	れないとも思う（前にやっていた教育分野でも教員給与等経常的経費支援が sustainability の観点からどうしても無視できない等々）。 2. 5 つの提言の 1 において選択と集中について母子保健を例にとってマルチ分野での貢献について触れられているが、先週ダボスでカナダのハーパー首相が演説して、ほとんど G20 絡みの中に G8 としての取り組みで母子保健を取り上げており、ムスコカサミットのプロセスでも中心議題となりそうである。	2. 母子保健回帰の中、いかに効果的なインパクトを出せる、エビデンスに基づいた提言を打ち出せるかに我が国の保健 ODA の今後 5 年はかかっているといえよう。
金森サヤ子（外務省・地球規模課題総括課）	1. Household survey や census、facility-based survey etc. の知見が不足しているため、そのあたりを分かり易く記述すべきではないか（例：DOTS の効果→household survey, 妊産婦死亡→vital registration の必要性等）。 2. 改訂版提言書 P29、「5. リーダーの育成」パラ「これには、現在検討中である～」の、特に「10 万人育成」コミットメントとのリンクの関係性が不明である。 3. P14. パイ比較優位性の系統的検討：保健支援毎のアセスメントマトリックスが役に立つのではないか。個人的には、次期保健政策の中身に入れるべきポイントは既に明白で、それを体系的に visualize することで、より分かり易い叩	1. ご指摘のように、モニタリング手法について簡潔に追加した。 2. 10 万に育成はあくまでのイン・サービス研修がメインのために、確かに政策人材と結び付けることは難しい。しかし、こうした関連する案件を有機的に活用していくことも必要である。やはり、どういう人材を何のために育てたいのか、そしてそのためのマイルストーンや達成指標はどうするのか、という議論がなければ、今回の「10 万人育成」案件のように数合わせをしても、インパクトのある成果はほとんど出せないであろう。 3. ご指摘の通り、比較優位性の議論には枠組みが必要であり、アセスメントマトリックスは確かに役にたつ。ODA における国や地域別の保健介入の優先順位決定には、わが国 ODA の要請主義の原則は尊重しながらも、1）疾病負担（死亡と罹患）、2）介入の一般的費用対効果、3）わが国のリソースと

	き台に仕上げられるのではないかと考える。	キャパシティー、4）予見される案件の費用とアウトカム・インパクト、5）相手国政府の国家計画の優先順位、6）支援による国益の多寡、7）ODA スキーム・モダリティ活用の可否、8）世界（国際機関や multi-stakeholder partnerships）の援助優先順位、9）成果発信の可否（国内外ともに）、10）我が国国民や受益者の支持、などを考慮する必要があろう。
	4. 改訂版提言書 P.3 footnote2：コミットメントの名称は「1000 の保健施設の建設」ではなく、「1000 箇所の病院及び保健センターの改善」。	4. ご指摘通り修正した。
	5. 改訂版提言書 P.3 footnote2：「こうした施設強化を行い、その結果として何をアウトカムとして出すのかという視点が欠けている」は仰る通り。これを踏まえ、次にすべきは、現在のコミットメントの追加的要素として、具体的アウトカムを提示することにある。こうすることにより、上述のコミットメントを二度売りすることが可能となると考える。	5. フットノート 2 は、次のように変更。「この 1000 箇所の病院及び保健センターの中には、中核となる保健医療施設だけでなく、下位レベルの保健医療施設（ヘルスセンター等）も含まれ、それらに対しても建設・改修・設備などのインフラ整備や機材供与を積極的に実施し、下位施設の保健医療サービス機能を改善、レファラル機能を向上させる方針である。こうした施設強化を、「MDG4 や 5 達成のための保健システム強化の介入の一環として行い、その結果として何をアウトカムとしてするのか」という点を新 ODA 戦略で追加的に打ち出すことは、このコミットメントを、世界的によりインパクトのある有意義なものにしていくための大変有効な施策である。」
	6. 改訂版提言書 P.6 5～6 行目「治療的介入の結果として～存在しない」：このパラドックスのロジックが難解。	6. 次のように改訂：「その一方で、ARVs の配布は大きな効果を上げ始めており、予防効果が限定的な中、治療効果が上がれば、HIV 感染者の平均余命は延長し、感染者数は増え続けていく可能性がある。さらに、治療的介入による HIV 感染者の生活の質が向上する一方、行動変容がなされないままであれば、危険な性行為が増加し、その結果 HIV 感染が増加する可能性がある。これに関する断定的なエビデンスは今のところ存在しないが、治療的介入

		によるHIV感染増加のパラドクッスの可能性は否定できない。」
	7. 改訂版提言書P.7　第一パラ最後「ゆえに、結核のDOTS戦略は余地の余地があり～」：前文迄で、再考の余地がある点については理解できるが、それが、以降の「施設ベースでの医療的介入」と「保健システム強化（こちらはまだわかる)」との接点になりうる、と言い切るロジックについて要説明。もうワンステップ説明すべき。	7. 次のように改訂：「結核のDOTS戦略は明らかに再考の余地があるが、保健システム強化の潮流の中で、施設ベースでの医療的介入と保健システム強化との接点になりうると考えられ、わが国が施設を中心に援助を行う際には、母子保健以外にもシナジーを考慮をすべき案件であろう。」
	8. 改訂版提言書P.7　下から5行目：「地域の死亡率の短期間に～研究も進み、」「保健介入カバー率～コンセンサスも既にできている。」の、前半「」と後半「」の関連性が不明。つまり、前半の研究も進んで何がわかったから、保健介入率を中間アウトカム指標として用いることについてのコンセンサスも既にできた、の、何がわかったかの説明があるべき。	8. 次のように改訂：「なお、後述するように、現在のグローバルヘルス領域においては、保健介入の効果は、「アウトカム（介入のカバー率・有効カバー率の向上)」あるいは「インパクト（死亡率や罹患率の低下)」によって測定することが常識となっている。ゆえに、本稿もそれらに準拠して議論を進めていく。」
	9. 改訂版提言書P.8　2パラ後半部分「JICAにおける介入のパイロット段階で～デザインを組み込み」：現在のJICAのキャパではfeasibilityは難しいのではないか。アウトソースできるだけの国内キャパがあるかどうか要検討。	9. 次のように改訂：「例えば、JICAにおける介入のパイロット段階で国内研究機関と連携し、クラスターランダム化比較試験など質の高い研究デザインを組み込み、結果を積極的に英文で発信することで、巨額の追加的投資もなく円滑に進めることができる。」
	10. 改訂版提言書P.8 下から8～7行目以降：日本語が難解：「様々な妊産婦に関連した地域介入のモデルを比較した研究」は、即ちP.9の表1の「妊産婦検診に関連した介入」のことなのだから、この表現を統一すべき。	10. ご指摘通り修正した。
	11. 改訂提言書P.12 2パラ：ここで母子健康手帳の研究に対す	

