

## Public health reviews

# A systematic review of inequalities in the use of maternal health care in developing countries: examining the scale of the problem and the importance of context

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**Abstract** Two decades after the Safe Motherhood campaign's 1987 launch in India, half a million women continue to die from pregnancy-related causes every year. Key health-care interventions can largely prevent these deaths, but their use is limited in developing countries, and is reported to vary between population groups. We reviewed the use of maternal health-care interventions in developing countries to assess the extent, strength and implications of evidence for variations according to women's place of residence and socioeconomic status. Studies with data on use of a skilled health worker at delivery, antenatal care in the first trimester of pregnancy and medical settings for delivery were assessed. We identified 30 eligible studies, 12 of which were of high or moderate quality, from 23 countries. Results of these studies showed wide variation in use of maternal health care. Methodological factors (e.g. inaccurate identification of population in need or range of potential confounders controlled for) played a part in this variation. Differences were also caused by factors related to health-care users (e.g. age, education, medical insurance, clinical risk factors) or to supply of health care (e.g. clinic availability, distance to facility), or by an interaction between such factors (e.g. perceived quality of care). Variation was usually framed by contextual issues relating to funding and organization of health care or social and cultural issues. These findings emphasize the need to investigate and assess context-specific causes of varying use of maternal health care, if safe motherhood is to become a reality in developing countries.

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Une traduction en français de ce résumé figure à la fin de l'article. Al final del artículo se facilita una traducción al español. الترجمة العربية لهذه الخلاصة في نهاية النص الكامل لهذه المقالة.

## Introduction

Two decades after the launch of the Safe Motherhood campaign in India in 1987, half a million women, most of whom live in developing countries, continue to die from maternal causes each year.<sup>1</sup> Key health-care interventions can largely prevent women from dying of pregnancy-related causes. Attendance of antenatal care, delivery in a medical setting and having a skilled health worker at delivery improve maternal health.<sup>2–5</sup> However, use of these interventions is limited in developing countries.<sup>6</sup>

Maternal health-care use is also reported to vary within developing countries, with most findings showing differences between affluent and poor women, and between women living in urban and rural areas.<sup>7–9</sup> However, since the methodological quality of these studies has not been assessed systematically, it is

difficult to draw conclusions on which to base policy recommendations.

Additionally, factors related to place of residence and socioeconomic status may account for variations in use of maternal health care. These factors include women's age,<sup>10,11</sup> ethnicity,<sup>12</sup> education,<sup>7,10,13</sup> religion,<sup>13,14</sup> culture,<sup>15</sup> clinical need for care<sup>15</sup> and decision-making power.<sup>16</sup> The costs,<sup>17</sup> location<sup>7,18</sup> and quality of health services are also important.<sup>19</sup> These factors interact in different ways to determine use of health care. For example, rural women in northern India and those in KwaZulu Natal, South Africa, do not use antenatal care adequately, but for different reasons. In India, affluent rural women are unwilling to invite health workers into their homes;<sup>13</sup> in KwaZulu Natal, women have little time left after attending to essential household tasks.<sup>18</sup> When methodologi-

cally robust research shows variations in maternal health-care use according to women's place of residence or socioeconomic status, an understanding of context is essential to design delivery mechanisms to redress such inequalities.

We therefore undertook a systematic review of the use of key maternal health-care interventions in developing countries by women's place of residence and socioeconomic status. We sought to assess the extent and strength of evidence for variations in use, and to investigate the contextual circumstances of any variations shown in studies of moderate or high quality.

## Methods

### Identification of studies

Four electronic databases (MEDLINE, EMBASE, CAB Direct and POPLINE)

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were searched by developing search strategies specific to their medical subject headings and text words with the help of an expert librarian. Subject headings or text words related to reproductive and maternal health-care delivery (reproductive health services, reproductive health-care delivery, reproductive health-care utilization, maternal health services, obstetric care, women's health services, pregnancy complications) were combined with those related to access variables or population characteristics (access, utilization, equity, health service access, equity, inequality, determinant, socioeconomics, income; detailed search strategies are available from the authors on request). Web pages of organizations known to be active in the field and reference lists of retrieved articles were screened for further relevant papers.

We identified population-based cohort studies, case-control studies or cross-sectional studies that were reported in the English language, that were undertaken in developing countries and that reported the effect of the selected non-clinical factors on the use of maternal health care by women aged 15–49 years. A country's development status was determined by the United Nations classification. The published data had to report, or enable us to estimate, the association between non-clinical factors and use of health care by calculation of the ratio of the frequency of use for one group compared with that for another. If these data were not reported, we had to be able to cite the result of a statistical test for differences between the groups. Therefore, we did not consider qualitative studies of health-care use or health-care-seeking behaviour.

Research published before 1990 or including data from before 1985 was excluded, because the rapid development of maternal health care in the 1990s reduced the relevance of data from the 1980s. If publications of secondary analyses from large national surveys were identified for consecutive years from the same country, only the most recent version was considered. Data for only the most recent year were extracted if information existed for consecutive years within one publication.

### Outcome measures, non-clinical factors and need

Outcome measures of interest were use of a skilled health worker at delivery

(a medically trained person attending delivery, with or without specification of obstetric training), attendance of antenatal care in the first trimester of pregnancy (studies that reported frequency of antenatal visits without timing were excluded) and delivery in a medical setting (regardless of level of care). Non-clinical factors of concern were place of residence (urban versus rural) and economic status (assessed by possession of assets, household characteristics, income levels or expenditures). The population in need of health care was defined as pregnant women aged 15–49 years, although delivery in medical settings is not necessary for all women.<sup>20,21</sup>

### Study quality and data extraction

The first author identified articles by examining titles, then abstracts, for relevance, and retrieved the full text of relevant abstracts for further assessment. Uncertainties were resolved through discussions with the second author. Both authors extracted data independently from each included study on a customized form. Information on contextual factors was extracted from the discussion sections of the articles. Methodological quality, in terms of internal validity and generalizability, was assessed with a checklist of quality criteria (Box 1) developed by both authors on the basis of existing

instruments for observational studies.<sup>22–25</sup> Criteria judged to be especially important were related to the ability of the studies to identify the entire population in need of care, provision of explicit definitions for outcomes and independent variables, and controlling for potential confounders. Each criterion was answered on a scale from “not reported” to “well-covered”. Disagreement between the authors about study quality was resolved by reviewing the article again together.

We extracted, or calculated from proportions, numerator data (use of health services) and denominator data (population in need of health care) for each comparison group where possible. We extracted crude odds ratios (OR), adjusted odds ratios, or both, as reported. If these data were not reported, we calculated crude odds ratios and 95% confidence intervals (CI) if numerator and denominator data were available. We converted associations presented as correlation coefficients ( $\beta$ ) into odds ratios by taking the inverse natural log of the coefficients. We presented results of statistical significance tests if odds ratios could not be obtained.

