



Contents lists available at ScienceDirect

## International Journal of Gynecology and Obstetrics

journal homepage: [www.elsevier.com/locate/ijgo](http://www.elsevier.com/locate/ijgo)

## AVERTING MATERNAL DEATH AND DISABILITY

## Saving mothers and newborns through an innovative partnership with private sector obstetricians: Chiranjeevi scheme of Gujarat, India

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## ARTICLE INFO

## Keywords:

Chiranjeevi scheme  
Emergency Obstetric Care  
India  
Maternal mortality rate  
Public–private partnership

## ABSTRACT

**Objective:** To document an innovative public–private partnership between the government of Gujarat, India and private obstetricians in rural areas that provides delivery care to the poor. **Methods:** This is a descriptive analysis of the scheme and analysis of secondary data. We estimate the lives of mothers and newborns potentially saved because of the scheme. **Results:** More than 800 obstetricians have joined the scheme and more than 269 000 poor women have delivered in private facilities in 2 years. We estimate that the percentage of institutional deliveries among poor women increased from 27% to 48% between April 2007 and September 2008. In addition, there are fewer reported maternal and newborn deaths among the beneficiaries compared with the number of deaths expected in the absence of the scheme. **Conclusions:** This innovative program shows that, at least in some areas of India, it is possible to develop a large scale partnership with the private sector to provide skilled birth attendance and emergency obstetric care to poor women at a relatively low cost. This is one way of addressing the human resource deficit in the public sector in rural areas of low-income countries to achieve Millennium Development Goals 4 and 5. We also conclude that the skilled care thus provided can reduce maternal and neonatal mortality among the poor.

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## 1. Introduction

Each year India has a higher number of births (27 million), maternal deaths (about 117 100), and neonatal deaths (1 098 000) than any other country in the world [1,2]. Although the maternal mortality ratio has decreased from about 700 to about 300 over the last 40 years [3,4], mortality reduction has been much slower in India than in Sri Lanka or Malaysia, which had comparable levels of development 40 years ago [5]. Some of the reasons for the slow progress include lack of political will, poor management capacity, underdeveloped midwifery services, reliance on ineffective strategies such as prenatal care without the back-up of skilled birth attendants (SBAs) or emergency obstetric care (EmOC), poor implementation of policies, poor accountability of human resources in rural areas, fragmentation of care and lack of referral systems, nonavailability of obstetricians, and inadequate delegation of lifesaving functions to medical officers and nurses [6–9].

This paper describes the experience of an innovative partnership between the health department of the State Government of Gujarat in India, and private obstetricians to provide SBA and comprehensive EmOC to the poor. A comment on this program was published earlier [10]. A preliminary report will be published in December 2009 [11]. Here we present a detailed description of the program, updated data

on use, and an estimation of mortality reduction attributable to the program.

## 1.1. Lack of obstetricians in rural areas of India and Gujarat

A review of research since the early 1990s provides ample evidence that EmOC is an effective way to reduce maternal mortality [12,13]. A recent review of evidence also recommends healthcenter-based intrapartum care as a key strategy to reduce mortality [14]. The EmOC strategy was adopted in India in 1992 under the Child Survival and Safe Motherhood (CSSM) project (funded by the World Bank and UNICEF). This program specifically focused on development of comprehensive EmOC centers throughout India [15]. The focus continued in the subsequent program (1997–2004, also funded by the World Bank) with the new name of Reproductive and Child Health (RCH). However, there was little progress in establishing comprehensive EmOC centers in rural areas [16]. The key constraint was nonavailability of skilled staff to provide EmOC in the public sector in rural areas [17]. India does not have well-trained midwives and many medical officers are also not skilled in normal delivery or EmOC. Hence, there is substantial reliance on obstetricians who are only available in urban areas. The gap between the norm for health staffing (especially obstetricians) and the actual availability in rural government hospitals is significant (Table 1) [17]. Even when the obstetricians are posted they may not be living there or may not be providing EmOC [18].

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**Table 1**  
Availability of obstetricians in the public sector, rural areas of selected states, and India (2006).  
Source: Government of India [17].