	る質の低さを長々と力説しても大した意味なし。寧ろ、引用論文（44）に対して、ジャーナル上でコメントするべきではないか。	11. 母子手帳の有効性に関する科学的エビデンスが乏しいことを示す必要があると考える。母子手帳をアフリカに広げる動きがある現在、その有効性について、さらなる健闘が必要である。
	12. 改訂提言書P.12 18行目の「前者」、20行目「後者」：それぞれ何を指しているのか不明。	12. 次のように改訂：「5S-TQMも母子健康手帳も、基本的には効果的な保健介入を円滑に導入し実施するためのツールとして考案されているものであることに、留意すべきであろう。逆にいえば、これにより妊産婦や小児の死亡を減少させることを目的としたものではない。世界的には、プロセスの向上を目的とするものとして、スコアカード等によるフィードバックと監視による継続的な質向上や、リーダーシップ・ファシリテーション・ワークショップが、効果も確かめやすく標準的となっている。小児の成長・予防接種や妊娠中のケアに関してはユニセフのカードなどが存在している。新たなツールを導入する際には、そのための目的を整理し、質の高い科学的根拠で検討したのち、他のドナー国やmulti-stakeholder partnershipsと協議して援助協調をするべきである。」
	13. 改訂提言書P.14　下から7行目「人類学の教えるところは～」：感覚的にわかるが、「人類学の教えるところ～低下につながる」はあくまで結果論であって、以降に続く「人口コントロール政策の失敗」に繋がるとは言えないのでは。	13. 次のように改訂：「人類学の教えるところは、まず死亡率の低下が起こって初めて出産率の低下につながる。それゆえ、優先順位を死亡率の低下に置くことは理にかなっている。人口コントロール政策の失敗を見直し、新たなリプロダクティブ・ヘルス戦略、特にMDG5達成のための施策を再検討することは喫緊の課題である。」
	14. 改訂提言書P.15 3パラ「再度、シアトルグループの行ったような～分析を行い（25）」：referenceは25でなく23なのでは。	14. ご指摘の通り訂正した。
	15. 改訂提言書P.15　下から4行目「我が国の援助機関」：具体的には外務省とJICAを指しているのか。ここだけ抽象的	15. 「外務省とJICA」に変更。

	な印象を受ける。	
	16. 改訂版提言書P.16 下から5～3行目：P.17 2パラ前半部分と内容が重複。何れか削除すべき。	16. ご指摘の通り削除した。
	17. 改訂版提言書P.17 上から17行目：2国間援助→二国間援助（表記を統一すべき。他にも表現にvariationあり）。	17. 「二国間援助」に統一した。
	18. 改訂版提言書P.13 4パラ、P.17 上から19行目：伝統的バイによるin-kindの援助とは具体的に何を指しているのか、難解。	18. 次のように改訂：「バイによる具体的案件を介した連携」
	19. 改訂版提言書P.19 3パラ：「ODAに占める保健セクターの割合～2%→8%」：P.17太字部分の3%→10%と矛盾。	19. 「3%→10%」に統一した。
	20. 改訂版提言書P.22 上から1行目「人材育成のすべての分野において～エビデンスはない」：具体的には、P.11 表3、P.25下部から「政策人材の育成に比較優位はないものの、地域、施設における人材育成には比較優位はある」と言えるのであれば、そう書くべきではないか。そうでないと、P.25 下部との整合性が取れない（「3.地域・施設における人材育成」に比較優位性があると明記している）。	20. 次のように改訂：「我が国の人材育成は、地域や施設での育成に優位性があると考えられるが、それを示すことができるエビデンスはない。」
	21. 改訂版提言書P.25 「4.医療分野におけるITシステム」：ここだけ大したエビデンスも示さずに結論づけているのは違和感を感じる。これだと、寧ろ欧米諸国の方が比較優位性はあるのでは？との印象を否定できない。	21. 直前の「ITの技術等を駆使して多くの病院で採用されている備品や製薬の在庫管理システム」を指している。
	22. 改訂版提言書P.27 上から4行目「地域戦略」：地域戦略というよりは、地域における介入ではないか。	22. 「地域における介入」に訂正した。

	23. 改訂版提言書P.30～、P.40～：レファレンスが重複。何れか削除すべき。 24. 文章中に挿入されているグラフと、本文のリンクを明確にすべき。具体的には、グラフに番号を振り、該当文章にグラフ番号を記載すべき。	23. 引用の重複を削除した。 24. ご指摘のように、番号を図・表と本文に加えた。

添付資料 3

Method of delivery and pregnancy outcomes in Asia: the WHO global survey on maternal and perinatal health 2007–08

Method of delivery and pregnancy outcomes in Asia: the WHO global survey on maternal and perinatal health 2007–08

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Summary

Background There has been concern about rising rates of caesarean section worldwide. This Article reports the third phase of the WHO global survey, which aimed to estimate the rate of different methods of delivery and to examine the relation between method of delivery and maternal and perinatal outcomes in selected facilities in Africa and Latin America in 2004–05, and in Asia in 2007–08.

Methods Nine countries participated in the Asia global survey: Cambodia, China, India, Japan, Nepal, Philippines, Sri Lanka, Thailand, and Vietnam. In each country, the capital city and two other regions or provinces were randomly selected. We studied all women admitted for delivery during 3 months in institutions with 6000 or fewer expected deliveries per year and during 2 months in those with more than 6000 deliveries. We gathered data for institutions to obtain a detailed description of the health facility and its resources for obstetric care. We obtained data from women's medical records to summarise obstetric and perinatal events.

Findings We obtained data for 109101 of 112152 deliveries reported in 122 recruited facilities (97% coverage), and analysed 107950 deliveries. The overall rate of caesarean section was 27·3% (n=29428) and of operative vaginal delivery was 3·2% (n=3465). Risk of maternal mortality and morbidity index (at least one of: maternal mortality, admission to intensive care unit [ICU], blood transfusion, hysterectomy, or internal iliac artery ligation) was increased for operative vaginal delivery (adjusted odds ratio 2·1, 95% CI 1·7–2·6) and all types of caesarean section (antepartum without indication 2·7, 1·4–5·5; antepartum with indication 10·6, 9·3–12·0; intrapartum without indication 14·2, 9·8–20·7; intrapartum with indication 14·5, 13·2–16·0). For breech presentation, caesarean section, either antepartum (0·2, 0·1–0·3) or intrapartum (0·3, 0·2–0·4), was associated with improved perinatal outcomes, but also with increased risk of stay in neonatal ICU (2·0, 1·1–3·6; and 2·1, 1·2–3·7, respectively).

Interpretation To improve maternal and perinatal outcomes, caesarean section should be done only when there is a medical indication.

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Introduction

Several factors, including the increased perception of safety, have contributed to a worldwide increase in rates of caesarean section.[1] In many countries, these rates have reached epidemic proportions, motivating a debate about whether the high rates are appropriate.[2] Unnecessary caesarean section is a classic example of the mismatch between evidence and practice in obstetrics. This debate also draws attention to the complexities that attempts to change practice entail.[3,4] On the one hand, some are concerned about possible additional maternal and perinatal morbidity caused by unnecessary caesarean sections. On the other hand, assessment of whether the caesarean section operation poses an intrinsic risk to the mother or the baby is difficult. Ethical and practical constraints prevent assessment of intrinsic risks related to caesarean sections with use of a randomised controlled trial.

In developing countries, improvement of maternal and perinatal health strongly depends on strengthening of health systems.[5] When resources are scarce, caesarean sections that are not medically indicated could, if done in large numbers, represent a serious resource drain. At the same time as unnecessary overuse of surgical practices is being assessed in some countries, millions of women in other countries who need these procedures do not have access to them, putting their own and their children's lives at risk.[6]

This Article reports the third phase of the WHO global survey project—a study that was implemented in the Americas (2005), Africa (2005), and Asia (2007–08) to alleviate the scarcity of information for planning and assessment of maternal and perinatal health services, specifically, intrapartum care. The survey in Latin America suggested that, at the level of facilities, increasing rates of caesarean section do not necessarily lead to

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improved outcomes and could be associated with harm.[7] The WHO global survey in Asia aimed to obtain regional estimates of different methods of delivery in facilities, studying the relation between method of delivery and maternal and perinatal outcomes. By undertaking the study in a randomly selected number of health facilities that have not participated in research before, we aimed to develop a network with capacity to collect routine data and participate in collaborative research across countries and regions.