Because of the wide variation in study populations, definitions of non-clinical factors, outcome measures and confounders investigated, it was not appropriate to obtain a statistical summary for the size of the effect of specific non-

#### Box 1. Criteria used to assess quality of included studies

- Study addresses a clearly focused question
- Characteristics of study population are clearly described
- Clear eligibility criteria for selection of participants
- Participants are representative of target population
- Indicates how many of those asked to participate did so in each group
- Outcomes clearly defined
- Justification provided for independent variables and definitions
- Study-specific data collection
- Data collection tools defined
- Valid and reliable measurement of assessment of outcome and other independent variables
- Valid and reliable measure of assessment of exposures
- Indicates number of participants for whom data analysed in each group
- Main potential confounders identified and controlled for in the analysis [socio-demographic, health beliefs, attitudes and relevant health status measures (i.e. previous pregnancy outcomes, problems during ongoing pregnancy)]
- Factors influencing need for care are explored and taken into account in the analysis (i.e. health beliefs, attitudes, obstetric risk measures)
- Confidence intervals provided
- If individual and group level variables were analysed in the same model, multilevel modelling used

clinical factors on each outcome. We tabulated and summarized data as brief narrative for each outcome measure. Low-quality studies are included in the tables, but their findings were given less weight in the narrative summary.

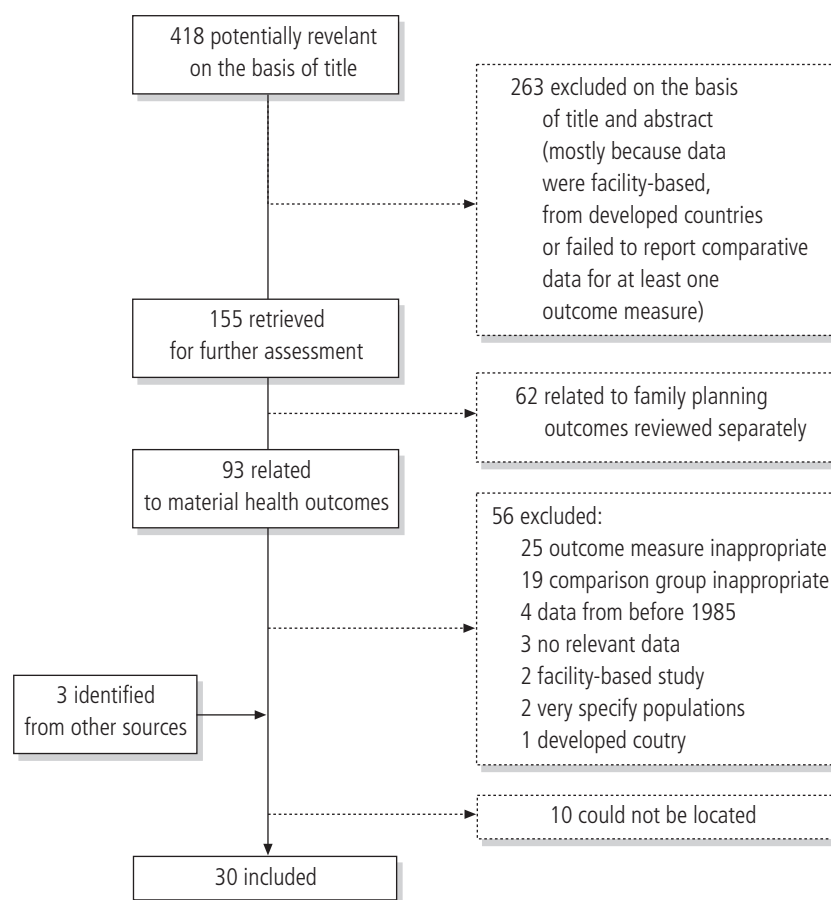
### Analytical framework

We used an extended version of an analytical framework that we have previously used to explain variations in health-care use.<sup>23</sup> The extended framework outlined the steps that must be followed to explain results. First, methodological quality was assessed to judge whether findings were likely to be artefactual and caused by chance or bias. Second, we attempted to account for results in terms of factors related to health-care users, factors related to the supply of health care, or an interaction between the two; we focused on whether findings could be explained by variations in women's socioeconomic status or place of residence. Third, variations in use of health care by socioeconomic status or place of residence were placed in context to seek a complete explanation.

### Description of studies

We identified 5575 citations for maternal health care and family planning outcomes, of which 418 were judged to be potentially relevant. Citations were excluded at this stage mostly because they reported no quantitative data or data on other outcome measures. When abstracts had been reviewed, 155 studies were retrieved for full evaluation, of which 93 were related to use of maternal health care. Fifty-six of these studies had to be excluded (Fig. 1); a further 10 could not be located (three were unpublished conference proceedings). Therefore, 27 studies were included. Identification of an additional three studies from the reference lists of included papers and websites brought the total number of included studies to 30, from 23 countries in three continents (Annex 1, available at: <http://www.who.int/bulletin/volumes/85/10/06-035659/en/index.html>). Three studies were of high quality, nine of moderate quality, and 18 of low quality. Twenty-one studies examined delivery in medical settings; the outcome of interest was the presence of a skilled health worker at delivery in 11 studies and antenatal care attendance in the first trimester of pregnancy in six.

Fig. 1. Identification of studies



Thirteen studies were secondary analyses of large retrospective cross-sectional surveys, four were analyses of other existing data, and 13 were done prospectively. Two studies provided separate analyses from different country settings<sup>26,27</sup> and one from different states of India.<sup>28</sup>

## Findings

### Skilled health worker at delivery Urban-rural differences

Seven studies (three of moderate quality, four of low quality) assessed urban-rural differences in having a skilled health worker at delivery in nine countries (Table 1, available at: <http://www.who.int/bulletin/volumes/85/10/06-035659/en/index.html>). The three moderate-quality studies reported significant differences in favour of urban women in Tajikistan (adjusted OR, 3.48; 95% CI: 1.50–8.06),<sup>29</sup> Nepal ( $P < 0.01$ ),<sup>30</sup> and three of four Indian states [adjusted ORs between 1.42 ( $P < 0.10$ ) and 2.30 ( $P < 0.01$ )].<sup>28</sup> These findings seemed to be confirmed by those from low-quality studies in Ethiopia, Kenya, Turkey, and

the United Republic of Tanzania,<sup>27,31–33</sup> although two of these studies did not make adjustments for potential confounding factors. Other low-quality studies reported no differences (Paraguay, Uganda) or lower use by urban women than by rural women (India;  $P < 0.10$ ).<sup>27</sup>

### Economic differences

Nine studies on the effect of economic status on having a skilled attendant at delivery provided 15 analyses (Table 1). One study was of high<sup>34</sup> quality and five were of moderate quality.<sup>16,28–30,35</sup> The high-quality study showed no effect of economic status, defined by landholding size across three groups in Bangladesh.<sup>34</sup> Instead, factors that affected this practice included the education of the woman and of her husband, complications of delivery and receipt of antenatal care. By contrast, all studies of moderate quality showed consistently greater use of a skilled health worker at delivery by affluent groups compared with poorer women. In four Indian states, economic

status was defined by a standard-of-living index that included household assets and environmental characteristics. This study showed differences by standard of living that remained significant after controlling for potential confounders, including age, education of the woman and of her husband, obstetric history, caste and occupation.<sup>28</sup> These findings were consistent with those of other moderate-quality studies, which defined economic status in terms of house-building materials in India (adjusted OR, 2.87; 95% CI: 1.70–4.84),<sup>35</sup> income levels in China (adjusted OR, 1.38; 95% CI: 1.06–1.79),<sup>16</sup> and total expenditure per capita in Tajikistan [adjusted OR between 2.09 (95% CI: 0.98–4.46) and 3.41 (95% CI: 1.58–7.06) across quintiles]<sup>29</sup> and Nepal ( $P < 0.01$ ).<sup>30</sup> Results of low-quality studies were generally consistent with these findings<sup>27,32</sup> or showed no difference.<sup>27,36</sup>