State	Rural population (millions)	Obstetricians required (state norm)	Actual number of obstetricians available at subdistrict level	Gap	Rural population per obstetrician
Andhra Pradesh	55	164	73	91	753 425
Chhattisgarh	17	116	15	101	1 133 333
Gujarat	32	272	8	264	4 000 000
Madhya Pradesh	44	229	13	216	3 384 615
Rajasthan	43	326	105	221	409 524
India	749	3346	1215	1643	615 768

India has about 22 000 obstetricians [19], but fewer than 1300 work in the public sector in rural areas at subdistrict level [16]. Inadequate infrastructure, low salaries, professional and social isolation, and the policy of some states not to allow private practice by government employed obstetricians are some of the reasons for this. Some young obstetricians join government service in rural areas, but leave after a few years to start private practice or seek jobs with better prospects. From time to time, governments in Indian states have tried to post obstetricians to government facilities in rural areas, but with little success. A similar situation is seen in many countries in South Asia.

Gujarat is economically better off than many states in India, with a population of 55 million and a per capita income 25% higher than the national average. It has an estimated 17 738 registered doctors (with about 2000 obstetricians), of whom three-quarters work in the private sector [20]. Those working in government are largely in medical colleges or in large district hospitals. In Gujarat, the availability of obstetricians at subdistrict level is limited to 7 or 8 obstetricians serving a rural population of about 32 million [17]. Because of this, first referral units (FRUs, usually district hospitals) are rarely fully functional, hence access to EmOC is very limited. In the rest of India the situation is not very different. The gap in requirement and availability of government obstetricians in many states in India is long standing and large (Table 1).

### 1.2. Lack of access by the poor to skilled birth attendance and emergency obstetric care

The inability of the poor to afford health care is recognized as an important global barrier to maternal, neonatal, and reproductive health care [21]. National Family Health Survey II data from India shows that the use of institutional delivery and cesarean delivery is low among poor people. Utilization reviews suggest nonavailability of staff and services in government facilities leave poor mothers with obstetric complications no alternative but to use private facilities despite the expense. This increases the financial burden on families below the poverty line. Furthermore, it is estimated that 25% of individuals admitted to hospital who are not poor become poor because of the cost of treatment [22]. Many families become indebted because of the expense of EmOC [23].

### 1.3. Reaching the poor through a public–private partnership

Despite private and NGO sectors traditionally being involved in health services, the Government of Gujarat tried to develop its own rural hospitals as FRUs under the CSSM and RCH programs described earlier. They met with little success. Most FRUs could not become functional owing to the lack of obstetricians and pediatricians willing to work in the public sector in rural areas.

In 2005, the Gujarat government, in collaboration with an academic institution (Indian Institute of Management, Ahmedabad),

an NGO (Sewa Rural, Jhagadia), and facilitated by the German bilateral aid agency (GTZ), started to explore options for providing skilled delivery care and EmOC through insurance companies and private sector obstetricians. Aware that Gujarat has many private obstetricians practicing in small towns and in rural areas, the health department formulated a scheme of public–private partnership after holding a series of consultations with key stakeholders. The scheme was called “Chiranjeevi Yojana,” which means “a scheme for long life” (of mothers and babies), and involved contracting with private obstetricians to provide delivery care to poor women in rural areas.

A pilot project was started in October 2005 in 5 remote and underdeveloped districts of the state with a population of 11 million. Under the scheme the health department contracted with private obstetricians with their own small hospitals in rural areas.

### 1.4. Contracted obstetricians

Contracts were offered to private obstetricians who met the following criteria: a postgraduate qualification in obstetrics; their own hospitals, preferably with at least 15 beds; labor and operating rooms; able to access blood for transfusions; able to arrange anesthesiologists and emergency surgery. In addition, preference was given to facilities accredited by the government to do tubal ligations. Although it was planned to select 2–3 private obstetricians per sub-district, all willing obstetricians were included in the scheme.

The contracted private hospitals owned by obstetricians were to provide poor women with skilled care for delivery (and comprehensive EmOC, when required), free of charge in their own hospitals. In return the government would pay the hospital US \$4488 for 100 deliveries including managing complications (i.e. US \$45 per delivery) (Table 2). Compensation levels were developed by a reputed NGO (SEWA Rural) based on costs in a private setting in rural areas and were negotiated with the contracted obstetricians. A key feature of the compensation package was that even though more was allocated for treatment of complications (for example US \$125 for cesarean delivery) than for normal delivery (US \$20), the incidence of cesarean delivery and other complications was assumed to be fixed (Table 2). This removed any monetary incentive for performing more cesarean deliveries, which can occur in privately paid fee-for-services [24]. Secondly, the obstetricians were to pay their poor patients US \$5 for transport out of the US \$45 per delivery. This was intended to reduce the delay in reaching the hospitals. About US \$125 was to be paid to traditional birth attendants who might accompany their clients to private hospitals.

