentage excess CS, using 19 and 9 per cent as benchmarks, as well as the overall CS proportion as outcome and total private contributions as exposure variable. We then estimated a similar model where we included separate variables for compulsory, voluntary and out-of-pocket payments. In both models, we controlled for income per capita and general size of the health sector to reduce potential confounding biases. To further address residual confounding concerns, we estimated two additional models that also controlled for the proportion of deliveries made by skilled birth attendants (model 3) as well as the health systems human resources (model 4). All confounding variables included have been shown to predict variation in medical practice,^{1 17} such as variation in CS provision.¹ To address missing data on some of the

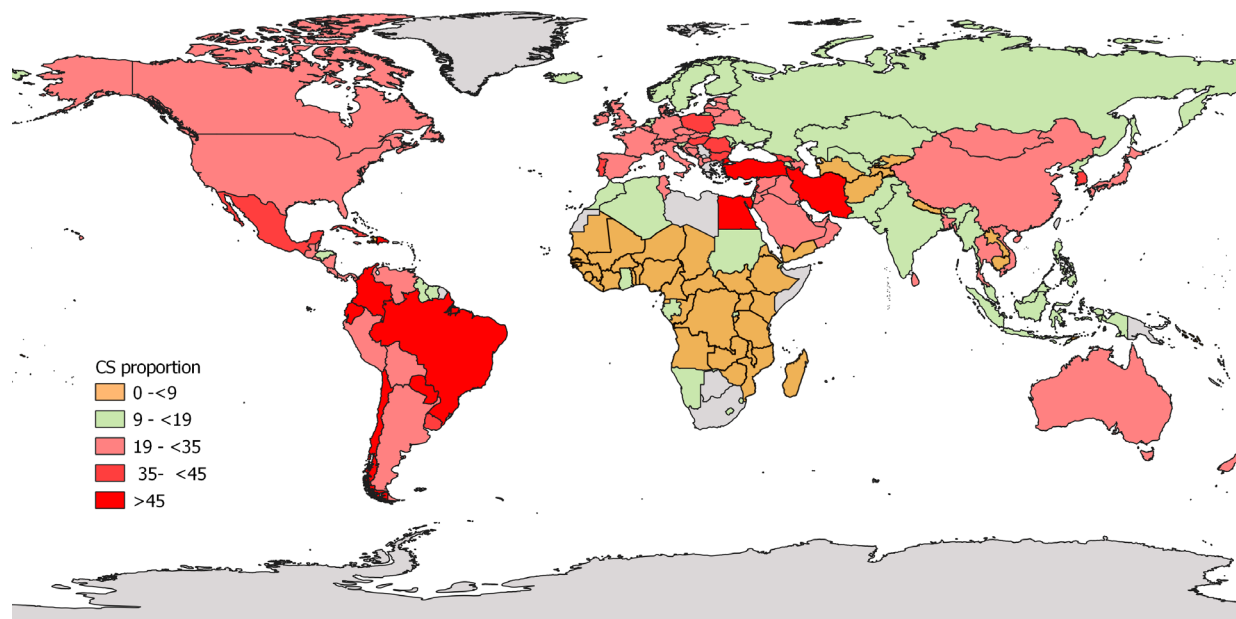


Figure 1 Global distribution of caesarean birth proportions. CS, caesarean section.

control variables, we used Stata's multiple imputation with chained equations algorithm.

Sensitivity analysis

To ensure the results are not disproportionately shaped by specific regions, we estimate separate models by country-income group in our sensitivity analysis. All analysis was conducted using the Stata V.15 SE statistical software package.

Patient and public involvement statement

Our study does not directly use data from patients. We used only the WHO and the World Bank data published online.

RESULTS

Figure 1 shows the distribution of caesarean proportions for the 172 countries with data available. CS proportions varied between 0.5 per cent in South Sudan and 58.1 per cent in the Dominican Republic. At the regional level, lowest proportions were observed for the WHO Africa region (mean 7 per cent) and highest proportions were found for the Americas, with an average proportion of 31.8 per cent. Ninety countries (52 per cent) had CS proportions $\leq 19\%$, and 82 countries (48 per cent) had proportions above the target range.