### Medical setting for delivery Urban-rural differences

Ten studies on urban-rural differences in delivery in medical settings were identified, including one of high quality and four of moderate quality. These studies reported 16 analyses from eleven countries (Table 2, available at: <http://www.who.int/bulletin/volumes/85/10/06-035659/en/index.html>). The high-quality study showed that urban women in Jamaica were significantly more likely than rural women to deliver in medical settings ( $P < 0.01$ ) after controlling for probable confounders, including pregnancy complications and attendance of antenatal care.<sup>3</sup>

These findings were confirmed by the studies of moderate quality in three states and a sub-district in India, Morocco and Tajikistan [adjusted ORs from 2.13 (95% CI: 1.21–3.76) to 3.64 ( $P < 0.01$ )]<sup>28,29,37,38</sup> and in four low-quality studies in Belize, Ghana, Kenya, Uganda and the United Republic of Tanzania.<sup>27,32,39,40</sup> Three of these studies controlled for factors that could pose a risk during delivery.<sup>28,37,38</sup> No differences were found in India's Kerala state<sup>28</sup> or in Nepal.<sup>41</sup>

### Economic differences

Seventeen studies looked at the association between economic status and use of medical settings for delivery (Table 2). The only high-quality study used per-capita household expenditure to mea-

sure economic status.<sup>3</sup> Higher economic status was associated with an increased probability of using medical settings for delivery in Jamaica ( $P < 0.01$ ) after controlling for probable confounders including education, living in the metropolitan area, pregnancy complications and receipt of antenatal care. Three of the five moderate-quality studies reported similar findings; in India, where economic status was assessed either by the financial value of household assets [adjusted OR, 1.23 ( $P < 0.05$ ) for middle economic groups and 1.55 ( $P < 0.01$ ) for wealthier groups, compared with poorer groups]<sup>37</sup> or by different standards of living;<sup>28</sup> and in Morocco (adjusted OR, 2.94; 95% CI: 1.45–6.04).<sup>38</sup> By contrast, moderate-quality studies undertaken in Guatemala and Tajikistan showed no effect of economic status, measured by food consumption and per-capita household expenditure, respectively.<sup>12,29</sup> Instead, determinants of delivering in a medical setting included education, age, obstetric risk measures, medical insurance, time to travel to site of care and openness to the outside world in Guatemala;<sup>12</sup> and education, region, availability of polyclinic in the community and timing of the birth in Tajikistan.<sup>29</sup> The low-quality studies tended to report either an association between higher economic status and increased use,<sup>27,32,42–45</sup> or no difference with increasing wealth.<sup>19,46–49</sup>

### Antenatal care in the first trimester

#### Urban-rural differences

Five studies, one of high quality and three of moderate quality, examined the effect of urban-rural residence on antenatal care during the first trimester of pregnancy (Table 3, available at: <http://www.who.int/bulletin/volumes/85/10/06-035659/en/index.html>). The high-quality study showed that urban women in Jamaica were significantly less likely ( $P < 0.05$ ) than rural women to attend antenatal care during this period.<sup>3</sup> By contrast, the moderate-quality studies reported no significant difference between urban and rural women in India<sup>28,37</sup> or reported that urban women were significantly more likely to attend antenatal care during the first trimester in Brazil (adjusted OR, 1.37;  $P < 0.01$ ) after controlling for probable confounders, including sociodemographic and economic factors.<sup>26</sup> Results of the low-quality study

from Ecuador were consistent with those from Brazil.<sup>50</sup>

### Economic differences

Six studies (two studies of high quality, three of moderate quality) assessed the effect of economic status on attendance of antenatal care during the first trimester (Table 3). The two high-quality studies from Jamaica found that an increased probability of early antenatal care attendance was associated with increased household expenditure ( $P < 0.001$ )<sup>3</sup> after controlling for mainly sociodemographic factors and differences across income quartiles in favour of wealthier women.<sup>5</sup> Economic status, measured by household assets score or living standards, was also significantly associated with antenatal care in the first trimester in Brazil (adjusted OR, 3.51;  $P < 0.001$ ), South Africa (adjusted OR, 2.88;  $P < 0.001$ )<sup>26</sup> and India's Kerala state (adjusted OR, 1.51;  $P < 0.05$ ).<sup>28</sup> However, two other studies of moderate quality in other parts of India showed no effect of economic status after controlling for potential confounders.<sup>28,37</sup> In these studies, factors associated with receipt of early antenatal care were education, pregnancy order, women's autonomy and obstetric risk measures.

### The importance of context

Contextual factors that could account for variations found in studies of moderate and high quality were identified and summarized (Tables 1–3). The diversity of findings between and within populations reflected a wide range of different ethnic, cultural and religious groups among the women surveyed, who reported important differences in beliefs and preferences relating to formal and informal maternal health care. These variations were explained by differences in women's autonomy, gender relationships and social networks, which are influenced by embedded social structures, religion and cultural beliefs. For example, the extent of an Indian woman's autonomy, which is often determined by continued links with her parental family after marriage, affected use of skilled delivery care, because living with or near a member of her birth family increased her ability to leave the house and go where she wanted.<sup>35</sup> However, among rural Chinese women, freedom of movement did not affect rates of delivery with the help of a skilled health worker.<sup>16</sup> Jamaican women did not want

to be treated as ill during uncomplicated pregnancies, and so tended to delay initiation of antenatal care.<sup>3</sup> Non-white South African women did not see the value of antenatal care, aside from it being necessary to allow access to care during delivery; therefore they began antenatal visits later in pregnancy.<sup>26</sup>

The wide range of health policies, financing arrangements and organizational structures also needed to be taken into account. Women who did not comply with policies to restrict numbers of children in China tended to avoid formal maternal health care to prevent being discriminated against by health-care providers.<sup>16</sup> Following the end of apartheid, health policies in South Africa have been especially concerned with increasing access to primary health care, including maternal health care.<sup>26</sup> Health care is free for pregnant women in Jamaica and South Africa.<sup>3,5,26</sup> By contrast, the private and informal sectors are increasingly active in provision of maternal health care in India.<sup>37</sup> Introduction of fees for maternal health care in Morocco during reorganization of the health sector was thought to limit access for poor women.<sup>38</sup> Differences in use of skilled delivery care across economic groups were explained by informal charges in Tajikistan, where maternal health care was officially free of charge.<sup>29</sup> Interventions aimed at poor areas did not benefit poor and underserved women in Brazil.<sup>26</sup> By contrast, multipurpose health workers facilitated provision of antenatal care in remote parts of Karnataka in India, where rural residence and economic status did not affect this aspect of care.<sup>28</sup>

Interactions between factors at the level of the individual and those associated with supply or organization of health care were often crucial. Women in Tajikistan preferred to deliver at home because although medical settings were accessible and free of charge, women perceived these settings to be of very low quality and unsafe.<sup>29</sup> Midwives' advice on where to deliver was ignored by Jamaican women, who perceived the midwives to be too authoritarian.<sup>3</sup> Women in rural Guatemala were less likely to deliver in medical settings because of the lack of social support provided by health-care professionals compared with traditional midwives.<sup>12</sup>

## Discussion

Overall, the evidence we reviewed showed that use of maternal health care varied greatly both within and between countries. Within countries, urban or wealthier women were usually more likely to deliver with the help of a skilled health worker than were rural or poor women. Urban women were more likely to use medical settings for delivery than were rural women. In some countries, wealthier women tended to deliver in medical settings, but in others (e.g. Guatemala and Tajikistan) economic status did not affect such practices. The association between place of residence and receipt of early antenatal care was not consistent. Some evidence suggested that wealthier women were more likely than poorer ones to receive early antenatal care, although no such difference was found in India.