**Table 2**  
Compensation package for the Chiranjeevi Yojana scheme.<sup>a</sup>

Procedure	Assumed cases per 100 deliveries	Cost in Rs per procedure (US \$)	Total Rs (US \$)
Normal delivery	85	800 (20)	68 000 (1700)
Complicated cases			
Eclampsia/forceps/vacuum/breech	3	1000 (25)	3000 (75)
Septicemia	2	3000 (75)	6000 (150)
Blood transfusion	3	1000 (25)	3000 (75)
Cesarean delivery	7	5000 (125)	35 000 (475)
Other costs			
Pre-delivery visit	100	100 (2.5)	10 000 (250)
Investigation (lab tests)	100	50 (1.25)	5000 (125)
Ultrasound	30	150 (3.75)	4500 (112.5)
NICU support	10	1000 (25)	10 000 (250)
Food	100	100 (2.5)	10 000 (250)
Dai	100	50 (1.25)	5000 (125)
Transport	100	200 (5)	20 000 (500)
Total	100		179 500 (4488)

Abbreviation: NICU, neonatal intensive care unit.

<sup>a</sup> Conversion rate used US \$1 = Rs 40.

### 1.5. The beneficiaries

The poor are defined as families earning less than or equal to 12 000 Indian rupees (Rs) a year (US \$300) or those lacking certain household assets. They are commonly called below poverty line (BPL) people and are provided with an identification card (called BPL card), which makes them eligible for several social welfare programs targeted at the poor.

### 1.6. Implementation and subsequent expansion

The scheme was promoted through meetings with community leaders, obstetric societies, district health offices, and through rural auxiliary nurse midwives (ANMs) [25]. Each poor woman was informed during the prenatal period by the ANM of the obstetricians contracted by the state in her area. There was no specific voucher given, but each woman needed to carry her family's BPL card to use free delivery services from any private obstetrician contracted under the scheme. To allay the fears of private doctors that the government would not pay on time, obstetricians were given an initial advance payment of about US \$625 on signing the contract. As deliveries took place in the private hospitals the obstetricians were reimbursed rapidly by the district health office. Paperwork was kept to a minimum.

Because of the rapid uptake of the services offered by the scheme in 5 pilot districts, the scheme was scaled up in January 2007 to the whole state (25 districts) covering the entire BPL population of approximately 12.6 million. There was no formal detailed evaluation of the pilot phase, but informal assessments were done by government officers. The first 3 months in the scale-up process were spent contacting the obstetricians in each district, encouraging them to join the scheme, and making the contractual arrangements with them. Since April 2007 the scaled-up scheme is fully operational throughout state. More than 800 obstetricians have joined the scheme. As a result, poor women can now access delivery care in hospitals much nearer to home and also have wider choice because in each district many providers have joined the scheme.

## 2. Materials and methods

### 2.1. Data

The Chiranjeevi scheme is not a randomized controlled trial undertaken by a research agency, but is rather a large government-led intervention program. Hence, the only available source of data on deliveries, cesarean deliveries, and mortality is the Management Information System (MIS) reports designed for the program and from the routine MIS for the state health department, where data are collected by health workers in rural areas and are compiled by the district health office. The private health service providers in Gujarat are poor at keeping records of the type of treatment given or complications of delivery. There are no standard delivery registers or clinical protocols to diagnose and record complications, which is a limitation of the data from this program. It is, therefore, not possible with available MIS data to estimate with any accuracy the decrease in severe morbidity in mothers and neonates attributable to the scheme.

Maternal and neonatal deaths are under-registered in the routine MIS. The data have other practical limitations, which are found in service statistics in any low-income country. Hence, impact assessment is also challenging. However, we make the best effort possible to use available data to estimate the impact of the program on mortality.

