NGO facilitation of a government community-based maternal and neonatal health programme in rural India: improvements in equity

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Socio-economic disparities in health have been well documented around the world. This study examines whether NGO facilitation of the government's community-based health programme improved the equity of maternal and newborn health in rural Uttar Pradesh, India. A quasi-experimental study design included one intervention district and one comparison district of rural Uttar Pradesh. A household survey conducted between January and June 2003 established baseline rates of programme coverage, maternal and newborn care practices, and health care utilization during 2001–02. An endline household survey was conducted after 30 months of programme implementation between January and March 2006 to measure the same indicators during 2004–05. The changes in the indicators from baseline to endline in the intervention and comparison districts were calculated by socio-economic quintiles, and concentration indices were constructed to measure the equity of programme indicators. The equity of programme coverage and antenatal and newborn care practices improved from baseline to endline in the intervention district while showing little change in the comparison district. Equity in health care utilization for mothers and newborns also showed some improvements in the intervention district, but notable socio-economic differentials remained, with the poor demonstrating less ability to access health services. NGO facilitation of government programmes is a feasible strategy to improve equity of maternal and neonatal health programmes. Improvements in equity were most pronounced for household practices, and inequities were still apparent in health care utilization. Furthermore, overall programme coverage remained low, limiting the ability to address equity. Programmes need to identify and address barriers to universal coverage and care utilization, particularly in the poorest segments of the population.

Keywords Equity, newborn care, maternal care, programme evaluation, community-based

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> **KEY MESSAGES**
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> - NGO facilitation of government programmes is a feasible strategy to improve the equity of maternal and neonatal health programmes.
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> - Improvements in equity were most pronounced for household practices and coverage of home visits, and inequities were still apparent in health care utilization. Programmes need to identify and address barriers to universal coverage and to care utilization, particularly in the poorest segments of the population.
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> - Programmes should include equity analysis as part of a complete evaluation plan.

Introduction

Disparities in child health by socio-economic status have been well documented around the world (Kutty *et al.* 1993; Wagstaff 2000; Poerwanto *et al.* 2003; Wagstaff and Watanabe 2003; Khatun *et al.* 2004; Bhargava *et al.* 2005; Hosseinpoor *et al.* 2005; World Bank 2006). In India, the poorest 20% of the population experiences twice as much mortality as the richest 20% (Peters *et al.* 2002), and infants from families in lower castes and with less education are more likely to die than those from higher caste families (Bhargava *et al.* 2005). Poor families are less likely to obtain access to crucial maternal and child health services such as antenatal care, skilled birth attendance, family planning, essential newborn care and immunizations (Jamil *et al.* 1999; Bishai *et al.* 2002; Peters *et al.* 2002; Bonu *et al.* 2003; Masanja *et al.* 2005; Victora *et al.* 2005; Chowdhury *et al.* 2006; Karim *et al.* 2006; World Bank 2006; Gillespie *et al.* 2007). The poor are thus caught in a vicious cycle in which poverty and ill health perpetuate each other (Wagstaff 2002).

The term *inequity* implies that an unequal distribution of a health indicator or service exists among different social and economic groups, that these differences are unwanted, and that known effective interventions are less available to the disadvantaged groups (Gillespie *et al.* 2007). Donors and public health practitioners have begun focusing on reducing inequities and delivering health care in an equitable way (Peters *et al.* 2002; Wagstaff 2002; Schwartz and Bhushan 2004a; Schwartz and Bhushan 2004b; Wagstaff *et al.* 2004; Gaudin and Yazbeck 2006; World Bank 2006).