## Methodological issues

We located few studies of high or moderate quality, and eight studies<sup>19,35,36,41,43,45,48,49</sup> had sample sizes of less than 500 women, restricting the ability to draw conclusions. In some instances, the population in need of health care was not identified accurately because data were collected for other purposes, such as the evaluation of child health; for example, in one study, the population was restricted to married women younger than 35 years with at least one child younger than 5 years.<sup>37</sup> The definition of need for maternal health care was also inconsistent: eligible groups included women who had given birth ever,<sup>29,46</sup> in the past 45 days<sup>43</sup> and in the past 5 years.<sup>12,32,33,38–40,47</sup>

The choice of potential confounders was another important reason for the difference in findings. Some studies did not adjust for any probable confounders.<sup>44,47</sup> Those that did used a wide range of confounders in different combinations. Variables included user-related items such as education, religion, ethnicity, marital status, age, women's or partners' education and number of children,<sup>28,38–40,43</sup> and supply-related items including distance to care and characteristics of health care facility.<sup>12,27,29,38</sup> However, other variables of probable importance, such as obstetric risk and users' beliefs and preferences, were often not mentioned.

We also noted wide variation in definitions of non-clinical factors, confounders and outcomes, all of which

probably contributed to the diversity of the findings. Measures of economic status varied greatly, ranging from land-holding size<sup>34</sup> or the type of walls<sup>35</sup> or roof<sup>47</sup> of housing to more conventional measures such as household income,<sup>36,45</sup> expenditure<sup>3,29</sup> or asset scores.<sup>26</sup>

Some investigators did not provide definitions for outcomes, probable confounders and non-clinical factors.<sup>33,41,44</sup> Reliance on women's self-reported histories of pregnancy and delivery up to 5 years previously made findings susceptible to recall bias.

## Potential limitations

First, the search strategy might not have identified all relevant papers. To check for completeness, we also searched reference lists of included papers, and identified only two additional articles. However, practical constraints restricted the search strategy to papers in the English language, meaning that relevant studies published in other languages were missed. Second, maternal health-care indicators were defined in broad terms; for example, it was not feasible to consider the relative effectiveness of different types of skilled health workers. The definitions chosen were, however, relevant from a policy perspective in the context of the millennium development goals. Third, the quality assessment instrument did not undergo formal psychometric evaluation, but was based on an existing widely used instrument, was deemed to have content validity, and was used by two authors independently. We felt that this instrument was adequate for our objective: to provide an explicit indication of study quality, rather than precise measurement.

## Conclusion

This review demonstrates variations in the use of maternal health care across populations both within and between 23 developing countries. Variations were partly explained by methodological differences in study designs. However, important and diverse contextual factors were also identified, many relating to the funding and organization of health care. In addition, more subtle, but equally influential, context-specific individual level factors emerged, as did interactions between individual level and health service-related factors. Two reasons for the limited success of the safe motherhood campaign during the

past two decades have been the lack of rigorous analysis of the data available on variations in use, together with an inadequate grasp of the contextual issues that must be addressed if inequalities in maternal health care use are to be reduced. Our results highlight the need to thoroughly explore and address context-specific causes of variable use of

maternal health care if safe motherhood is to become a reality in developing countries. ■

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**Competing interests:** None declared.

## Résumé

### Examen systématique des inégalités en matière de recours aux soins de santé maternels dans les pays en développement : étude de l'ampleur du problème et de l'importance du contexte

Vingt ans après le lancement de la Campagne pour une maternité sans risque en 1987 en Inde, un demi million de femmes continuent de mourir chaque année de causes liées à la grossesse. Un certain nombre d'interventions sanitaires essentielles peuvent prévenir dans une large mesure ces décès, mais leur application est limitée dans les pays en développement et signalée comme très variable d'un groupe de population à un autre. Nous avons étudié le recours aux interventions sanitaires délivrant des soins maternels dans des pays en développement afin d'évaluer l'ampleur, la force et les implications des preuves de variations de ce recours en fonction du lieu de résidence des femmes ou de leur statut socioéconomique. Des études apportant des données sur le recours à un agent de santé qualifié lors de l'accouchement, à des soins anténataux pendant le premier trimestre de grossesse et à un établissement médical pour l'accouchement ont été évaluées. Nous avons trouvé 30 études exploitables, dont 12 étaient de qualité bonne à moyenne, en provenance de 23 pays. Les résultats de ces études font apparaître de grandes variations dans le recours aux

soins de santé maternels. Des facteurs méthodologiques (définition imprécise de la population ayant besoin de ces soins ou de la gamme de facteurs de confusion potentiels contrôlés, par exemple) ont joué un rôle dans ces variations. Certaines différences étaient également imputables à des facteurs liés aux usagers des soins de santé (âge, éducation, assurance maladie, facteurs de risque cliniques, par exemple), à la dispensation des soins (disponibilité d'un dispensaire, distance à l'établissement, par exemple) ou à une interaction entre ces facteurs (perception de la qualité de soins, par exemple). Ces variations étaient habituellement conditionnées par des aspects contextuels, liés au financement et à l'organisation des soins de santé, ou par des facteurs d'ordre culturel ou social. Les résultats de cette étude font ressortir clairement qu'il est nécessaire de rechercher et d'évaluer les causes propres au contexte des variations du recours aux soins de santé maternels si l'on veut atteindre l'objectif d'une maternité sans risque dans les pays en développement.

## Resumen

### Revisión sistemática de las desigualdades en atención de salud materna en los países en desarrollo: estudio de la magnitud del problema y la importancia del contexto

Transcurridos dos decenios desde el lanzamiento, en 1987, de la campaña Maternidad sin Riesgos en la India, medio millón de mujeres siguen muriendo por causas relacionadas con el embarazo cada año. Una serie de importantes intervenciones sanitarias permiten prevenir esas defunciones, pero la implementación de las mismas es limitada en los países en desarrollo y varía según el grupo de población. Analizamos la aplicación de intervenciones de salud materna en los países en desarrollo a fin de evaluar la magnitud, contundencia e implicaciones de los datos probatorios sobre las diferencias al respecto en función del lugar de residencia y la situación socioeconómica de las mujeres. Se evaluaron con ese fin los estudios que aportaban datos sobre la utilización de trabajadores sanitarios calificados durante el parto, la atención prenatal en el primer trimestre de embarazo y el entorno médico del parto. Identificamos 30 estudios que reunían los requisitos fijados, 12 de ellos de calidad moderada o alta, y abarcaban 23 países. Los resultados de esos trabajos mostraron amplias

diferencias en el uso de los servicios de salud materna. Algunos factores metodológicos (como por ejemplo la identificación inexacta de la población necesitada o el número de factores de confusión controlados) explican parte de esas diferencias. Pero éstas se debían también a factores relacionados con las usuarias de los servicios de salud (p. ej., la edad, la educación, el seguro médico o los factores de riesgo clínicos), con la oferta de atención sanitaria (p. ej., la disponibilidad de consultorios o la distancia hasta el establecimiento), o con la interacción entre esos factores (por ejemplo la calidad percibida de la atención). Las diferencias se inscribían por lo general en cuestiones contextuales relacionadas con la financiación y la organización de la atención sanitaria o con aspectos sociales y culturales. Estos resultados subrayan la necesidad de investigar y evaluar las causas contextuales del diferente uso de la atención de salud materna, a fin de que la maternidad sin riesgo se convierta en una realidad en los países en desarrollo.