#### 2.1.1. Estimates of maternal mortality

We estimated the probable impact of the scheme on maternal mortality using available MIS data and estimates of maternal mortality in Gujarat using the Registrar General of India (RGI). The RGI estimates of the maternal mortality ratio (MMR) are derived from a system

called Sample Registration System (SRS), which is based on vital registration done by special part-time workers in sample areas of the state. This system was not developed to estimate MMR, but to estimate crude birth rate, crude death rate, and infant mortality rate. Through special efforts and combining data for 3 years, RGI has estimated MMR from these sample areas of SRS.

The RGI estimate for MMR for Gujarat is 202 (95% CI, 141–262) for 1999–2001 and 172 (95% CI, 116–228) for 2001–2003. Because the MMRs were declining in Gujarat, we made a linear projection to estimate the MMR for 2007 using the RGI estimates for 1999–2001 and 2001–2003. This gave an MMR estimate of 97 (95% CI, 65–129) for 2007.

The most recent estimates of India's MMR used a correction factor of 1.5 to adjust for the under-registration of the RGI estimate of MMR based on the Sample Registration System [26]. Therefore, we also used the same factor of 1.5 to multiply the estimate of MMR. This gave a corrected MMR estimate for Gujarat of 145.5 (95% CI, 99–193) for 2007.

Because the RGI estimates of MMR are not available disaggregated by poor and nonpoor and there is no other MMR estimate available for the poor in Gujarat, we had to make an assumption regarding how much higher the MMR for the poor will be compared with the MMR for the total population. We assume that the MMR among the poor will be at least 1.5 times the average MMR. Hence, to get an estimate of MMR for the poor, this corrected MMR of 145.5 was multiplied by 1.5 which gave an estimated MMR of 218 (95% CI, 147–289). This is used to calculate the expected number of maternal deaths among the poor who were eligible for the Chiranjeevi scheme. We also estimated the expected number under several other assumptions in a sensitivity analysis: under-registration: 1.0 (no under-registration), 1.2, and 2.0; and the ratio of poor to total MMR: 1.0 (no difference), 1.2, and 2.0.

#### 2.1.2. Neonatal mortality

In India, fairly reliable state-specific estimates of neonatal mortality (NMR) are available from the RGI through the SRS system and from National Family Health Survey-3 (NFHS-3) conducted in 2005–2006. The SRS reports an NMR of 36 for 2005 for Gujarat, while the NFHS-3 estimate is 33.5. The poor are expected to have a higher NMR and hence we have assumed an NMR figure of 40 for estimating expected neonatal deaths among the Chiranjeevi beneficiaries.

For 2007–2008, the government's routine MIS reported 11 844 neonatal deaths (out of 1.2 million births), giving an NMR of 10. This indicates that the routine MIS-based NMR is roughly one-third that of the SRS or NFHS-based NMR estimates for the state, implying a 300% undercount.

#### 2.1.3. Cost estimates

Only the direct costs are included in the estimates—which largely means the money paid to the private hospitals to perform deliveries of poor women. Planning, facilitation, and monitoring costs are not included as these were done by the regular staff of the health department and hence there were no additional administrative costs.

## 3. Results

### 3.1. Acceptance by private obstetricians

A total of 180 obstetricians joined the scheme in the 5 pilot districts. Under the pilot project, each contracted private obstetrician attended an average of 540 deliveries between January 2006 and March 2008 (see Table 3). Each private obstetrician earned an average of US \$24 840, in addition to regular earnings. Thus, in addition to poor women who delivered in private hospitals under supervision of qualified obstetricians, doctors who earned extra money also benefited, as did the district health authorities who could provide expanded obstetric services to their constituents [11]. In the state-wide scaled-up program, more than 850 obstetricians had signed contracts by December 2008. Table 3 shows the number of obstetricians

**Table 3**

Private obstetricians practicing in the district and enrolled in the scheme, and deliveries performed from January 2006 to March 2008, in 5 pilot districts of Gujarat, India. Source: Bhat et al. [29].

District	Private obstetricians available	Obstetricians enrolled in the scheme	Number of deliveries performed	Average deliveries per obstetrician
Banaskantha	50	66 <sup>a</sup>	17468	265
Dahod	18	16	22171	1386
Kutch	47	19	10233	539
Panchmahals	29	31 <sup>a</sup>	27171	876
Sabarkantha	73	48	20149	420
Total	217	180	97192	540

<sup>a</sup> For these districts, obstetricians in the neighboring districts were also enrolled in the scheme as they were expected to serve patients from these districts. Hence, the number of enrolled obstetricians exceeds the number available.

enrolled and the deliveries performed by them in the whole state through December 2008. Thus, the availability of human resources providing skilled birth attendance and EmOC services to poor women has increased from 7 to 8 government obstetricians in rural hospitals in 2005 to more than 850 only 3 years later.