Within child survival programmes, the neonatal period is increasingly recognized as a critical period for health interventions. Neonatal mortality accounts for almost 40% of under-five child mortality worldwide and nearly half of under-five mortality in India (Black *et al.* 2003; Lawn *et al.* 2005). Interventions with proven cost-effectiveness to prevent neonatal mortality have been identified, including tetanus toxoid immunization, clean delivery practices, newborn thermal care, immediate and exclusive breastfeeding, and recognition and treatment of maternal and newborn complications (Jones *et al.* 2003; Darmstadt *et al.* 2003; Bang *et al.* 2005; Bhutta *et al.* 2005; Darmstadt *et al.* 2005). Delivering these interventions as a package at the community-level is more cost-effective than implementing single interventions (Adam *et al.* 2005; Darmstadt *et al.* 2005). Community-based programmes and outreach workers have been shown to help reach the poor effectively and to achieve equity goals (Berman 1984; Berman *et al.* 1987; Haines *et al.* 2007; Haws *et al.* 2007). High coverage of these interventions delivered to reach the poor and reduce inequities has great potential to improve newborn health. Government

programmes often have low coverage and quality, and there is some evidence that facilitation by a non-governmental organization (NGO) can improve health care delivery performance in an equitable way (Bhushan *et al.* 2002; Soeters and Griffiths 2003; Schwartz and Bhushan 2004a; Schwartz and Bhushan 2004b; Loevinsohn and Harding 2005). However, further research is needed to identify strategies for equitable delivery of health programmes (Wagstaff 2002; Haines *et al.* 2007).

We present here an evaluation of the neonatal component of an integrated nutrition and health programme that was conducted in rural Uttar Pradesh, India. The programme employed existing government community-based health workers and infrastructure and was facilitated by CARE-India, an international NGO, along with local NGOs. We previously demonstrated that the programme increased coverage of antenatal and postnatal home visits by community-based workers, and improved the levels of maternal and newborn care practices that were promoted through the intervention, but overall levels remained low and there was no impact on neonatal mortality (Baqui *et al.* 2008). One goal of the programme was to deliver the interventions equitably. This analysis examines the extent to which the programme was able to improve antenatal and postnatal home visit coverage, healthy maternal and newborn practices, and health care utilization in an equitable way.

Methods

Programme description

Programme activities and the research design have been described elsewhere in detail (Baqui *et al.* 2008). CARE-India collaborated with the government of India to facilitate implementation of an Integrated Nutrition and Health Programme (INHP) through the Ministry of Women and Child Development's Integrated Child Development Services (ICDS) and the Ministry of Health and Family Welfare (MHFW). The INHP programme was intended to improve the health and nutritional status of women and children under five, and a community-based newborn care component was added in 2003. The role of CARE-India was to aid in the integration and strengthening of the ICDS and MHFW programmes by providing inputs in planning, training and logistics. The ministries provided infrastructure, including health workers, supplies and supervision. The partnership emphasized use of existing infrastructure, training of community-based workers to strengthen counselling and problem-solving skills, home visits to promote behaviour change, complete geographical coverage during critical time-periods (e.g. pregnancy, postnatal period), creating support for community-based workers by recruiting

community volunteers, and strengthening supportive supervision. The programme was delivered by auxiliary nurse midwives (ANMs), *anganwadi* workers (AWWs), and community volunteers called 'change agents', which we collectively refer to as community-based workers.

Home visitation by community-based workers during the antenatal and postnatal periods was the main strategy for behaviour change communication about healthy maternal and newborn care practices, including recognition of danger signs and care-seeking. The promoted behaviours in the antenatal period included: having at least three antenatal care visits from a trained provider; receiving at least two tetanus toxoid immunizations; consuming at least 100 iron/folic acid tablets; and making a birth plan, including advice to deliver in a health facility or identifying a location and a trained birth attendant for home delivery and saving money for emergencies. The newborn care practices that were promoted through home visits included: using clean thread and a clean blade to cut and tie the umbilical cord; practicing immediate and exclusive breastfeeding; drying and wrapping the infant immediately after birth; delaying the newborn's first bath for at least 6 hours; and taking the newborn for a check-up by a medically qualified provider. Additionally, workers promoted recognition of newborn complications and maternal complications during pregnancy, delivery or post-partum.