## ملخص

### مراجعة منهجية لأوجه الجور في الانتفاع بالرعاية الصحية الأمومية في البلدان النامية: دراسة مدى المشكلة وأهمية السياق

هذه الدراسات تفاوتاً كبيراً في الانتفاع بالرعاية الصحية الأمومية. وقد كان للعوامل المنهجية (مثل التعرّف غير الدقيق على السكان المحتاجين أو مدى التحكم بالعوامل التي يحتمل تداخلها) دور في هذا التفاوت. كما نجمت الاختلافات عن عوامل تتعلق بالمستخدمين للرعاية الصحية (مثل العمل والتعلم والضمان الصحي وعوامل الخطر السريرية)، أو تتعلق بإيتاء الرعاية الصحية (مثل توافر المرافق الصحية والبعد عن المرفق الصحي)، أو تتعلق بالتفاعل المتبادل بين هذه العوامل (مثل جودة الرعاية المتوخاة). وتتشكل هذه التفاوتات بفعل قضايا سياقية تتعلق بتمويل وتنظيم الرعاية الصحية أو بقضايا اجتماعية أو ثقافية. وتؤكد هذه الموجودات الحاجة لدراسة وتقييم الأسباب الخاصة بالسياق والمتعلقة بتفاوت الانتفاع من الرعاية الصحية الأمومية، وذلك إذا كان المطلوب أن تصبح الأمومة المأمونة حقيقة واقعة في البلدان النامية.

بعد انقضاء عقدين على إطلاق حملة الأمومة المأمونة في الهند عام 1987، لا يزال نصف مليون امرأة يمتن لأسباب تتعلق بالحمل كل عام؛ ورغم أن التدخلات الرئيسية في الرعاية الصحية يمكنها أن تقي إلى حد كبير من هذه الوفيات، فإن الانتفاع منها محدود في البلدان النامية، وتشير التقارير إلى أن هذا الانتفاع يتفاوت بين الفئات السكانية. وقد استعرض الباحثون عملية الانتفاع بالتدخلات في الرعاية الصحية الأمومية في البلدان النامية لتقييم مدى وقوة وتأثيرات البيانات المتعلقة بهذا التفاوت، وفقاً لمكان إقامة المرأة ووضعها الاقتصادي والاجتماعي، وقيموا دراسات حول معطيات تتعلق بالانتفاع من العاملين الصحيين المهرة أثناء الولادة، وفي الرعاية السابقة للولادة في الأثلوث الأول من الحمل وفي المواقع الطبية المخصصة للولادة. وتم تحديد ثلاثين دراسة مؤهلة للمراجعة، وقد كانت 12 دراسة منها ذات مستوى رفيع أو متوسط الجودة، وهذه الدراسات تتوزع في 23 بلداً. وقد أوضحت نتائج

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## Corrigendum

In Vol. 85, issue number 8, 2007, page 571, reference 6 should read "unpublished data".



Table 1. Inequalities in use of skilled health worker at delivery

Study	Country	Sample size	Comparison groups	OR (95% CI or significance)	Adjusted analysis done <sup>a</sup>	Quality <sup>b</sup>	Contextual issues <sup>c</sup>
<b>Urban-rural variations</b>							
Celik (2005)	Turkey	2002	Urban, rural	4.37 (3.44–5.55), 1.00	–	–	–
Falkingham (2003)	Tajikistan	1840	Urban, rural	3.48 (1.50–8.06), 1.00	+	+	Deterioration of economy and health services since independence; rural women disproportionately affected.
Hotchkiss (2001)	Nepal	1434	Urban, rural	Higher in urban ( $P < 0.01$ )	+	+	Rural women might prefer traditional care.
Magadi (2000)	Kenya	5290	Urban, rural	4.52 (3.65–5.59), 1.00	–	–	–
Mekonnen (2003)	Ethiopia	7830	Urban, rural	8.50 (5.80–12.40), 1.00	+	–	–
Navaneetham (2002)	India Andhra Pradesh	1571	Urban, rural	1.42 ( $P < 0.10$ ), 1.00	+	+	Different patterns between states due to differential availability and accessibility of services. General lack of access for socially excluded communities (caste) due to residential segregation and limited availability of services.
	Karnataka	1925		1.80 ( $P < 0.01$ ), 1.00			
	Kerala	1101		1.29 (NS), 1.00			
	Tamil Nadu	1416		2.30 ( $P < 0.01$ ), 1.00			
Tsui (2002)	Paraguay	722	Urban, rural	NS	+	–	–
	Uganda	1224		NS			
	United Republic of Tanzania	4157		Higher in urban ( $P < 0.10$ )			
	India	3129		Lower in urban ( $P < 0.10$ )			
<b>Economic variations</b>							
Bloom (2001)	India	300	Low, high	1.00, 2.87 (1.70–4.84)	+	+	Women's autonomy, often determined by continued links with parental family, facilitates their leaving home when needed, thus their use of skilled care at delivery.
Hotchkiss (2001)	Nepal	1434	Continuous	Higher with high ( $P < 0.01$ )	+	+	Limited broader socioeconomic development.
Li (2004)	China	915	Continuous	1.38 (1.06–1.79)	+	+	Gender inequality and women's position in society (measured with the extent of husband sharing work, women's exposure to outside world and son preference) are important issues. Non-compliance with family planning policy limits contact with health services (to avoid discrimination). Limited access for women with low income and those from remote areas exists; freedom of movement not found significant.

(Table 1, cont.)

Study	Country	Sample size	Comparison groups	OR (95% CI or significance)	Adjusted analysis done <sup>a</sup>	Quality <sup>b</sup>	Contextual issues <sup>c</sup>
Magadi (2000)	Kenya	5290	Low, medium, high	1.00, 2.00 (1.77–2.27), 6.88 (5.56–8.50)	–	–	–
Navaneetham (2002)	India Andhra Pradesh	1571	Low, medium, high	1.00, 1.21 (NS), 3.75 ( $P < 0.01$ )	+	+	Different patterns between states due to differential availability and accessibility of services. General lack of access for socially excluded (lower-caste) communities due to residential segregation and limited availability of services.
	Karnataka	1925		1.00, 1.67 ( $P < 0.01$ ), 4.34 ( $P < 0.01$ )			
	Kerala	1101		1.00, 1.95 ( $P < 0.01$ ), 2.80 (NS)			
	Tamil Nadu	1416		1.00, 1.28 (NS), 3.43 ( $P < 0.01$ )			
Tsui (2002)	Paraguay	722	Low, medium, high	NS	+	–	–
	United Republic of Tanzania	4157		Higher in high ( $P < 0.10$ )			
	India	3129		Higher in high ( $P < 0.10$ )			
Paul (2002)	Bangladesh	2334	Landless, small, medium, large land holdings	NS	+	++	Strongest determinant of use is the expectation or encounter of delivery complications. Lack of information about the services provided could be a potential barrier.
Phoxay (2001)	Lao People's Democratic Republic	205	Low, middle, high	1.00, 2.07 (0.71–6.01), 2.56 (0.50–13.03)	+	–	–
<b>No skilled health worker at delivery</b>							
Falkingham (2003)	Tajikistan	1840	Poorest, 2nd quintile, 3rd quintile, 4th quintile, richest	3.41 (1.58–7.06), 2.36 (1.11–5.02), 2.23 (1.06–4.72), 2.09 (0.98–4.46), 1.00	+	+	Health care is free, but due to deterioration of health care (and general economic status) and therefore the payments of health professionals, informal user charges limit poor women's use of skilled health workers.