Methods

Study design

Methodological details of the global survey have been published elsewhere.[8] Briefly, this is a multicountry, facility-based survey that collected data for all delivering women in randomly selected facilities worldwide. WHO subregions, classified by the number of children younger than 5 years and adult mortality rates, were used as a proxy for the burden of maternal and perinatal mortality. A stratified multistage cluster sampling design was used to obtain a sample of countries and health institutions worldwide. From each subregion, four countries were selected, with probability proportional to population size. When a subregion had fewer than four countries, all countries within that subregion were included. This process resulted in 12 subregions having four countries each, and two subregions having three countries each.[8] Owing to financial and practical constraints, we could not undertake the survey in developed countries of the region (unless they volunteered to—eg, Japan) and some of the selected countries (eg, Indonesia). Nine Asian countries were included: Cambodia, China, India, Japan, Nepal, Philippines, Sri Lanka, Thailand, and Vietnam. In each country, two regions or provinces, in addition to the capital city, were randomly selected by computer, with probability of selection proportional to their size. Once a province had been selected, we obtained a census of all facilities with more than 1000 births per year and those doing caesarean sections. If there were more than seven facilities, seven were randomly selected by computer, with probability of selection proportional to the number of births per year. If there were fewer than seven facilities, all were selected. In each of the selected institutions, we studied all women admitted for delivery during 3 months in institutions with 6000 or fewer expected deliveries per year and during 2 months in those with more than 6000 expected deliveries per year.

Data collection was started in China in October, 2007, and concluded in the Philippines in May, 2008. We obtained written permission from all ministries of health of the participating countries and the directors of the selected facilities. We obtained data for all individuals from medical records and did not identify participants. The Ethics Review Committee of WHO and of each country independently approved the protocol.

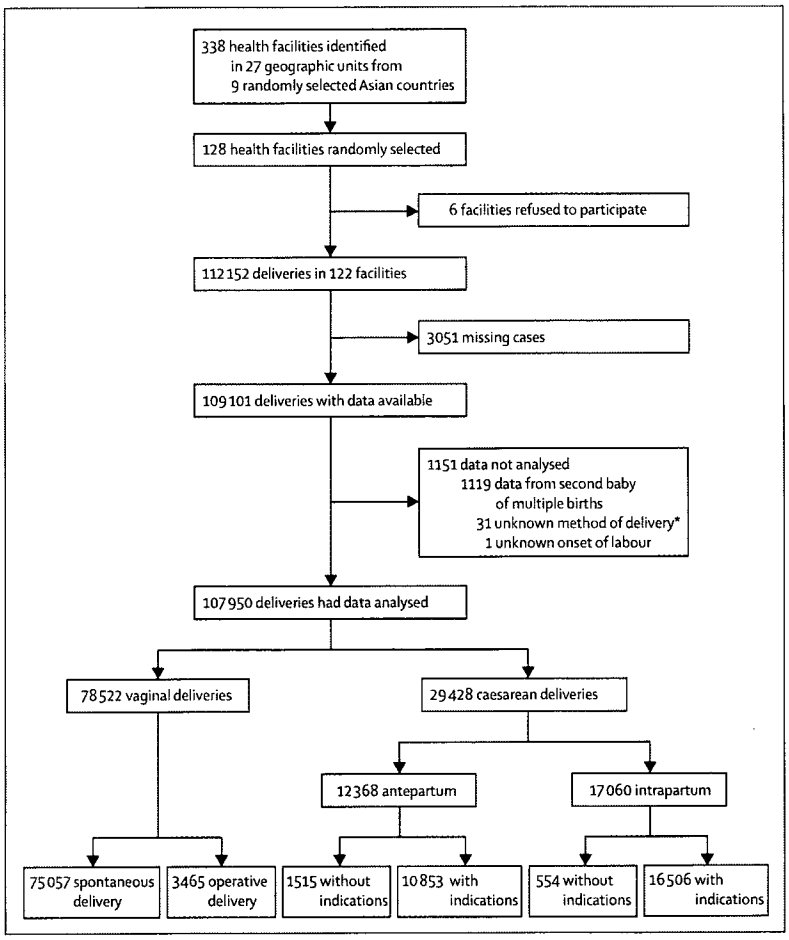

Figure 1: **Study profile**
*Includes 28 cases of laparotomy for uterus rupture.

Data collection

We collected data for institutions and for individuals. For institutions, data included characteristics of maternal and perinatal care, including the availability of laboratory tests; anaesthesiology resources; services for intrapartum care, delivery, and care of the newborn baby; and presence or absence of basic emergency medical and obstetric care facilities, intensive care units (ICUs), and human and training resources. We gathered data only once to obtain a detailed description of the health facility and its resources for obstetric care. The hospital coordinator completed a form in consultation with the director or head of obstetrics. For individuals, we obtained data from women's medical records to complete a two-page precoded form, summarising obstetric and perinatal events. Data collected included demographic characteristics, maternal risk, current pregnancy, method of delivery, and outcomes (maternal and perinatal) up to hospital discharge. All women giving birth at the facility during the study period were included. Trained staff reviewed the medical records of all women and their

	Vaginal delivery		Caesarean section					Total
	Spontaneous	Operative	Overall	Antepartum without indications	Antepartum with indications	Intrapartum without indications	Intrapartum with indications	
Cambodia	4319 (77·6%)	431 (7·7%)	14·7%	2 (0·04%)	144 (2·6%)	12 (0·2%)	657 (11·8%)	5565 (5·2%)
China	7649 (52·6%)	179 (1·2%)	46·2%	1356 (9·3%)	2855 (19·6%)	341 (2·4%)	2161 (14·9%)	14541 (13·5%)
India	19586 (79·3%)	719 (2·9%)	17·8%	16 (0·1%)	892 (3·6%)	48 (0·2%)	3421 (13·9%)	24682 (22·9%)
Japan	2445 (74·1%)	200 (6·1%)	19·8%	2 (0·1%)	457 (13·9%)	0	196 (5·9%)	3300 (3·1%)
Nepal	6447 (75·9%)	323 (3·8%)	20·3%	3 (0·04%)	522 (6·2%)	5 (0·1%)	1189 (14·0%)	8489 (7·9%)
Philippines	10427 (78·4%)	372 (2·8%)	18·8%	5 (0·04%)	1064 (8·0%)	19 (0·1%)	1408 (10·6%)	13295 (12·3%)
Sri Lanka	9900 (65·9%)	526 (3·5%)	30·6%	83 (0·6%)	3021 (20·1%)	29 (0·2%)	1465 (9·8%)	15024 (13·9%)
Thailand	6007 (61·6%)	420 (4·3%)	34·1%	33 (0·3%)	1309 (13·4%)	15 (0·2%)	1961 (20·1%)	9745 (9·0%)
Vietnam	8277 (62·2%)	295 (2·2%)	35·6%	28 (0·2%)	576 (4·3%)	112 (0·8%)	4021 (30·2%)	13309 (12·3%)
Total	75057 (69·5%)	3465 (3·2%)	27·3%	1515 (1·4%)	10853 (10·1%)	554 (0·5%)	16506 (15·3%)	107950 (100%)

Table 1: **Numbers of women by country and method of delivery**

babies before discharge from the hospital, and abstracted data daily to their forms for individual data collection. The hospital coordinator supervised data collection, resolving or clarifying unclear medical notes before forms were sent for data entry. Attending staff updated incomplete records before discharge.

We developed a hospital complexity index, summarising an institution's capacity to provide different levels of care, dependent on its ratings for eight categories: building, general medical care, laboratory, anaesthesiology, screening tests, human resources, basic obstetric services, and continuous medical education. We classified hospitals without any of these services or resources as low level (rating score 0), those that had both essential and optional services and resources as high level (rating score 2), and those that did not have some of the optional services or resources, but had all essentials, as medium level (rating score 1). We judged hospitals with a total score of 9 or less of low complexity, those with scores of between 10 and 12 of medium complexity, and those with scores of 13 or more of high complexity. Criteria for data abstraction were defined in the manual of operations, which was available for staff training and monitoring of data quality, keeping to a minimum the need for judgment and interpretation. The manual contained definitions of all terms used and synonyms of medical and obstetric terms, and described questions and precoded corresponding answers.