Evaluation design

The programme was implemented in eight states of India, but the evaluation took place in two districts of rural Uttar Pradesh, which was selected because it is India's largest state and one of the most disadvantaged. A quasi-experimental design with intervention and comparison districts was used. We selected Barbanki as the intervention district in collaboration with CARE-India, and Unnao was selected as the comparison district because analysis of demographic data suggested that Unnao was most comparable to Barabanki in terms of size and population characteristics. CARE-India facilitated the government programme in the intervention district, Barabanki, while the comparison district, Unnao, received the standard government programme. The newborn care aspects of the intervention were evaluated separately by a group of researchers who were independent of programme implementation.

A baseline household survey was conducted from January to June 2003, to establish rates of existing service coverage and maternal knowledge and practices during 2001 to 2002. Implementation of the newborn component of INHP commenced in July 2003. An endline survey was conducted between January and March 2006, which measured the same indicators during 2004 to 2005. Each district had 15 rural blocks; 9 blocks in the intervention district and 8 blocks in the comparison district were selected randomly using a computer program. Within each block, one sector, an area with an estimated population of 20 000 to 25 000, was randomly selected. All households in the selected sectors were included in the surveys. The respondents were women who had a live or stillbirth in the reference period (2001–02 for baseline and 2004–05 for endline) for each survey. Only those women who had a live birth in the reference period were included in this analysis, hereafter referred to as study mothers. The survey assessed household and maternal characteristics, exposure to the intervention, maternal and newborn care practices, and health care utilization during pregnancy, delivery and the postnatal period.

Baseline and endline surveys were both conducted by the same survey agency. Investigators were involved in training both groups of data collectors using the same standards and data collection manuals. Questions were asked in the same manner for baseline and endline. The data quality assurance procedures were the same for both baseline and endline surveys. The survey agency checked data quality both in the field and at the point of data entry. In addition, investigators set up an independent data quality assurance system which included re-interviewing 5% of households, weekly comparisons of original and re-interview data to identify disagreements, and additional field visits and training of data collectors to resolve discrepancies. The survey agency's managers and data collectors were unaware of the study's hypothesis.

Statistical analysis

The use of durable household assets and materials used to build houses have been shown to be reasonable proxies for estimating wealth status in the absence of income or consumption data (McKenzie 2003; Wagstaff and Watanabe 2003; Morris *et al.* 2006; Morris *et al.* 2007). To construct a household asset indicator, we included the following variables: source of drinking water; use of electricity; type of sanitation facilities; construction materials for roof, walls and floor of the house; number of rooms in the house; number of livestock, including goats and buffalo; and ownership of items such as a table, chair, watch or clock, radio, television, bicycle and *chaf* cutter (a piece of farm equipment). Principle component analysis, a method shown to be robust and reliable (Filmer and Pritchett 2001), was used to create an asset score with a mean of 0 and standard deviation of 1. Using the combined score for the intervention and comparison districts, the population was then divided into five equal wealth groups (quintiles) separately for baseline and endline.

Descriptive statistics were calculated using standard methods. Definitions of outcome indicators of interest are provided in Table 1. Since the main strategy for programme delivery was home visitations, programme coverage was assessed by calculating the percentage of study mothers who were visited at home by a community-based worker in the antenatal and postnatal (within 28 days of delivery) periods. Household practices related to antenatal, delivery and newborn care and to health care utilization were assessed among all study mothers. All indicators were coded as binary variables, and the proportion of study mothers reporting each practice within each wealth quintile was calculated for comparison and intervention districts at baseline and endline.

As a measure of equity of distribution across wealth quintiles, concentration indices and standard errors were calculated for intervention and comparison districts at baseline and endline for each indicator. To obtain the *concentration curve*, the cumulative proportion of the population ranked by wealth status is plotted on the x-axis, and on the y-axis is the cumulative proportion of the outcome of interest. A perfect 45-degree diagonal line on the graph indicates perfectly