CI, confidence interval; NS, not significant; OR, odds ratio.

<sup>a</sup> Includes a range of factors related to the individual (e.g. age, marital status, number of children, education, autonomy, health beliefs), community (e.g. type of the roads, village) and health service (distance/time to care, availability of doctors), varying across studies.<sup>b</sup> Indicates how well the study was done to minimize the risk of bias or confounding, and to establish an association between exposure (examined non-clinical factor) and effect (outcome measure). Code: ++ high quality; + moderate quality; – low quality.<sup>c</sup> Contextual influences that could explain the differences found in studies of moderate and high quality.

Table 2. Inequalities in the use of medical settings for delivery

Study	Country	Sample size	Comparison groups	OR (95% CI or significance)	Adjusted analysis done <sup>a</sup>	Quality <sup>b</sup>	Contextual issues <sup>c</sup>
<b>Urban-rural variations</b>							
Addai (1998)	Ghana	4562	Urban, rural	1.76 ( $P < 0.01$ ), 1.00	+	–	–
Bhatia (1995)	India	3595	Urban, rural	2.57 ( $P < 0.01$ ), 1.00	+	+	Limited physical access to facilities for rural women. Self-reported hygiene emerged as a significant factor. Increasing importance of private sector due to poor reputation of government hospitals.
Bolam (1998)	Nepal	334	Urban, rural	0.90 (0.52–1.56), 1.00	–	–	–
Falkingham (2003)	Tajikistan	1982	Urban, rural	2.67 (1.76–4.08), 1.00	+	+	Deterioration of economy and health services since independence; rural women disproportionately affected.
Gertler (1993)	Jamaica	823	Urban, rural	Higher in urban ( $P < 0.01$ )	+	++	Accessibility (transport, work responsibilities) is limited for poor and rural women, and informal care alternatives exist. Midwives' advice as to the place of delivery is not followed because of what some subjects call their authoritarian attitudes.
Hotchkiss (2003)	Morocco	1609	Urban, rural	2.13 (1.21–3.76), 1.00	+	+	Low geographical accessibility and costs of services limited use. Women living in households with another adult woman are more likely to give birth in hospitals because they can get advice and are accompanied to the hospital.
Magadi (2000)	Kenya	5290	Urban, rural	2.66 ( $P < 0.05$ ), 1.00	+	–	–
Navaneetham (2002)	India Andhra Pradesh	1571	Urban, rural	2.21 ( $P < 0.01$ ), 1.00	+	+	Different patterns between states due to differential availability and accessibility of services. General lack of access for socially excluded (caste) communities because of residential segregation and limited availability of services.
	Karnataka	1925		2.41 ( $P < 0.01$ ), 1.00			
	Kerala	1101		1.65 (NS), 1.00			
	Tamil Nadu	1416		3.64 ( $P < 0.01$ ), 1.00			
Stupp (1994)	Belize	977	Urban, rural	7.14 ( $P < 0.001$ ), 1.00	+	–	–
Tsui (2002)	Paraguay	722	Urban, rural	NS	+	–	–
	Uganda	1224		Higher in urban ( $P < 0.10$ )			
	United Republic of Tanzania	4055		Higher in urban ( $P < 0.10$ )			
	India	3165		NS			

(Table 2, cont.)

Study	Country	Sample size	Comparison groups	OR (95% CI or significance)	Adjusted analysis done <sup>a</sup>	Quality <sup>b</sup>	Contextual issues <sup>c</sup>
<b>Economic variations</b>							
Anson (2004)	China	4273	Continuous	0.96 (NS)	+	–	–
Barbhuiya (2001)	Bangladesh	505	Lower, higher	1.00, 2.43 (1.29–4.59)	–	–	–
Bhatia (1995)	India	3595	Low, middle, high	1.00, 1.23 ( $P < 0.05$ ), 1.55 ( $P < 0.001$ )	+	+	Increasing importance of private sector and decreased functioning of public services. Those who cannot afford private care do not deliver at facilities. Differences by caste show segregation of some groups.
Duong (2004)	Viet Nam	200	Continuous	NS	+	–	–
Falkingham (2003)	Tajikistan	1840	Poorest, 2nd quintile, 3rd quintile, 4th quintile, Richest	NS	+	+	Deterioration of economy and health services since independence; quality of care is very low. Women, particularly those who are wealthier, perceive giving birth at home as safer than in hospitals that lack running water or heating.
Gertler (1995)	Jamaica	823	Continuous	Higher with high ( $P < 0.01$ )	+	++	Accessibility (transport, work responsibilities) is limited for poor and rural women; informal care alternatives exist. Midwives' advice as to the place of delivery is not followed because of what some subjects call their authoritarian attitudes.
Glei (1999)	Guatemala	3253	Continuous	1.00	+	+	Other factors (clinical risk, openness to outside world) in particular cultural differences between ethnic groups (for example, indigenous women prefer traditional midwives because of the social support they provide) determine maternal health-care use.
Hodgkin (1996)	Kenya	149	Continuous	Higher with high ( $P < 0.10$ )	+	–	–
Hotchkiss (2003)	Morocco	1609	Lower half, higher half	1.00, 2.94 (1.45–6.04)	+	+	User fees limit access for poor people. Women living in households with another adult woman are more likely to give birth in hospitals, because they can get advice and are accompanied to the hospital.
Kavitha (1997)	India	172	1000, 1001–2000, >2000	NS	+	–	–

(Table 2, cont.)

Study	Country	Sample size	Comparison groups	OR (95% CI or significance)	Adjusted analysis done <sup>a</sup>	Quality <sup>b</sup>	Contextual issues <sup>c</sup>
Navaneetham (2002)	India, Andhra Pradesh	1571	Low, medium, high	1.00, 1.40 ( $P < 0.05$ ), 3.37 ( $P < 0.01$ )	+	+	Different patterns between states due to differential availability and accessibility of services. General lack of access for socially excluded communities (caste) due to residential segregation and limited availability of services.
	Karnataka	1925		1.00, 1.72 ( $P < 0.01$ ), 3.61 ( $P < 0.01$ )			
	Kerala	1101		1.00, 1.85 ( $P < 0.01$ ), 4.92 ( $P < 0.05$ )			
	Tamil Nadu	1416		1.00, 1.33 ( $P < 0.01$ ), 3.91 ( $P < 0.01$ )			
Toan (1996)	Viet Nam	1151	Not good, good	1.00, 1.26 (0.97–1.63)	–	–	–
Tsui (2002)	Paraguay	722	Low, medium, high	Higher in high ( $P < 0.10$ )	+	–	–
	United Republic of Tanzania	4055		Higher in high ( $P < 0.10$ )			
	India	3165		Higher in high ( $P < 0.10$ )			
Van der Heuvel (1999)	Zimbabwe	235	Lower, low, middle	NS, NS	+	–	–
Wagle (2004)	Nepal	308	Low, high	4.4 (1.8–10.6)	+	–	–
<b>Home delivery</b>							
Letamo (2003)	Botswana	1184	Low, medium, high	4.14 (3.45–4.96), 1.28 (1.06–1.54), 1.00	+	–	–
Magadi (2000)	Kenya	5290	Low, medium, high	1.00, 0.54 ( $P < 0.05$ ), 0.19 ( $P < 0.05$ )	+	–	–

CI, confidence interval; NS, not significant; OR, odds ratio.