Table 1 provides summary statistics for our sample. Countries with CS proportions $>19\%$ were on average substantially wealthier, and had higher obstetrician and midwife densities, while overall health expenditure as percentage of gross domestic product (GDP) was relatively similar in the two subgroups (6.5 vs 7.2%, p value 0.112). Countries with CS proportions $>19\%$ had substantially higher average rates of out-of-pocket expenditures as well as mandatory and voluntary insurance contributions. The correlation between all variables used is shown

in the online supplemental appendix. The highest bivariate correlation was found between midwife density and GDP per capita (0.79)—no evidence of multicollinearity was found in the regression models.

Overall, using a 19 per cent benchmark, we estimate that there were 8.8 million unnecessary CS in 2018. **Table 2** summarises the global distribution of CS and percentage excess CS using the World Bank's country income classification for the 172 countries in our sample. Given that most countries with missing data in the GHO have low populations, the 172 countries in our sample covered 97 per cent of the global births in 2018. While low-income countries did not contribute at all to percentage excess provision of CS in that year, overprovision was common in lower middle-income countries. Overall, lower middle-income countries accounted for 48 per cent of all births in 2018, and for 18 per cent of all percentage excess CS. Upper middle-income countries account for 25 per cent of all births, but for 67 per cent of all percentage excess CS. Using 9 per cent as a benchmark, we estimate a total of 17 million of unnecessary CS. Trends across country income groups mimic the main findings with 19 per cent benchmark.

Table 3 shows the main regression results. There are three sets of results. We first show results for our main outcome measure, that is, percentage excess using 19 per cent benchmark. The other two sets included results for additional outcomes, that is, percentage excess using 9 per cent benchmark and the absolute CS proportion. When we pooled all private contributions in column 1, we found a small positive association between private contributions and CS excess. A coefficient of 0.08 implies that countries with 100 per cent private financing have on average 8 per cent higher excess CS proportions than countries relying fully on government financing. When we split private contributions into their three components in column 2,

Table 1 Descriptive statistics by excess category

	Full sample (N=172)			CS proportion ≤9% (N=48)			CS proportion >9% (N=124)			Equal means test*			CS proportion ≤19% (N=90)			CS proportion >19% (N=82)			Equal means test*		
	Mean	SD		Mean	SD		Mean	SD		P value	Mean	SD		Mean	SD		P value	Mean	SD		P value
Overall CS proportion	20	13.8		4.4	2		26	11.6		<0.001	9.1	5.6		32	9.5		<0.001				
Out-of-pocket expenditure as percentage of CHE	32.9	19.7		39.5	21.2		30.4	18.5		0.011	36.4	21.8		29.1	16.3		0.015				
Voluntary insurance as percentage of CHE	4	4.9		2.5	3.2		4.6	5.3		0.002	2.9	3.7		5.2	5.7		0.003				
Compulsory insurance as percentage of CHE	18.4	24.9		1.3	2.4		25.3	26.5		<0.001	7.6	15.4		30.3	27.9		<0.001				
Total private contributions as percentage of CHE	54.4	26.7		41.4	21.1		59.5	27		<0.001	45.8	24.4		63.8	26.1		<0.001				
GDP per capita 2016 in US\$	14379	23690		1723.3	2362.5		19230.8	26274.9		<0.001	6703	14517		22631	28500		<0.001				
Current health expenditure as percentage of GDP	6.8	3		6	2.9		7.2	3		0.024	6.5	3.3		7.2	2.6		0.112				
Skilled birth attendance percentage	85.9	19.3		64.8	21.5		94.8	8.3		<0.001	76.8	21.6		97	6.1		<0.001				
Obstetricians per 10000 population	0.9	1.1		0.2	0.5		1.2	1.1		<0.001	0.5	0.8		1.3	1.2		<0.001				
Nurse and midwives per 1000 population	5.4	4.7		1.4	1.4		6.2	4.7		<0.001	4.1	4.8		6.3	4.5		0.021				

Table shows mean and SD for all variables for the full sample, as well as for countries with a CS proportion ≤9% and 19%, and countries with a CS proportion >9% and 19%. *p values are based on a zero-mean-difference test between the two subsamples.

CHE, current health expenditure as percentage of GDP; CS, caesarean section; GDP, gross domestic product.