Statistical analysis

All data were continuously entered by country data managers or hospital coordinators with a web-based system (MedSciNet AB, Stockholm, Sweden) in collaboration with WHO between October, 2007, and May, 2008. We calculated the survey coverage by comparing the number of delivery forms completed during the study period with the total number of deliveries, as independently recorded in the hospital logbooks. We used frequencies to describe methods of delivery for each country and facility characteristics, and

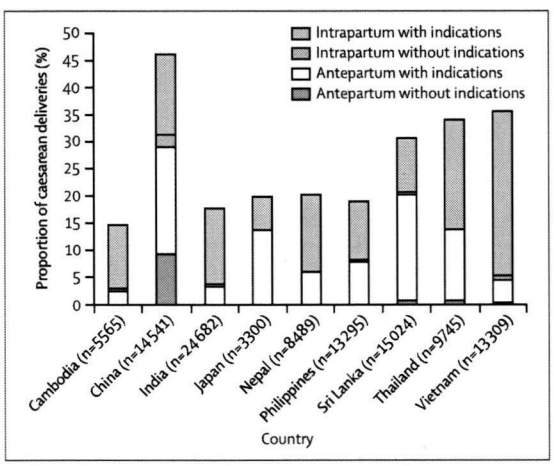

Figure 2: **Proportion of caesarean deliveries by four classifications and countries**

characteristics of mothers and babies for each group of delivery method. We assessed the association of each maternal outcome of death, admission to ICU, blood transfusion, hysterectomy, and mortality and morbidity index (which was defined as the presence of at least one of: maternal mortality, admission to ICU, blood transfusion, hysterectomy, or internal iliac artery ligation); and perinatal outcomes of perinatal mortality, fetal deaths, neonatal mortality up to hospital discharge, stay in neonatal ICU for 7 days or longer, and perinatal mortality and morbidity index (defined as the presence of perinatal death or stay in neonatal ICU for 7 days or longer), with methods of delivery by use of odds ratios (OR) and 95% CIs.

Univariate analysis was done separately for assessment of the association of methods of delivery and other characteristics of mothers, babies, and facilities individually on each outcome. The crude ORs were always corrected for the clustering effect of the facility. Individual-level and facility-level variables that were significantly associated with the outcome in the univariate

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	Vaginal delivery		Caesarean section				Total (n=107 950)
	Spontaneous (n=75 057)	Operative (n=3465)	Antepartum without indications (n=1515)	Antepartum with indications (n=10 853)	Intrapartum without indications (n=554)	Intrapartum with indications (n=16 506)	
General characteristics							
Marital status (single)	4973 (6·6%)	196 (5·7%)	4 (0·3%)	425 (3·9%)	7 (1·3%)	552 (3·3%)	6157 (5·7%)
Maternal age (years)							
≤16	550 (0·7%)	19 (0·6%)	0	22 (0·2%)	1 (0·2%)	63 (0·4%)	655 (0·6%)
17–34	68 713 (91·6%)	3091 (89·2%)	1378 (91·0%)	8841 (81·5%)	500 (90·3%)	14 772 (89·5%)	97 295 (90·2%)
≥35	5780 (7·7%)	355 (10·2%)	137 (9·0%)	1989 (18·3%)	53 (9·5%)	1667 (10·1%)	9981 (9·3%)
Primigravida	32 479 (43·3%)	1948 (56·2%)	671 (44·3%)	3372 (31·1%)	251 (45·3%)	7743 (46·9%)	46 464 (43·0%)
Last pregnancy							
Last baby birthweight (previous delivery [g])							
<1500	904 (1·2%)	91 (2·6%)	1 (0·1%)	161 (1·5%)	0	93 (0·6%)	1250 (1·2%)
≥1500–2499	9292 (12·3%)	501 (14·5%)	26 (1·7%)	1486 (13·7%)	22 (3·9%)	1654 (10·0%)	12 981 (12·0%)
≥2500–3999	63 900 (85·2%)	2808 (81·1%)	1383 (91·3%)	8664 (79·8%)	510 (92·1%)	14 040 (85·1%)	91 305 (84·6%)
≥4000–4499	873 (1·2%)	56 (1·6%)	95 (6·3%)	457 (4·2%)	21 (3·8%)	621 (3·8%)	2123 (2·0%)
≥4500	69 (0·1%)	6 (0·2%)	9 (0·6%)	83 (0·8%)	1 (0·2%)	87 (0·5%)	255 (0·2%)
Caesarean delivery in the last pregnancy	1034 (1·4%)	127 (3·7%)	43 (2·8%)	3996 (36·8%)	21 (3·8%)	3347 (20·3%)	8568 (7·9%)
Complications during current pregnancy							
Prelabour rupture of membranes	8388 (11·2%)	425 (12·3%)	129 (8·5%)	732 (6·7%)	112 (20·2%)	3100 (18·8%)	12 886 (11·9%)
Pregnancy-induced hypertension	2158 (2·9%)	222 (6·4%)	38 (2·5%)	838 (7·7%)	16 (2·9%)	845 (5·1%)	4117 (3·8%)
Pre-eclampsia	1096 (1·5%)	134 (3·9%)	7 (0·5%)	543 (5·0%)	1 (0·2%)	517 (3·1%)	2298 (2·1%)
Eclampsia	183 (0·2%)	36 (1·0%)	1 (0·1%)	73 (0·7%)	0	96 (0·6%)	389 (0·4%)
Breech or other non-cephalic presentation	805 (1·1%)	725 (20·9%)	0	1637 (15·1%)	0	2172 (13·2%)	5339 (5·0%)
Referred for complication related to pregnancy or delivery	13 719 (18·3%)	698 (20·1%)	100 (6·6%)	2781 (25·6%)	49 (8·8%)	2828 (17·1%)	20 175 (18·7%)

Data are number (% of country total) for method of delivery columns and (% of study total) for total column.

Table 2: **Characteristics of women classified by method of delivery**

analysis ($p<0·05$) were successively included in a multivariate model. In the multivariate analysis, each model of the outcomes of interest included method of delivery defined in six categories: vaginal spontaneous (reference category); operative vaginal; antepartum caesarean delivery with and without indications; and intrapartum caesarean delivery with and without indications, and the variables found to be significant in the univariate analyses. Variables for both individuals and facilities that did not show significance at the 5% level in the resulting model were then removed one by one until all remaining variables were significant. Gestational age was always included irrespective of statistical significance when we considered perinatal outcomes. For all models fitted, we used generalised linear and latent mixed models (GLLAMM) for the multilevel analysis by using procedure GLIMMIX in SAS (version 9.1). The procedure accounted for clustering effects within facilities. The multilevel analysis was also done for perinatal outcomes in subgroups of fetal presentations (cephalic, breech, and others). Risks of maternal and perinatal outcomes associated with method of delivery were presented by adjusted ORs with corresponding 95% CIs.

Role of the funding sources

The sponsors of the study had no role in study design, data collection, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

Figure 1 shows the study profile. In the nine randomly selected Asian countries, we selected 27 geographical units. There were 388 health facilities in these units, of which we randomly selected 128 facilities. Six facilities declined to participate, leaving 122 in the survey. 112 152 deliveries were reported in these 122 facilities during the study period. Our survey collected data for 109 101 deliveries (97% coverage). We checked the data quality by randomly selecting 5% of the records and asking the hospital coordinators to extract the same data from medical records again, and compared these data with the original record. The mean agreement was 92% (range 81–98). We excluded 31 patients with unknown method of delivery, 1119 second babies of multiple births, and one with unknown onset of labour, leaving 107 950 analysable deliveries.