### 3.2. Utilization of services by the poor

Data on births in the scheme show the rapid increase in deliveries of poor women. In the state of Gujarat there are about 282 000 such deliveries per year, or 23 500 deliveries per month. Between January 2006 and March 2008, 91 792 poor women in the 5 pilot districts benefited from the program. The coverage of deliveries among the poor in all districts of the state under the scheme increased from 27% in April 2007 to 53% in October 2007, with some reduction from November 2007 to March 2008. It has now stabilized at 50%–60% of the total expected deliveries to the poor. Therefore, even though the scheme is successful, it has not yet reached universal coverage among the target group.

The reported complications vary among districts, partly because different obstetricians classify complications differently. The low overall reported rate of 6% reflects the classification problem. The cesarean delivery rate also varies among districts; the overall cesarean delivery rate is about 6%. In only 3 of 25 districts is the facility-based cesarean delivery rate higher than 15%, which is above the range for population-based rates recommended by WHO (5%–15%). While facility-based cesarean rates are difficult to interpret, we can conclude that cesarean delivery is not being over-used in this scheme. Table 4 gives data on total deliveries, cesarean deliveries, and complications treated, as well as the cesarean delivery rate for the whole state under this program.

### 3.3. Impact on mortality

#### 3.3.1. Maternal mortality

Table 5 shows that given the “most likely” assumptions and using the method described above (item 2.1.1), and in the absence of the Chiranjeevi scheme, one would expect 588 maternal deaths among 269 942 deliveries. Only 52 deaths were reported by the participating doctors and the routine MIS. Therefore, among the beneficiaries of the Chiranjeevi scheme, reported maternal deaths are less than 10% of

**Table 4**

Number of deliveries, cesarean deliveries, complicated deliveries, and doctors enrolled in the Chiranjeevi Scheme in Gujarat from January 2006 to December 2008.

Normal deliveries	Cesarean deliveries	Complicated deliveries	Total deliveries	Cesarean delivery rate (%)	Number of doctors enrolled
237 131	16 569	16 242	269 942	6.14	865

what would be expected in this population under assumptions of under-reporting ( $\times 1.5$  correction factor) and assumptions of MMR being higher among the poor ( $\times 1.5$  correction factor), as described in the methods section (see Table 5)

If one assumes that the actual deaths are 3–4 times higher than the reported 52 deaths under the scheme, there would be about 156–208 deaths among those served by the Chiranjeevi scheme. These numbers are still substantially lower than the expected maternal deaths (588 deaths in 269 942 births). Even using the most pessimistic assumptions, the Chiranjeevi scheme appears to have saved lives. Only if 80% or more of deaths have gone unreported in the government system would there be no impact on maternal mortality. This is unlikely in our opinion.

#### 3.3.2. Neonatal mortality

We estimate that the number of newborn deaths would be 10 798 among 269 942 Chiranjeevi deliveries using an NMR of 40. Against this, the reported number of neonatal deaths through routine MIS was only 1061 among the deliveries under the Chiranjeevi scheme. Available data show that there is under-reporting by a factor of 3 in the routine MIS, i.e., the actual number of neonatal deaths would be 3 times higher than the reported deaths. Hence, the estimated neonatal deaths among the deliveries under the scheme would be 3183. This figure is still much lower than the expected number of newborn deaths in the absence of the scheme (10 798 deaths) (see Table 5). Thus, the poor women who delivered in private maternity homes run by private obstetricians are reporting fewer neonatal deaths (even after adjusting for under-reporting) than would be expected in this population.

#### 3.4. Cost of the scheme and sustainability

The total direct cost of the pilot scheme was Rs 110 million (US \$2.75 million) for 1 year for 5 pilot districts. When extended to the whole state, the estimated first year cost is Rs 506 million (US \$12.6 million), which is just 3.6% of the total health budget of Rs 13 070 million (US \$326.8 million). The scheme's expenditure is being met currently from the state government fund and funds provided by the national government under the National Rural Health Mission (a special program through 2012).