Table 2 Distribution of birth, percentage excess of CS across country income groups

Country income group	Number of countries	Total population (millions)	Total number of births per year (millions)	Average CS share (% of births)	Percentage excess number of CS 9% (millions)	Percentage excess number of CS 19% (millions)
Low income	30	667	23	4.7	0	0
Lower middle income	49	3087.7	66.7	15.3	5.2	1.6
Upper middle income	46	2523.5	34.6	27.9	9.2	5.9
High income	47	1186.1	12.9	27	2.6	1.3
Total	172	7464.3	137.2	20	17	8.8

CS, caesarean section.

we found that this overall association is primarily driven by voluntary insurance mechanisms. When controlling only for GDP per capita and the size of the health sector in [table 3](#), column 2, we found no associations for out-of-pocket expenditure, a moderate sized coefficient for compulsory contributions and a rather large coefficient for voluntary health insurance: each 10 per cent increase in voluntary health insurance contributions is associated with a 5.6 per cent increase in excess CS proportions. These associations change only marginally when adjusting for general reproductive and health access variables in [table 3](#), columns 3 and 4. Effects are similar or even more pronounced if we use percentage excess with 9 per cent benchmark or continuous CS proportions.

[Table 4](#) shows the main results of our sensitivity analysis. When we split our sample by country income groups, we find the largest associations in all categories for the upper-middle income group, and the weakest in the low-income group. Due to the small sample sizes the precision of these estimates is however very low (all p values >0.1) for all outcome measures we used.

DISCUSSION

Consistent with previous papers highlighting the increasing global trend of increasing CS proportions²⁻⁹ we have found a striking number of CS that seem unnecessary. Using a relatively conservative 19 per cent CS rate benchmark, we estimate that 8.8 million unnecessary CS were carried out in 2018. The vast majority of these percentage excess CS occurred in upper-middle income countries. Belizán *et al* using a 15 per cent benchmark, with data between 1993 and 1997 estimated that over 850 000 unnecessary CS are performed each year in Latin America.⁸ Gibbons *et al* looking at 137 countries, using a 15 per cent benchmark and data from 2008, estimated that 6.2 million unnecessary CS are performed each year, with China and Brazil accounting for close to 50% of this global total. With a 20 per cent benchmark rate, there was an estimate of 4 million of unnecessary CS a year.⁶ Our estimates are about 30 per cent higher than these previous numbers may represent both a growing number of births each year and a continued rise in CS rates in middle-income settings.

Studies looking at global CS trends have highlighted the associations between CS and maternal and newborn mortality,^{5 18-20} socioeconomic status of women,^{3 9} private sector care^{8 9 38} and economic growth.^{4 8} Our results suggest that health financing mechanisms may play a key role in explaining the large differences across countries. We show that, on average, countries relying on private financing have higher CS rates. These associations are particularly pronounced for voluntary health insurance schemes, which generally are used to ‘top up’ basic health plans and allow users to use premium features. Health insurance, by incentivising healthcare providers,^{1 25-27} is known to encourage the overuse of CS.^{26 39}

In general, higher CS rates should be expected in higher income countries due to increased resources^{17 40} or supply sensitive care.^{17 40} Similar to previous studies,^{4 8} we find that national CS rates increase with income. We find however that this positive gradient is only observable up to the middle-income category, and flat or even declining in higher income settings. The generally positive trends can be attributed to a large number of factors, including an increasing proportion of births occurring in health facilities⁹ or attended by trained health personnel,⁷ different work force composition⁴¹⁻⁴⁵ and different technology.⁴⁶

Increases in CS rates are a result of multitude of factors^{1 23} that interact in complex ways. As such, results of ecological studies should be interpreted with caution, and in the context of the specific systems analysed. For example, private insurance and private sector care often overlap at the country level, and both are likely to contribute to the use of care in general and CS in particular.²⁵⁻²⁷ Studies looking at cross-country comparisons have documented the impact of private care. Belizán *et al* looking at 19 Latin American countries, observed a positive correlation between private hospitals and the rate of CS.⁸ Boerma *et al*, on the basis of data from 169 countries,⁹ and Benova *et al* looking at 57 countries,³⁸ concluded similarly. Another example of complexities in interaction of health system factors as they influence service delivery, is explanation of social inequalities in CS rates. Social inequalities in CS rates highlighted by Boatman *et al*³ and Boerma *et al*⁹ also suggest the important influences of economic and cultural issues.^{37 47-51} Supply factors, such as hospital beds, equipment and human resources (ie,