China, India, and the Philippines had the highest numbers of facilities (seven per province), whereas India, Sri Lanka, and China had the highest numbers of deliveries (table 1). 84 (69%) facilities were in urban areas and 104 (85%) were in the public system. Most of the hospitals were secondary or tertiary referral hospitals; however, 83 (68%) had low facility complexity resources. 87 (71%) hospitals had anaesthesiology resources 24 h per day in the facility, and in 75 (62%), financial incentives were offered for undertaking caesarean section. The overall rate of caesarean section of this survey in Asia was 27·3%. China had the highest overall rate followed by Vietnam, Thailand, and Sri Lanka (table 1). China also had the highest rate of caesarean section without indication (11·7%), followed by Vietnam (1·0%), Sri Lanka (0·8%), and Thailand (0·5%; table 1 and figure 2). Since the pattern of caesarean section was substantially different in China from the other countries (figure 2), we undertook a sensitivity analysis for the maternal and newborn outcomes, excluding data from China. We noted no changes to the results (data not shown), and the results are reported for all nine countries together. The commonly reported indications for caesarean section were previous caesarean section (24·2%), cephalopelvic disproportion (22·6%), fetal distress (20·5%), and breech or other abnormal presentation (12·5%).

Table 2 shows characteristics of women by method of delivery. We noted a higher proportion of single marital status and very low birthweight infant (<1500 g) in women who delivered vaginally than in those who delivered by caesarean section. Delivery by caesarean section in the last pregnancy was more common in women who delivered by caesarean section than in those who had vaginal delivery (table 2). The rates of complications during current pregnancy were similar between women who delivered vaginally or by caesarean section (table 2).

For maternal mortality, only operative vaginal delivery had significantly increased risk compared with spontaneous vaginal deliveries (adjusted OR 3·1, 95% CI 1·5–6·5). The risk for antepartum caesarean section without indication could not be estimated because there were no maternal deaths in this group. Operative vaginal delivery and all types of caesarean section had significantly increased risk of admission to ICU compared with spontaneous vaginal delivery (table 3). Operative vaginal delivery, antepartum caesarean section with indications, and intrapartum caesarean section with and without indication had significantly increased risks of blood transfusion compared with spontaneous vaginal delivery (table 3). The risk of hysterectomy was increased in mothers who delivered by operative vaginal delivery, antepartum caesarean section with indications, and intrapartum caesarean section with indications (table 3). We recorded no cases of hysterectomy in women who delivered by antepartum caesarean section without indications and intrapartum caesarean section without indications, so the risk could not be estimated. Operative vaginal delivery and all types of caesarean section were associated with significantly increased risk of maternal mortality and morbidity index compared with spontaneous vaginal

	n/N (%)	Adjusted OR (95%CI)
Death*		
Spontaneous (reference)	53/75 057 (0·1%)	1
Operative vaginal delivery	9/3465 (0·3%)	3·1 (1·5–6·5)
Antepartum CS without indications	0/1515	..
Antepartum CS with indications	11/10 853 (0·1%)	1·1 (0·5–2·3)
Intrapartum CS without indications	1/554 (0·2%)	4·8 (0·6–36·0)
Intrapartum CS with indications	23/16 506 (0·1%)	1·6 (0·9–2·8)
Admission to ICU†		
Spontaneous (reference)	442/75 057 (0·5%)	1
Operative vaginal delivery	76/3465 (2·0%)	2·4 (1·8–3·3)
Antepartum CS without indications	5/1515 (0·3%)	9·9 (3·8–25·8)
Antepartum CS with indications	391/10 853 (3·6%)	42·8 (34·5–53·1)
Intrapartum CS without indications	35/554 (6·2%)	67·0 (42·0–106·7)
Intrapartum CS with indications	1489/16 506 (9·0%)	55·7 (47·1–65·8)
Blood transfusion‡		
Spontaneous (reference)	785/75 057 (1·0%)	1
Operative vaginal delivery	78/3465 (2·3%)	2·1 (1·6–2·8)
Antepartum CS without indications	3/1515 (0·3%)	0·8 (0·3–2·6)
Antepartum CS with indications	352/10 853 (3·2%)	4·1 (3·4–4·8)
Intrapartum CS without indications	7/5854 (1·4%)	3·9 (1·8–8·5)
Intrapartum CS with indications	541/16 506 (3·3%)	4·7 (4·1–5·3)
Hysterectomy§		
Spontaneous (reference)	28/75 057 (0·04%)	1
Operative vaginal delivery	4/3465 (3·3%)	2·8 (0·9–7·9)
Antepartum CS without indications	0/1515	..
Antepartum CS with indications	35/10 853 (0·3%)	6·9 (4·1–11·6)
Intrapartum CS without indications	0/554	..
Intrapartum CS with indications	37/16 506 (0·2%)	5·8 (3·5–9·6)
Maternal mortality and morbidity index¶		
Spontaneous (reference)	1215/75 057 (1·6%)	1
Operative vaginal delivery	146/3465 (4·2%)	2·1 (1·7–2·6)
Antepartum CS without indications	9/1515 (0·6%)	2·7 (1·4–5·5)
Antepartum CS with indications	744/10 853 (6·9%)	10·6 (9·3–12·0)
Intrapartum CS without indications	40/554 (7·2%)	14·2 (9·8–20·7)
Intrapartum CS with indications	1947/16 506 (11·8%)	14·5 (13·2–16·0)

OR=odds ratio. CS=caesarean section. ICU=intensive care unit. *Adjusted for malaria, severe anaemia, other medical disorders, any condition suggesting HIV/AIDS, pre-eclampsia, eclampsia, suspected fetal growth impairment, vaginal bleeding in second half of pregnancy, and referred for complication related to pregnancy or delivery. †Adjusted for maternal age, year of education, birthweight, HIV, chronic hypertension, cardiac/renal diseases, malaria, severe anaemia, other medical disorders, prelabour rupture of membranes, pregnancy-induced hypertension, pre-eclampsia, eclampsia, vaginal bleeding in second half of pregnancy, referred for complication related to pregnancy or delivery, and country. ‡Adjusted for maternal age, year of education, primiparous, birthweight, cervix surgery, chronic respiratory disease, sickle-cell anaemia, severe anaemia, other medical diseases, pregnancy-induced hypertension, pre-eclampsia, eclampsia, vaginal bleeding in second half of pregnancy, referred for complication related to pregnancy or delivery, and country. §Adjusted for chronic hypertension, severe anaemia, and vaginal bleeding in second half of pregnancy. ¶Maternal mortality and morbidity index=death or admission to ICU, blood transfusion, hysterectomy, or internal iliac artery ligation. Adjusted for maternal age, year of education, primiparous, birthweight, history of neonatal death or stillbirth, HIV, chronic hypertension, cardiac/renal diseases, sickle-cell anaemia, severe anaemia, other medical disorders, prelabour rupture of membranes, pregnancy-induced hypertension, pre-eclampsia, eclampsia, vaginal bleeding in second half of pregnancy, any antenatal antibiotic treatment, referred for complication related to pregnancy or delivery, and country.