Table 1 Coverage and behaviour change indicators and definitions

Indicator	Definition
Antenatal care	
AN home visit	Received at least one home visit from an auxiliary nurse midwife, *anganwadi* worker, and/or change agent during pregnancy
Birth preparation	Mother/family identified a delivery location, and a birth attendant, and/or obtained a disposable delivery kit (at least one)
Emergency preparation	Mother/family saved money, identified a health facility, and/or arranged transport in preparation for obstetric emergencies or newborn complications (at least one)
TT immunization	Mother had 2 or more tetanus toxoid immunizations before delivery
IFA supplementation	Mother consumed at least 100 iron-folic acid tablets during pregnancy
ANC	Mother attended at least 1 antenatal care visit from a medically qualified doctor, nurse, lady health visitor or auxiliary nurse midwife
Delivery care	
Medically trained birth attendant	Delivery took place in a hospital or clinic or a home delivery was attended by a medically qualified doctor, nurse, lady health visitor or auxiliary nurse midwife
Newborn care	
Clean cord care	Umbilical cord cut with boiled blade and tied with sterile thread
Newborn dried and wrapped	Newborn dried and wrapped immediately after birth
Newborn bath delayed	Newborn's first bath was delayed at least 6 hours
Immediate BF	Newborn was breastfed within 1 hour of birth
PN home visit (28 days)	Received at least 1 home visit from an auxiliary nurse midwife, *anganwadi* worker, and/or change agent within 28 days of delivery
Newborn check-up	Newborn was taken for routine check-up or for illness-related care by a medically qualified doctor, nurse, lady health visitor or auxiliary nurse midwife within 1 week after birth

AN = antenatal; ANC = antenatal care; BF = breastfeeding; IFA = iron-folic acid; PN = postnatal; TT = tetanus toxoid.
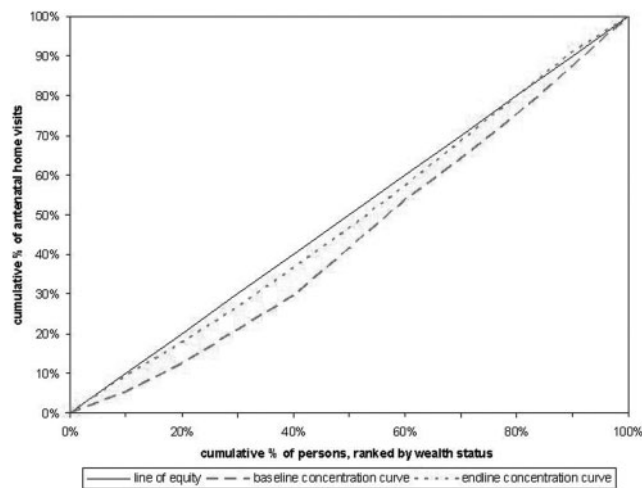
Figure 1 Example concentration curve: antenatal home visit coverage for intervention district, baseline (2001–02) versus endline (2004–05)

equitable distribution of the indicator across wealth status. A curve above the line of equality indicates that more of the poorest people in the population exhibit the outcome, while a curve below the line indicates a concentration of the outcome in the richest people. Figure 1 shows an example concentration curve. The *concentration index* is defined as twice the area between the observed concentration curve and the diagonal line of equality. The concentration index has a negative value if the curve is above the line and a positive value if the curve is below the line. In this analysis, all indicators are desired outcomes

(programme goals), so a negative concentration index indicates a distribution favouring the most poor.

Changes in concentration indices were also calculated for each indicator by subtracting the baseline value from the endline value in intervention and comparison districts separately; thus, a negative value indicates a change towards a more equitable distribution (a value of zero means total equity). Statistical analyses were conducted using Stata Version 8 (StataCorp 2003).

Results

Previous analysis showed that participants in the intervention and comparison districts were comparable with regard to most socio-demographic variables; however, women in the intervention district were more likely to be illiterate and from a lower caste (Baqui *et al*. 2008). Distribution in wealth was also comparable between districts, though women in the comparison district were slightly more likely to be in the poorest and the least poor categories than women in the intervention district (data not shown).

Coverage of antenatal and postnatal home visitation increased in an equitable way in the intervention district (Table 2). Overall coverage increased for both types of visits, and the concentration indices for both decreased by more than 50% from baseline to endline, showing a movement towards zero (total equity). In the comparison district, the two concentration indices increased slightly from baseline to endline showing no improvement in equity.