<sup>a</sup> Includes a range of factors related to the individual (e.g. age, marital status, number of children, education, autonomy, health beliefs), community (e.g. type of roads, village) and health service (distance/time to care, availability of doctors), varying across studies.

<sup>b</sup> Indicates how well the study was done to minimize the risk of bias or confounding, and to establish an association between exposure (examined non-clinical factor) and effect (outcome measure). Code: ++ high quality; + moderate quality; – low quality.

<sup>c</sup> Contextual influences that could explain the differences found in studies of moderate and high quality.

Table 3. Inequalities in antenatal care attendance in the first trimester

Study	Country	Sample size	Comparison groups	OR (95% CI or significance)	Adjusted analysis done <sup>a</sup>	Quality <sup>b</sup>	Contextual issues <sup>c</sup>
<b>Urban-rural variations</b>							
Bhatia (1995)	India	3230	Urban, rural	1.05 (NS), 1.00	+	+	Community-based health workers extend the provision of antenatal care to total areas. Women's autonomy and personal hygiene are related to antenatal care use.
Burgard (2004)	Brazil	4958	Urban, rural	1.37 ( $P=0.005$ ) 1.00	+	+	Targeted interventions to improve maternal health services did not benefit rural and poor communities.
Eggleston (2000)	Ecuador	3041	Urban, rural	1.38 (1.15–1.65), 1.00	+	–	–
Gertler (1993)	Jamaica	823	Urban, rural	Lower in urban ( $P<0.05$ )	+	++	Urban women do not want to be treated as ill, therefore initiate pregnancy care later. Another reason is the poor quality of preventive care, particularly in the capital area.
Navaneetham (2002)	India, Andhra Pradesh	1571	Urban, rural	0.66 (NS), 1.00	+	+	Community-based health workers extend antenatal care provision to remote rural areas. Strong determinants include birth order and education.
	Karnataka	1925		1.21 (NS), 1.00			
	Kerala	1101		1.11 (NS), 1.00			
	Tamil Nadu	1416		1.09 (NS), 1.00			
<b>Economic variations</b>							
Bhatia (1995)	India	3230	Low, middle high	1.00, 1.11 (NS), 1.17 (NS)	+	+	Community-based health workers extend antenatal care provision.
Burgard (2004)	South Africa	4800	Continuous	2.88 ( $P<0.001$ )	+	+	Health providers' attitudes (unhelpful and even abusive) towards poor women limit their reception of accurate information. Previous bad experiences with the health-care system, provider preferences in relation to service provision and working conditions, and the low value attached to prenatal care by women are other possible issues.
	Brazil	4958	Continuous	3.51 ( $P<0.001$ )			
Eggleston (2000)	Ecuador	3041	Low, medium, high	0.87 (0.71–1.08) 1.00 1.61 (1.31–1.98)	+	–	–
Gertler (1995)	Jamaica	823	Continuous	Higher in high ( $P<0.01$ )	+	++	Despite the availability of free health care, the quality of maternal health care is poor (i.e. long waiting times).

(Table 3, cont.)

Study	Country	Sample size	Comparison groups	OR (95% CI or significance)	Adjusted analysis done <sup>a</sup>	Quality <sup>b</sup>	Contextual issues <sup>c</sup>
McCaw Binns (1995)	Jamaica	9968	Poorest, 2nd quartile, 3rd quartile, richest	0.5 (0.4–0.6) 0.6 (0.5–0.7), 0.7 (0.6–0.8) 1.00	+	++	Antenatal care is not a priority for women living in multiple deprivation. Pregnancy is viewed as a normal process. Pregnancy care is free and there are programmes providing incentives for antenatal care use, but economic and social costs of attendance outweigh the benefits.
Navaneetham (2002)	India, Andhra Pradesh	1571	Low, medium, high	1.00, 0.97 (NS), 1.48 (NS)	+	+	Community-based health workers extend antenatal care provision to remote rural areas and poor women.
	Karnataka	1925		1.00, 0.85 (NS), 0.98 (NS)			
	Kerala	1101		1.00, 1.51 ( $P < 0.05$ ), 1.51 (NS)			
	Tamil Nadu	1416		1.00, 1.08 (NS), 1.24 (NS)			

CI, confidence interval; NS, not significant; OR, odds ratio.

<sup>a</sup> Includes a range of factors related to the individual (e.g. age, marital status, number of children, education, autonomy, health beliefs), community (e.g. type of roads, village) and health service (distance/time to care, availability of doctors).

<sup>b</sup> Indicates how well the study was done to minimize the risk of bias or confounding, and to establish an association between exposure (examined non-clinical factor) and effect (outcome measure). Code: ++ high quality; + moderate quality; – low quality.

<sup>c</sup> Contextual influences that could explain the differences found in studies of moderate and high quality.

## Annex 1. Characteristics and quality assessment of studies

Study	Setting, year	Methods	Participants	Comparison groups	Outcome measures	Quality <sup>a</sup>
Addai (1998)	Ghana (national), 1993	Cross-sectional household survey – retrospective analysis of DHS; multistage cluster sampling	Women delivered within 5 years of the survey	Urban-rural, age	Most recent delivery in a medical setting	–
Anson (2004)	China (province), 1996–99	Cross-sectional household survey – retrospective analysis from a larger study; stratified sampling of 288 villages	Women delivered (live birth) at least once	Age, economic (per-capita family income)	Most recent delivery in a medical setting	–
Barbhuiya (2001)	Bangladesh (sub-district), 1997	Prospective cross-sectional household survey; all eligible women from randomly selected villages	Women pregnant (last trimester) or delivered during past 3 months	Economic (family income)	Most recent delivery in a medical setting	–
Bhatia (1995)	India (Karnataka, sub-district), 1993	Cross-sectional household survey – analysis of data from a child survival study; all eligible women living in town and villages with more than 500 inhabitants	Women younger than 35 years with at least one child younger than 5 years (for antenatal care outcome: women attended antenatal care - 90% of sample)	Urban-rural, age, economic (financial value of household assets)	Antenatal care during the first trimester for most recent delivery; most recent delivery in a medical setting	+
Bloom (2001)	India (Varanasi, Uttar Pradesh), 1995–96	Prospective cross-sectional household survey; two-stage cluster sampling; urban setting (poor/middle income households within 15 minutes' walking distance from health facility)	Women delivered within 3 years of the survey, and either Muslim or Hindu (97% of population); youngest eligible woman from household	Economic (type of building walls: cement [high] or other material [low])	Most recent delivery by a skilled attendant (with formal medical training, regardless of delivery site)	+
Bolam (1998)	Nepal (Kathmandu), 1994–95	Case-control study; all eligible women in selected urban and peri-urban areas	Pregnant women in urban and peri-urban areas	Urban/peri-urban	Index delivery in a medical setting	–
Burgard (2004)	South Africa (national), 1998; Brazil (national), 1996	Cross-sectional household survey – retrospective analysis of DHS; multistage cluster sampling	Deliveries within 5 years of survey	Age, economic (household assets)	Antenatal care during the first trimester	+
Celik (2002)	Turkey (national), 1993	Cross-sectional household survey – retrospective analysis of DHS; multistage cluster sampling	Ever-married women delivered within 3 years of survey	Urban-rural, age	Most recent delivery by a skilled attendant	–
Duong (2004)	Viet Nam (district), 2000	Case-control study; five stratified areas from 41 communes; cases (hospital delivery) and controls (home delivery) randomly selected from immunization and antenatal care records	Women delivered at a hospital setting or at home within 3 months of survey	Age, economic (income)	Index delivery in a medical setting	–
Eggleston (2000)	Ecuador (national), 1994	Cross-sectional household survey – retrospective analysis of DHS; multistage cluster sampling	Women who delivered within 2 years of survey and who had at least one antenatal visit (76% had antenatal care)	Urban-rural, age, economic (household assets)	Antenatal care during the first trimester for most recent delivery	–



(Annex 1, cont.)