Table 3: **Risk of maternal mortality and morbidity by method of delivery**

delivery (table 3). Intrapartum caesarean section (both with and without indications) had higher risk of maternal mortality and morbidity than did antepartum caesarean section (table 3). Deliveries by all types of caesarean section had significantly increased risks of maternal mortality and morbidities except for perineal tears of third and fourth degree, for which as expected caesarean section had a protective effect compared with vaginal delivery (data not shown).

	n/N (%)	Adjusted OR (95%CI)
Perinatal mortality*		
Spontaneous (reference)	1072/75 057 (1·4%)	1
Operative vaginal delivery	126/3465 (3·6%)	1·6 (1·2–2·0)
Antepartum CS without indications	1/1515 (0·1%)	0·3 (0·04–2·3)
Antepartum CS with indications	143/10 853 (1·3%)	1·1 (0·9–1·3)
Intrapartum CS without indications	0/554	..
Intrapartum CS with indications	284/16 506 (1·7%)	1·5 (1·2–1·7)
Fetal death†		
Spontaneous (reference)	673/74 945 (0·9%)	1
Operative vaginal delivery	68/3448 (2·0%)	1·1 (0·8–1·6)
Antepartum CS without indications	1/1515 (0·1%)	0·4 (0·06–3·2)
Antepartum CS with indications	61/10 853 (0·6%)	0·6 (0·5–0·8)
Intrapartum CS without indications	0/554	..
Intrapartum CS with indications	130/16 504 (0·8%)	0·8 (0·6–1·0)
Neonatal mortality up to hospital discharge‡		
Spontaneous (reference)	399/73 726 (0·5%)	1
Operative vaginal delivery	58/3320 (1·8%)	2·5 (1·7–3·7)
Antepartum CS without indications	0/1514	..
Antepartum CS with indications	82/10 767 (0·8%)	1·7 (1·3–2·3)
Intrapartum CS without indications	0/580	..
Intrapartum CS with indications	154/16 319 (1·0%)	2·6 (2·1–3·2)
Stay for ≥7 days in neonatal ICU§		
Spontaneous (reference)	1092/75 057 (1·5%)	1
Operative vaginal delivery	110/3465 (3·2%)	1·9 (1·5–2·4)
Antepartum CS without indications	5/1515 (0·3%)	0·4 (0·2–1·1)
Antepartum CS with indications	458/10 853 (4·2%)	2·4 (2·0–2·8)
Intrapartum CS without indications	5/554 (0·9%)	1·3 (0·5–3·1)
Intrapartum CS with indications	436/16 506 (2·6%)	2·4 (2·1–2·8)
Perinatal mortality and morbidity index¶		
Spontaneous (reference)	2117/75 057 (2·8%)	1
Operative vaginal delivery	232/3465 (6·7%)	1·9 (1·6–2·3)
Antepartum CS without indications	6/1515 (0·4%)	0·4 (0·2–0·9)
Antepartum CS with indications	593/10 853 (5·5%)	1·9 (1·7–2·2)
Intrapartum CS without indications	5/554 (0·9%)	0·9 (0·4–2·3)
Intrapartum CS with indications	707/16 479 (4·3%)	2·1 (1·9–2·3)

OR=odds ratio. CS=caesarean section. ICU=intensive care unit. *Adjusted for year of education, birthweight, history of neonatal death or stillbirth, severe anaemia, pre-eclampsia, eclampsia, vaginal bleeding in second half of pregnancy, breech or other non-cephalic presentation, referred for complication related to pregnancy or delivery, induced labour, country, and gestational age. †Adjusted for year of education, birthweight, sickle-cell anaemia, severe anaemia, eclampsia, suspected fetal growth impairment, vaginal bleeding in second half of pregnancy, breech or other non-cephalic presentation, referred for complication related to pregnancy or delivery, and gestational age. ‡Adjusted for year of education, birthweight, breech or other non-cephalic presentation, referred for complication related to pregnancy or delivery, country, and gestational age. §Adjusted for year of education, birthweight, caesarean delivery, chronic hypertension, condyloma acuminatum, other medical disorders, prelabour rupture of membranes, pregnancy-induced hypertension, pre-eclampsia, eclampsia, suspected fetal growth impairment, vaginal bleeding in second half of pregnancy, any antenatal antibiotic treatment, breech or other non-cephalic presentation, referred for complication related to pregnancy or delivery, induced labour, country, and gestational age. ¶Perinatal mortality and morbidity index=perinatal mortality or stay for 7 or more days in neonatal ICU. Adjusted for year of education, birthweight, history of neonatal death or stillbirth, caesarean delivery, chronic hypertension, chronic respiratory disorders, diabetes mellitus, condyloma acuminatum, other medical disorders, prelabour rupture of membranes, pregnancy-induced hypertension, pre-eclampsia, eclampsia, suspected fetal growth impairment, vaginal bleeding in second half of pregnancy, any antenatal antibiotic treatment, breech or other non-cephalic presentation, referred for complication related to pregnancy or delivery, country, and gestational age.

Table 4: **Perinatal outcomes for singleton and first child of multiple births by method of delivery**

Risk of perinatal mortality was significantly increased compared with spontaneous vaginal delivery in infants born by operative vaginal delivery and intrapartum caesarean section with indications (table 4). Only infants delivered by antepartum caesarean section with indications had a significantly lower risk of fetal death than those born vaginally, whereas risk of fetal death did not differ significantly for other methods of delivery compared with spontaneous vaginal delivery (table 4). For neonatal mortality up to hospital discharge, infants born by operative vaginal delivery, antepartum caesarean section with indications, and intrapartum caesarean section with indications had significantly increased risk compared with spontaneous vaginal delivery (table 4). We recorded no cases of neonatal mortality up to hospital discharge for women delivering by caesarean section without indication, and the risk compared with spontaneous vaginal delivery could not be estimated.

Infants born by operative vaginal delivery and intrapartum and antepartum caesarean section with indications had significantly increased risk of stay for 7 days or longer in neonatal ICU compared with spontaneous vaginal delivery (table 4). Operative vaginal delivery and antepartum and intrapartum caesarean section with indications had significantly increased risk of perinatal mortality and morbidity index (table 4). For breech and other abnormal presentation, caesarean section with indication, either antepartum or intrapartum, significantly reduced risk of perinatal mortality but had significantly increased risk of stay in neonatal ICU for 7 days or longer (table 5).

Discussion

In the 122 Asian health facilities studied, more than one in four women underwent caesarean section. Facilities in China, Sri Lanka, Vietnam, and Thailand had higher aggregated rates of caesarean section than did those in Cambodia, India, Japan, Nepal, and the Philippines. Operative vaginal delivery and caesarean section were independently associated with increased risk of maternal mortality and morbidity index. Caesarean section without a medical indication was associated with increased risk of maternal mortality and morbidity. Caesarean section for breech presentation was associated with improved perinatal outcomes.

With use of a slightly different analytical approach, this survey confirms the findings of the previous survey undertaken in Latin America.[9] Together these findings provide strong multiregional support for the recommendation of avoiding unnecessary caesarean

sections. A randomised controlled trial[10] to assess the benefits and risks of caesarean section might not be a realistic approach in view of the immediate and long-term physical and psychological effects of different methods of delivery on the woman and her baby and the lack of agreement between health professionals. In the absence of a randomised trial, we have to rely on observational studies to elucidate various benefits and risks of this operation. Intrinsic risk associated with the caesarean section operation is not easy to separate from the medical and obstetrical indications that lead to the procedure. In the previous survey, the intrinsic risk was investigated by dividing the method of delivery into three categories: vaginal, elective caesarean section, and intrapartum caesarean section with elective caesarean section as a proxy. We identified six categories as described in the results. Assisted vaginal delivery represents a high-risk situation, and combination of such deliveries with spontaneous vaginal deliveries as the reference group might not be appropriate. Second, we noticed that several births that were recorded as elective had an indication for caesarean section. The group with no medical indication therefore is probably a more appropriate group to assess the intrinsic risk associated with this procedure.