Table 3 Associations between health financing variables and CS proportions

Outcome	CS proportions				Excess CS proportion 9%				Excess CS proportion 19%			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Out-of-pocket percentage of CHE	0.0500 (0.0533)	0.0951* (0.0505)	0.0846 (0.0522)	0.0799 (0.0489)	0.0563 (0.0474)	0.0906* (0.0473)	0.0502 (0.0342)	0.0698* (0.0357)	0.0799 (0.0489)	0.0502 (0.0342)	0.0698* (0.0357)	0.0637* (0.0369)
Voluntary insurance percentage of CHE	0.789*** (0.234)	0.602** (0.232)	0.515** (0.252)	0.493** (0.238)	0.723*** (0.221)	0.581*** (0.219)	0.565*** (0.182)	0.484*** (0.180)	0.493** (0.238)	0.565*** (0.182)	0.484*** (0.180)	0.400** (0.196)
Compulsory private insurance percentage of CHE	0.190*** (0.0418)	0.120*** (0.0408)	0.113** (0.0443)	0.103** (0.0420)	0.163*** (0.0388)	0.110*** (0.0386)	0.0918*** (0.0318)	0.0614* (0.0323)	0.103** (0.0420)	0.0918*** (0.0318)	0.0614* (0.0323)	0.0588* (0.0349)
Total private contributions as percentage of CHE	0.149*** (0.0342)		0.133*** (0.0312)		0.0838*** (0.0238)				0.0838*** (0.0238)			
GDP per capita 2016 in US\$	0.000 105** (4.87e-05)	2.56e-05 (4.96e-05)	-4.13e-05 (4.86e-05)	2.40e-05 (7.39e-05)	1.31e-05* (4.37e-05)	-3.78e-05 (4.32e-05)	-2.72e-05 (2.82e-05)	-5.62e-05* (2.89e-05)	2.85e-05 (6.76e-05)	1.27e-05 (2.45e-05)	0.198 (0.239)	0.500* (0.299)
Current health expenditure	0.632* (0.370)	0.465 (0.370)	0.117 (0.317)	0.449 (0.411)	0.506 (0.332)	0.120 (0.304)	0.349 (0.239)	0.198 (0.224)	0.458 (0.395)	0.379* (0.229)	0.157*** (0.157***)	0.184*** (0.184***)
Skilled birth attendance percentage			0.363*** (0.0479)	0.387*** (0.0615)		0.276*** (0.0444)			0.300*** (0.0583)			
Obstetricians per 10 000 population			0.706 (1.126)	0.723 (1.084)					0.723 (1.084)			
Nurse and midwife per 1000 population			-0.637 (0.464)	-0.647 (0.444)					-0.647 (0.444)			
Observations	172	172	172	172	172	172	172	172	172	172	172	172

Estimated coefficients are based on ordinary least squares regressions with heteroscedasticity-robust SEs in parenthesis. Missing values on predictor were imputed using Stata's `mi` impute algorithm. *P values <0.10; **P value <0.05; ***P value <0.01. Column 1 uses the combined private expenditure variable as primary exposure variable. Columns 2–4 show separate results for out-of-pocket, voluntary and compulsory insurance contributions. All models control for GDP per capita and current health expenditure (percentage of GDP). Column 3 further controls for the percentage of births attended by a skilled birth attendant. Column 4 also control for the obstetrician and midwife densities. Descriptive statistics and definitions of all variables are provided in [table 1](#). CHE, current health expenditure as percentage of GDP; CS, caesarean section; GDP, gross domestic product.