## 4. Discussion

In many countries governments provide health care directly to the poor, while in other countries, governments ensure that the poor have access to health care via services arrangements with NGOs or with the private sector. Many government facilities worldwide have a shortage of human resources. Although there has been substantial discussion on this topic in global forums, strategies involving the private sector in achieving public health goals are rarely discussed in India. Reforms related to human resources are critical to improving health systems [27,28]. Public health bureaucracies need to reform health systems to facilitate private sector involvement. This requires a high level of political and social commitment that is not yet seen in many countries, including India. The program described here provides a practical experience of involving private obstetricians to deliver SBA and EmOC to poor women on a large scale. It provides a new direction for maternal health programming in low-income countries.

India started to improve access to comprehensive EmOC in rural areas in 1992 under the CSSM program. Results were poor, however, because of the shortage of public sector obstetricians and anesthesiologists in rural areas. There are several barriers to recruiting qualified obstetricians to rural public health facilities. These include low salaries (about US \$500 per month), private practice is not permitted, being posted to rural areas, and the threat of transfer at any time to unknown locations therefore uprooting family and social life. Yet all these barriers are amenable to policy change.

**Table 5**

Expected and reported maternal and newborn deaths and estimated lives saved by the Chiranjeevi Scheme, January 2006 to December 2008.

Total deliveries	Expected maternal deaths in absence of the scheme <sup>a</sup>	Maternal deaths reported <sup>b</sup>	Maternal lives likely to be saved	Estimated newborn deaths in absence of the scheme <sup>a</sup>	Estimated newborn deaths based on reported deaths <sup>c</sup>	Newborn lives likely to be saved
269 942	588	52	536	10 798	3183	7615

<sup>a</sup> Assumptions for expected maternal deaths: MMR for poor before intervention = 218 per 100 000 live births; NNMR for poor before intervention: 40 per 1000 live births.

<sup>b</sup> As reported by the private practitioners and government MIS.

<sup>c</sup> Estimate is calculated by multiplying the reported deaths by 3—the factor of under-registration of newborn deaths.

On the other hand, in states like Gujarat there are already many private obstetricians. This innovative and experimental public–private partnership in Gujarat showed that it is possible to develop a low cost (average US \$46 per delivery including cesareans) and efficient program to meet the needs in a fairly short period of time. This program also showed that poor women accustomed to home deliveries will rapidly change their behavior if perceived good quality services are accessible, free of cost, and within a reasonable traveling distance.

The key message of this paper is that it may be more feasible and efficient to co-opt the skilled providers that are available in the private sector by paying their marginal costs and a reasonable profit rather than waiting for obstetricians to join the public sector and be posted to rural areas.

Furthermore, this scheme empowers the poor in several ways:

- It entitles them to free delivery care in the private sector (which is perceived to be of higher quality).
- It provides immediate access to EmOC when needed.
- It provides women and their families with a choice of several providers nearby.

Although concerns have been raised that such schemes may not target poor women exclusively, recent household surveys in one of the pilot districts showed that most (94%) of the Chiranjeevi users had annual income levels below US \$300 per year, indicating that the scheme did adequately target poor families [29].

Furthermore, other benefits of this program include improving the working conditions of private healthcare providers by assuring a minimum demand for services. Thus, the health markets in these areas develop. This has implications for augmenting human resources in other areas of health care. This counteracts the pull of urban areas, which normally drain both public and private obstetricians from rural areas to cities. By focusing on paying the private providers for each delivery, the scheme funds the “outputs” rather than the “inputs,” as usually happens in government programs. It is a performance-based payment system—a better way of linking performance with payment. For its innovation, reach, and success, the *Wall Street Journal Asia* recently gave its prestigious “Asian Innovations Award” to this program [30].

Contracting private doctors by the government is not new and many countries have developed systems of contracting out services to private providers. For example, Germany has developed its social health insurance using a similar mechanism for more than 150 years, although the payment mechanisms are different [31]. In the UK, the National Health System's general practitioners also work under similar arrangements whereby they provide services to patients but are paid by the government. In India too, private healthcare providers partner with the government in family planning services on a small scale and in cataract removal surgery on a large scale. However, this is the first time that they have been involved in delivery care and EmOC. We recognize that this is an imperfect model and there is room for improvement. Much better contract management and monitoring of quality and outcomes are needed to make the program better and deliver MMR reduction goals. The current cost estimates are also not full costs since much of the overheads and transaction costs are not covered, and opportunity costs are not measured.