The most important finding of the survey is the increased risk of maternal mortality and severe morbidity, which was analysed as a composite outcome (the maternal mortality and morbidity index), in women who undergo caesarean section with no medical indication. The findings for the individual outcomes that make up the composite outcome suggest that the increased risk is mainly attributable to increased admission to ICU and blood transfusion. Although we acknowledge that both ICU admission and blood transfusion depend on the availability of those services and the potentially differing thresholds for giving blood and for admission of women to ICU or referral to higher levels of care, this outcome is nevertheless important.

Quantification of the risk across facilities and countries might not be appropriate because there will be differences from setting to setting. However, the results show that women receiving the operation are at increased risk of adverse events. We can therefore conclude that women who choose to have caesarean section, and the doctors who recommend the operation with no medical indication, have to make that decision with the understanding of the increased risks. The procedure also costs more than does a vaginal birth. In the UK, each additional vaginal birth instead of caesarean section would save more than £1200.[11] The costs include actual direct cost, use of operating theatre facilities, use of anaesthesia, human resources (theatre nurses, anaesthesiologists), and use of postoperative facilities. In low-income countries with an unmet need for caesarean section, the issue of this procedure being a resource drain is even more important than it is in high-income countries. If this operation is limited to medical indications and unnecessary use is avoided, resources will be used for a need and will not be taken from other parts of the health system.

	n/N (%)	Adjusted OR (95%CI)
Cephalic presentation		
Perinatal mortality*		
Spontaneous (reference)	914/74 250 (1·2%)	1
Operative vaginal delivery	38/2740 (1·4%)	2·0 (1·4–2·9)
Antepartum CS without indications	1/1515 (0·1%)	0·3 (0·05–2·5)
Antepartum CS with indications	115/9213 (1·3%)	1·3 (1·0–1·7)
Intrapartum CS without indications	0/554	..
Intrapartum CS with indications	206/14 333 (1·4%)	1·9 (1·6–2·2)
Fetal death†		
Spontaneous (reference)	557/74 146 (0·8%)	1
Operative vaginal delivery	21/2737 (0·8%)	1·6 (1·0–2·6)
Antepartum CS without indications	1/1515 (0·1%)	0·5 (0·06–3·5)
Antepartum CS with indications	50/9213 (0·5%)	0·9 (0·6–1·2)
Intrapartum CS without indications	0/554	..
Intrapartum CS with indications	85/14 332 (0·6%)	1·1 (0·8–1·4)
Neonatal mortality up to hospital discharge‡		
Spontaneous (reference)	357/73 111 (0·5%)	1
Operative vaginal delivery	17/2705 (0·6%)	2·5 (1·5–4·4)
Antepartum CS without indications	0/1514	..
Antepartum CS with indications	65/9145 (0·7%)	2·0 (1·4–2·7)
Intrapartum CS without indications	0/554	..
Intrapartum CS with indications	121/14 214 (0·9%)	3·1 (2·4–4·0)
Stay for ≥7 days in neonatal ICU§		
Spontaneous (reference)	1067/74 250 (1·4%)	1
Operative vaginal delivery	72/2740 (2·6%)	2·3 (1·7–3·0)
Antepartum CS without indications	5/1515 (0·3%)	0·4 (0·2–1·1)
Antepartum CS with indications	381/9213 (4·1%)	2·4 (2·0–2·8)
Intrapartum CS without indications	5/554 (0·9%)	1·3 (0·5–3·2)
Intrapartum CS with indications	346/14 333 (2·4%)	2·4 (2·1–2·8)
Perinatal mortality and morbidity index¶		
Spontaneous (reference)	1938/74 250 (2·6%)	1
Operative vaginal delivery	108/2740 (3·9%)	2·2 (1·8–2·8)
Antepartum CS without indications	6/1515 (0·4%)	0·4 (0·2–1·0)
Antepartum CS with indications	489/9213 (5·3%)	2·1 (1·8–2·4)
Intrapartum CS without indications	5/554 (0·9%)	1·0 (0·4–2·4)
Intrapartum CS with indications	541/14 333 (3·8%)	2·3 (2·0–2·5)

(Continues on next page)

The situation regarding potential risk of caesarean section is less clear when the woman has medical or obstetric indications for the procedure. We made several statistical adjustments to try to separate the possible effect of caesarean section in the maternal and perinatal outcomes. After all adjustments, women with medical indications for the operation had an increased risk of morbidity and mortality. One possible interpretation is that the increased risk results from the interaction between baseline morbidity and the morbidity specific to caesarean section. Alternatively, the statistical adjustment might have been unable to isolate the effect of the baseline morbidity—ie, the observed increased risk of

	n/N (%)	Adjusted OR (95%CI)
(Continued from previous page)		
Breech and other presentations		
Perinatal mortality‖		
Spontaneous (reference)	158/805 (19·6%)	1
Operative vaginal delivery	88/725 (12·1%)	0·6 (0·4–0·9)
Antepartum CS with indications	28/1637 (1·7%)	0·2 (0·1–0·3)
Intrapartum CS with indications	78/2172 (3·6%)	0·3 (0·2–0·4)
Fetal death**		
Spontaneous (reference)	116/797 (14·6%)	1
Operative vaginal delivery	47/711 (6·6%)	0·5 (0·3–0·7)
Antepartum CS with indications	11/1637 (0·7%)	0·07 (0·03–0·1)
Intrapartum CS with indications	45/2171 (2·1%)	0·2 (0·1–0·3)
Neonatal mortality up to hospital discharge††		
Spontaneous (reference)	42/613 (6·9%)	1
Operative vaginal delivery	41/615 (6·7%)	1·3 (0·7–2·3)
Antepartum CS with indications	17/1619 (1·1%)	0·4 (0·2–0·9)
Intrapartum CS with indications	33/2104 (1·6%)	0·6 (0·3–1·0)
Stay for ≥7 days in neonatal ICU‡‡		
Spontaneous (reference)	25/805 (3·1%)	1
Operative vaginal delivery	38/725 (5·2%)	1·7 (1·0–3·1)
Antepartum CS with indications	77/1637 (4·7%)	2·0 (1·1–3·6)
Intrapartum CS with indications	90/2172 (4·1%)	2·1 (1·2–3·7)
Perinatal mortality and morbidity index§§		
Spontaneous (reference)	179/805 (22·2%)	1
Operative vaginal delivery	124/725 (17·1%)	0·7 (0·5–1·0)
Antepartum CS with indications	104/1637 (6·4%)	0·4 (0·3–0·6)
Intrapartum CS with indications	166/2172 (7·6%)	0·6 (0·4–0·8)