Table 4 Sensitivity analysis: associations by country income group

Outcome:	CS proportion (continuous)				Excess CS proportion 9%				Excess CS proportion 19%		
	High income (1)	Upper-middle income (2)	Lower-middle income (3)	Low income (4)	High income (5)	Upper-middle income (6)	Lower-middle income (7)	Low income (8)	High income (9)	Upper-middle income (10)	Lower-middle income (11)
Total private contributions as percentage of CHE	0.0542 (0.0453)	0.111 (0.0910)	0.0987 (0.0626)	0.0309 (0.0295)	0.0542 (0.0453)	0.106 (0.0869)	0.0787 (0.0558)	-0.000 376 (0.0124)	0.0529 (0.0431)	0.0747 (0.0694)	0.0139 (0.0374)
GDP per capita 2016 in US\$	1.88e-05 (6.99e-05)	-7.29e-05 (0.000 550)	0.000 644 (0.000 899)	6.21e-05 (9.04e-05)	1.88e-05 (6.99e-05)	-6.67e-05 (0.000 529)	0.000 582 (0.000 807)	2.98e-05 (5.20e-05)	1.89e-05 (6.68e-05)	3.49e-05 (0.000 441)	0.000 285 (0.000 448)
Current health expenditure as percentage of GDP	0.834 (0.570)	1.097 (0.859)	0.235 (0.711)	-0.141 (0.190)	0.834 (0.570)	1.086 (0.856)	0.104 (0.655)	-0.00 260 (0.0717)	0.843 (0.546)	1.174 (0.718)	-0.0236 (0.456)
Skilled birth attendance percentage	0.124 (0.203)	0.804** (0.305)	0.254* (0.128)	0.102*** (0.0333)	0.124 (0.203)	0.753** (0.293)	0.176 (0.114)	0.0196 (0.0158)	0.110 (0.184)	0.542** (0.245)	0.0926 (0.0746)
Obstetricians per 10000 population	-1.191 (0.893)	2.165 (3.660)	1.914 (2.783)	0.309 (1.146)	-1.191 (0.893)	2.200 (3.597)	2.295 (2.630)	0.150 (0.378)	-1.244 (0.856)	2.009 (2.989)	2.076 (1.943)
Nurse and midwives per 1000 population	-0.908 (0.595)	-2.142* (1.178)	-0.924 (0.779)	-0.0530 (0.312)	-0.908 (0.595)	-2.116* (1.161)	-0.921 (0.697)	-0.0576 (0.119)	-0.854 (0.574)	-1.810* (0.997)	-0.719 (0.468)
Observations	47	46	49	30	47	46	49	30	47	46	49

Estimated coefficients are based on ordinary least squares regressions with heteroscedasticity-robust SEs in parenthesis. Missing values on predictor were imputed using Stata's *mi* impute algorithm. Total private expenditure is defined as the sum of out-of-pocket expenditure, mandatory and voluntary insurance contributions. Columns 1–4 show multivariable estimates using CS proportion as outcomes. Columns 5–8 use proportion >9% as outcome. Columns 9–11 use proportion >19% as outcome. No estimates are shown for lower income countries for CS >19% due to lack of variation. *P values <0.10; **P value <0.05; ***P value <0.01. CHE, current health expenditure as percentage of GDP; CS, caesarean section; GDP, gross domestic product.



obstetricians and midwives) are also known to influence CS rates.^{1 52 53} The lack of decreasing CS rates with lower numbers of skilled birth attendants in Latin American countries, as compared with other countries with lower skilled birth attendant numbers,⁷ may reflect cultural and social trends in such countries, and is an useful example to illustrate the complexity of the interplay and influence of health system factors in CS rates.

The ecological nature of study design is the main limitation of this study, as we cannot establish a causal relationship between our variables of interest. Although we used some of most reliable internationally available data sources from the WHO and the World Bank, we should be aware that the quality of such data may not be entirely uniform across countries included in the analysis. Finally, we have been able to adjust only for some confounders in our statistical models. There are many other macro level factors (ie, societal and cultural factors) that do play a role and we have not accounted in our analysis.

The exploratory results in this paper should be viewed as a first step towards an in-depth analysis of current health financing systems and their implications for sustainable provision of care in the future. Several pathways forward seem possible. First, global studies with larger and more detailed data on health system characteristics generated from global monitoring systems. Second, performing systematic reviews of individual studies looking at CS rates and health system factors. CS is one of the most studied procedures globally. Evidence synthesis in the form of systematic reviews could serve not just the cause of addressing CS increase and variation but can also prove to be a reference point in the general cause of examining health system influence on under and overuse of medical care. Finally, country specific analysis or even regional or facility level analysis looking at individual case data will be able to establish conclusive links of health system features with CS provision.^{25 27} This information can inform national policy efforts as well as global efforts for improvement of health system financing arrangements. Not all nations may be able to engage in research on optimal financial incentives despite persisting problems with CS.⁵⁴ Global collaborations to support countries struggling with these issues might be beneficial.

CONCLUSIONS

The results presented in this study suggest that, on average, countries relying more heavily on private contributions and voluntary health insurance have higher proportions of excess CS. Further research will be needed to better understand features driving these results and to help countries move towards more efficient use of health system resources.

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