Other challenges remain. In very remote subdistricts it is still difficult to find enough private obstetricians. Of 250 subdistricts in Gujarat, 90 had no private obstetrician to be contracted into the scheme. In addition, it is possible that private doctors who are paid on a fixed fee schedule may delay doing needed surgery or refer complicated or high risk cases to public facilities to avoid extra costs. This is likely to happen as the obstetricians are paid per delivery assuming a fixed proportion of cesarean deliveries and other complications. Thus, those who do fewer cesareans earn more profit and those who do more lose money. This needs further monitoring and quality of care auditing, which is not currently happening.

The quality of care in private sector hospitals can be questioned. Not all private obstetricians adopt evidence-based clinical practice. They may employ staff with only informal training rather than qualified nursing staff, thus compromising quality of care. Some quality of care issues can be addressed in future by restructuring contracts to ensure that the private providers adhere to evidence-based protocols and employ trained staff. Public facilities also suffer from similar low quality of care, such as nonuse of standard protocols, lack of staff, poor infection control practices, lack of supplies and medicines, and impersonal care etc.

Our assessment of the impact of the program on mortality is extremely limited by the quality of available data and the consequent need for assumptions, which may be unfounded. Registration and monitoring of maternal and neonatal deaths and morbidities need to be improved substantially so that impact assessment can be more rigorous.

Finally, involving the private sector does not mean that the state can continue to neglect the public health system, including health centers, FRUs, and hospitals. Simultaneous efforts are needed to improve the infrastructure, human resources, management, and accountability of public facilities to provide services to the population. Overall strengthening of the public health system should continue to be the long-term goal.

## 5. Policy recommendations

Based on the experience of Gujarat state, we recommend that governments of other states or districts where private providers are available and, where public sector services are nonfunctional or of poor quality, explore the option of public–private partnership to provide SBA and EmOC to poor women. The scope of the current package of services under the Chiranjeevi scheme is minimal. It includes 1 prenatal care visit, minimal sick newborn care, and no postnatal visit. It should be expanded in future to cover at least 3 prenatal visits, 2 postnatal visits, and sick newborn care. Ideally, it could also be extended to family planning and other reproductive health care.

Our estimate is that it will cost about Rs 10 billion (US \$250 million) per year to cover all poor women in the whole of India under this scheme at costs similar to those in Gujarat. We feel strongly that it is not a high price to pay to prevent the 117 000 maternal deaths and the 1 million neonatal deaths that occur each year in India. The current national government has promised to increase public spending on health substantially (from 0.9% to 2%–3% of GDP) and hence there is political will for such programs to expand nationally. This also implies that the financial sustainability of such a program is not in question. In

addition, the Ministry of Labor of the Government of India is in the process of introducing social health insurance for the poor, which will cover maternity care as well as major diseases.

We recommend that international organizations and governments of other low-income countries, where private doctors or midwives are available, consider the mechanism of public payment to private doctors and midwives. By removing the financial barriers, this approach may provide faster access to SBA and EmOC than alternative mechanisms. Such market-based mechanisms may also provide enough incentives to retain health human resources in rural areas.

## 6. Conflict of interest

No conflicts of interest.

## 7. Author contributions

Dileep Mavalankar conceptualized the structure of the paper, wrote key parts of the paper, and calculated the mortality decline estimates. Amarjeet Singh co-ordinates the design of the Chiranjeevi scheme as the health commissioner of Gujarat, and is leading the team that has been successfully implementing the scheme in Gujarat since its inception. Drs Ajesh Desai and S.R. Patel participated in the design, development, and monitoring of the scheme. Prabal V. Singh contributed to part of the data collection, analysis, and writing of the paper.

## Acknowledgements

We thank the government of the Gujarat Health Department, who partly funded the intervention costs of the Chiranjeevi Scheme and supplied the data from the MIS. We also thank Sida who funded part of the time of one author (DM) during analysis and writing of the paper. We thank IIM Ahmedabad for infrastructural support and a stipend to one of the coauthors (PS). There was no other direct funding for this work.

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