Study	Setting, year	Methods	Participants	Comparison groups	Outcome measures	Quality <sup>a</sup>
Falkingham (2003)	Tajikistan (national), 1999	Cross-sectional household survey – retrospective analysis of living standards survey; two-stage cluster sampling	Ever-married women who delivered at least once	Urban-rural residence, economic (per capita household expenditure)	Most recent delivery by a skilled attendant; most recent delivery in a medical setting	+
Gertler (1995)	Jamaica (national); 1989	Cross-sectional household survey – retrospective analysis of Jamaican Survey of Living Conditions; multistage cluster sampling	Women aged 15–45 years who had experienced a pregnancy lasting longer than 7 months within 5 years of survey (one randomly chosen woman from each household)	Age, economic (per capita household expenditure)	Antenatal care during the first trimester for most recent pregnancy; most recent delivery in a medical setting	++
Glei (1999)	Guatemala (four departments; rural communities), 1995	Cross-sectional household survey – Guatemalan Survey of Family Health; 15 communities in each department selected (probability proportional to size), 50 women in each selected community were interviewed	Births to women aged 18–35 years within 5 years of survey (up to two births per women)	Age, economic (household food consumption)	Births in a medical setting	+
Hodgkin (1996)	Kenya (district), 1989	Prospective cross-sectional household survey; randomly selected 60 villages – nine households per village	Women delivered within 1 year of survey	Economic (income)	Most recent delivery in a medical setting	–
Hotchkiss (2001)	Nepal (national), 2001	Cross-sectional household survey – retrospective analysis of Nepal Living Standards Survey; two stage cluster sampling	Ever-married women delivered within 3 years of survey	Urban-rural, age, economic (per capita household expenditure)	Most recent delivery by a skilled attendant (an auxiliary nurse, midwife, maternal/child health worker, nurse or a doctor)	+
Hotchkiss (2003)	Morocco (national), 1995	Cross-sectional household survey – retrospective analysis of DHS; multistage cluster sampling; linked service availability module	Women who gave birth at least once within 5 years of survey	Urban-rural, age, economic (household assets and characteristics)	Most recent delivery in a medical setting	+
Kavitha (1997)	India (two villages), 1995	Prospective cross-sectional survey; all eligible women	Births within the 4 years of survey (liveborn and living at the time of survey)	Economic (household income)	Most recent delivery in a medical setting	–
Letamo (2003)	Botswana (national), 1996	Cross-sectional household survey – retrospective analysis of Botswana Family Health Survey (DHS); multistage cluster sampling	Women had at least one pregnancy within 5 years of survey	Age, economic (household assets and characteristics)	Most recent delivery not by a skilled attendant, most recent delivery not in a medical setting	–
Li (2004)	China (district), 1994	Cross-sectional household survey – retrospective analysis of an infant health survey; administrative villages were selected by stratifying by township, per capita income, and population size; selected from list of infants	Women delivered within 3 years of survey	Economic (household income)	Most recent delivery by a skilled attendant	+

(Annex 1, cont.)

Study	Setting, year	Methods	Participants	Comparison groups	Outcome measures	Quality <sup>a</sup>
Magadi (2000)	Kenya (national), 1993	Cross-sectional household survey – retrospective analysis of DHS; multistage cluster sampling	Births within 5 years of the survey	Urban-rural residence, economic (household assets)	Most recent delivery not in a medical setting	–
McCaw Binns (1995)	Jamaica (national), 1986–87	Prospective cohort study	All women delivered during a 2-month period and attended antenatal care (96% had antenatal care)	Urban-rural, age, economic (food expenditure)	Antenatal care during first trimester for index delivery	++
Mekonnen (2003)	Ethiopia (national), 2000	Cross-sectional household survey – retrospective analysis of DHS; multistage cluster sampling	Women delivered at least once within 5 years of survey	Urban-rural, age	Most recent delivery by a skilled attendant	–
Nava-neetham (2002)	India (four states), 1992–93	Cross-sectional household survey – retrospective analysis of National Family and Health Survey; multistage cluster sampling	Ever-married women who delivered (live birth) within 4 years of survey	Age, urban-rural, economic (living standard index from household assets and environmental conditions)	Antenatal care during first trimester for most recent delivery; most recent delivery in a medical setting; most recent delivery by a skilled attendant	+
Paul (2002)	Bangladesh (rural area), 1995–97	Prospective cross-sectional survey; all villages in selected district	Women delivered within 2 years of survey	Age, economic (landholding size)	Most recent delivery by a skilled attendant (includes trained traditional attendants)	++
Phoxay (2001)	Lao People's Democratic Republic (district), 1999	Prospective cross-sectional survey; randomly selected villages; 10–20% of reproductive-age women per village	Women who have children younger than 5 years and who lived in the area during most recent pregnancy and birth	Economic (income)	Most recent delivery by a skilled attendant	–
Stupp (1994)	Belize (national), 1991	Retrospective cross-sectional household survey; two-stage cluster random sample	Married or in union women 15–44 years age who delivered within 5 years of survey (one woman from each household)	Urban-rural	Most recent delivery in a medical setting	–
Toan (1996)	Viet Nam (district), 1994	Prospective cross-sectional household survey; multistage cluster sampling	Women delivered during the 5 years before survey	Age, economic (quality of housing: roof)	Most recent delivery in a medical setting	–
Tsui (2002)	Paraguay (four departments), 1998; Uganda (nine of 39 districts), 1997; United Republic of Tanzania (national – except Zanzibar), 1996; India (state – Uttar Pradesh), 1995	Retrospective analysis of cross-sectional multistage cluster surveys linked with probability sample of health facilities	Women delivered within 5 years of surveys in Paraguay and United Republic of Tanzania and within 3 years of surveys in Uganda and India	Urban-rural, age, economic (household assets)	Most recent delivery in a medical setting; most recent delivery by a skilled attendant; contraceptive use	–

(Annex 1, cont.)

Study	Setting, year	Methods	Participants	Comparison groups	Outcome measures	Quality <sup>a</sup>
Van der Heuvel (1999)	Zimbabwe (district), 1996	Prospective cross-sectional household survey; two-stage cluster sampling	Women delivered within 3 years of survey and lived in catchment area of the hospital during most recent delivery and at time of survey	Economic (household assets and characteristics)	Most recent delivery in a medical setting	–
Wagle (2004)	Nepal, 2001	Prospective cross-sectional household survey	Women delivered within 45 days of survey	Age, economic (household assets)	Index delivery in a medical setting	–

DHS, demographic and health survey.

<sup>a</sup> Based on the SIGN methodological quality checklists. Code ++ (high-quality case-control, cohort or cross-sectional studies with a very low risk of confounding, bias or chance and a high probability that the association is causal), + (well-conducted case-control, cohort or cross-sectional studies with a low risk of confounding, bias or chance and a moderate probability that the association is causal), – (case-control, cohort or cross-sectional studies with a high risk of confounding, bias or chance and a significant risk that the association is not causal).