OR=odds ratio. CS=caesarean section. ICU=intensive care unit. *Adjusted for year of education, birthweight of previous baby, history of neonatal death or stillbirth, severe anaemia, pre-eclampsia, eclampsia, vaginal bleeding in second half of pregnancy, referred for complication related to pregnancy or delivery, induced labour, country, and gestational age. †Adjusted for year of education, birthweight of previous baby, sickle-cell anaemia, severe anaemia, eclampsia, suspected fetal growth impairment, vaginal bleeding in second half of pregnancy, referred for complication related to pregnancy or delivery, incentive for caesarean section, and gestational age. ‡Adjusted for year of education, birthweight of previous baby, referred for complication related to pregnancy or delivery, country, and gestational age. §Adjusted for year of education, birthweight of previous baby, previous caesarean delivery, chronic hypertension, diabetes mellitus, condyloma acuminatum, other medical disorders, prelabour rupture of membranes, pregnancy-induced hypertension, pre-eclampsia, eclampsia, suspected fetal growth impairment, any antenatal antibiotic treatment, referred for complication related to pregnancy or delivery, induced labour, country, and gestational age. ¶Perinatal mortality and morbidity index=perinatal mortality or stay for 7 days or more in neonatal ICU. Adjusted for maternal age, year of education, birthweight, cervix surgery, chronic hypertension, chronic respiratory disorders, diabetes mellitus, severe anaemia, condyloma acuminatum, other medical disorders, prelabour rupture of membranes, pregnancy-induced hypertension, pre-eclampsia, eclampsia, suspected fetal growth impairment, vaginal bleeding in second half of pregnancy, any antenatal antibiotic treatment, referred for complication related to pregnancy or delivery, country, and gestational age. ‖Adjusted for fistula, eclampsia, vaginal bleeding in second half of pregnancy, referred for complication related to pregnancy or delivery, country, and gestational age. **Adjusted for sickle-cell anaemia, vaginal bleeding in second half of pregnancy, referred for complication related to pregnancy or delivery, and gestational age. ††Adjusted for referred for complication related to pregnancy or delivery, induced labour, and gestational age. ‡‡Adjusted for condyloma acuminatum, prelabour rupture of membranes, vaginal bleeding in second half of pregnancy, any antenatal antibiotic treatment, country, and gestational age. §§Adjusted for birthweight, fistula, prelabour rupture of membranes, eclampsia, vaginal bleeding in second half of pregnancy, referred for complication related to pregnancy or delivery, induced labour, country, and gestational age.

Table 5: **Perinatal outcomes for singleton and first child of multiple births by fetal presentation at delivery and method of delivery**

mortality and morbidity could be attributed to the baseline conditions that caused the procedure to be undertaken. We detected a similar relation for assisted vaginal deliveries.

Findings from our survey confirm the protective effect of caesarean section on perinatal mortality for cases of breech or other presentations.[12] This result should be considered as additional evidence for strongly recommending avoidance of vaginal deliveries for breech presentations, while promoting the use of external cephalic version for term breech presentation even if the woman is already in labour.[13]

This study has several strengths. First, it is one of the largest observational studies to address the issue of benefits and harms of caesarean section, complementing the earlier surveys undertaken in Latin America[7,9] and Africa (unpublished). Second, the random selection of two provinces in addition to the capital province, and then random selection of participating facilities with more than 1000 deliveries per year, ensured avoidance of selection bias. A secondary aim of the project was to strengthen the capacity of a network of health facilities in routine data collection and collaborative research. The random selection process was crucial in working with facilities that had not previously participated in research projects. The high data-extraction quality suggested by the random data checks was very encouraging. In several participating countries, including China and India, data were entered online within facilities, which helped with the resolution of data queries. Afghanistan and Pakistan have been added to this network of facilities in 24 countries where the survey has been undertaken, and these 26 countries will implement the next survey that will focus on maternal and neonatal near miss in the next phase of the project in 2010–11.

Our study has some limitations. First, we had information about mortality and morbidities only until discharge from hospital; some outcomes might therefore have been underestimated, especially for women delivering vaginally who are usually discharged earlier than women having caesarean section. The calculated odds ratio might overestimate the risk of caesarean section. Although we had adjusted for many potential confounding factors, there might be some other factors that we did not have information about and could not adjust for. Second, data were abstracted from the patients' records. We were not able to confirm the absence of some of the risk factors if they had not been recorded. Third, our survey included only hospitals with caesarean facilities having 1000 or more deliveries every year. The results therefore cannot be generalised to smaller facilities. The results, especially rates of caesarean section, should not be regarded as representative rates and outcomes for entire countries or regions.

In view of the strengths and the limitations, our results are corroborated by other observational studies assessing the risks of caesarean section for mothers[14] and infants from different settings.[15] We conclude that caesarean section should be done only when there is a medical indication to improve the outcome for the mother or the baby. Women and their carers who plan to undertake

caesarean section delivery should discuss the potential risks to make an informed decision if they still wish to have a caesarean delivery.

Contributors

PL, ML, AMG, and JPS coordinated the study. EF participated in the preparatory activities, developing the study materials, and site visits. JV was the lead investigator in the first phase of the project undertaken in Latin America and Africa. In the Asia survey, JV supported the preparatory activities such as modifications in the forms, manuals, and training planning. PL, ML, AMG and JPS planned and undertook the analysis and wrote the report with input from all country investigators and GC (regional coordinator of the Latin American survey). KB-T undertook site visits, training, and contributed to the writing of the report. PR, GY, KChu, MR, NDH, RM, KChe, TR, DEA, ST, NS, MF, HTB, VU, and MJVC contributed to study design, data collection, data analysis, data interpretation, and writing of the report. All authors read and approved the final report.

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Conflicts of interest

We declare that we have no conflicts of interest.

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添付資料　4

WHO Survey Report

WHO全世界周産期調査にご協力いただきました皆様へ

上記の調査にご協力いただき、改めて感謝申し上げます。おかげさまで、日本で参加しました病院すべてにおいて、短期間に非常に質の高いデータを収集することができ、WHO本部としても大変感謝しております。

ほかのアジア諸国との比較解析をWHO本部が行い、ようやく終りましたので、結果を同封させていただきます。
この本解析が終わるまで日本国内のデータに関してまとめることができないことになっていましたので、報告の送付が遅くなったことをお詫び申し上げます。
今回日本国内で参加した１０の病院は、首都をもつ行政区域とその他の行政区域から二か所を無作為抽出し、その後それぞれの行政区域（都道府県）ないにある施設の中で、年間分娩数が 1000 を超える施設すべて、あるいはその施設数が 7 を超える場合はさらに無作為に 7 病院を抽出するという手法で選ばれました。今回選ばれたすべての病院にご了解を得て、データをすべて収集いたしました。データは、2008 年の 2 月から 4 月に出生を迎えたすべての分娩に関するものとなっており、これはすべての病院に共通です。
また追加の解析など、ご要望やご意見などありましたら、ご遠慮なくお知らせください。

今回の周産期全世界調査は日本全体の周産期医療を把握するだけではなく、発展途上国における周産期医療の発展のためにも大変貴重なデータとなりました。改めましてみなさまのご協力に感謝申し上げます。

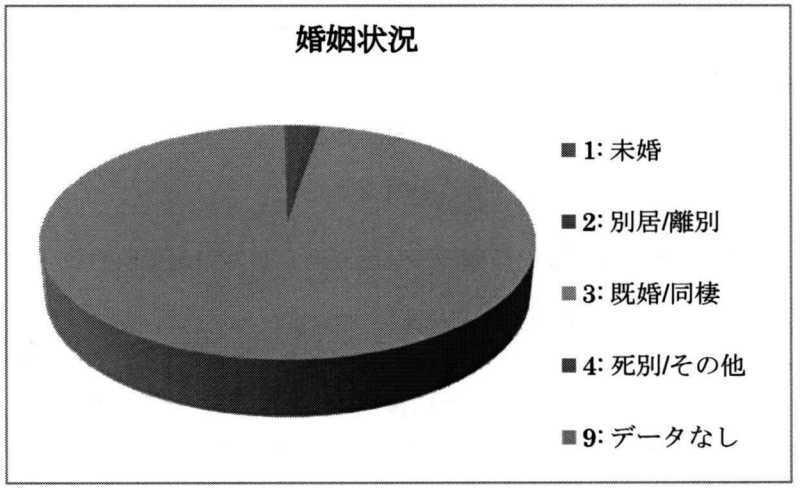
WHO全世界周産期調査・日本国内担当
東京大学医学系研究科国際保健政策学准教授・森　臨太郎

全体のデータ

（日本で参加した１０の病院の合計データ）

女性の個人情報

1.）婚姻状況



	N	%
1: 未婚	54	1.61
2: 別居/離別	34	1.01
3: 既婚/同棲	3260	97.14
4: 死別/その他	3	0.09
9: データなし	5	0.15
合計	3356	100