Table 2 Antenatal and postnatal (28 days) home visitation[a] coverage by wealth quintile and change in concentration indices (CI)[b] for intervention and comparison districts, baseline (2001–02) and endline (2004–05)

	Comparison			Intervention		
	Baseline ($n=6196$)	Endline ($n=6014$)	Change in CI[b]	Baseline ($n=8756$)	Endline ($n=7812$)	Change in CI[b]
Antenatal home visit coverage						
Poorest	21.3	16.8		10.7	51.4	
2nd quintile	22.4	20.0		14.1	54.1	
3rd quintile	24.3	18.9		17.4	58.6	
4th quintile	23.7	21.9		16.1	57.1	
Least poor	25.2	26.1		20.8	57.7	
Concentration index (95% CI)	0.1833 (0.1580, 0.2086)	0.2408 (0.2136, 0.2680)	0.0575 (0.0203, 0.0947)	0.2816 (0.2553, 0.3079)	0.1101 (0.0987, 0.1215)	−0.1715 (−0.2001, −0.1429)
Postnatal home visit coverage						
Poorest	4.5	4.4		2.1	37.5	
2nd quintile	4.3	4.0		2.7	39.7	
3rd quintile	4.2	4.8		3.6	40.0	
4th quintile	4.5	5.1		3.1	39.2	
Least poor	8.8	8.8		5.4	39.9	
Concentration index (95% CI)	0.3316 (0.2695, 0.3937)	0.3420 (0.2818, 0.4022)	0.0104 (−0.0761, 0.0969)	0.3554 (0.2933, 0.4175)	0.1301 (0.1144, 0.1458)	−0.2253 (−0.2894, −0.1612)

[a]See Table 1 for indicator definitions.
[b]Endline concentration index value minus baseline value. A change in the negative direction signifies that the concentration index became closer to 0, and therefore the indicator became more equitable in distribution. Numbers in parentheses are 95% confidence intervals.

Most household behaviours showed varying degrees of improvement in equity (Table 3). The intervention district showed decreases in the concentration indices for birth preparation and emergency preparation, although the comparison district showed an almost equal improvement for emergency preparation. All essential newborn care indicators showed improved coverage in the intervention district and became more equitable, with concentration indices less than 0.2. Women in the lower quintiles in the intervention district were equally as likely to have practiced clean cord care, immediate breastfeeding and delaying the newborn's bath for at least 6 hours as women in higher quintiles. In the comparison district, immediate breastfeeding was the only essential newborn care practice to show improvement in equity; however, the overall coverage remained quite low.

Concentration indices for health care utilization indicators also showed improvement in equity in the intervention district, although the distributions remained skewed towards the higher quintiles (Table 4). Women in the highest quintile were more than twice as likely to have had an antenatal care check-up or a medically trained birth attendant or to have brought the newborn for a check-up in the first week as women in the lowest quintile. The comparison district had slight increases in all concentration indices, indicating no improvement in equity.

Overall, the concentration indices for all indicators in Tables 2–4 were significantly different statistically from baseline to endline in the intervention district (the 95% confidence intervals of change in concentration indices do not include zero). In the comparison district, only the concentration indices for emergency preparation, immediate breastfeeding and

tetanus toxoid immunization had a significant change towards zero, and some indicators had a significant change away from zero (less equitable). For all but two indicators, emergency preparation and immediate breastfeeding, the intervention district had a significantly different change in concentration index compared with the comparison district (the 95% confidence intervals for the change in concentration index do not overlap those from the comparison district). For the two indicators that have overlapping confidence intervals, both comparison and intervention districts made significant changes towards zero.

Discussion

The neonatal component of the Integrated Nutrition and Health Programme aimed to increase coverage and equity of healthy maternal and newborn care practices through home visitation by community-based workers. The NGO-facilitated district was able to improve the equity of programme coverage and home-based care practices, achieving both higher overall coverage and improved equity for all indicators measured. Health care utilization also became more equitable although coverage remained low, particularly among the poorest.

Improvements in equity in the NGO-facilitated district compared with the government-only district were likely due to the inputs from the NGO, including training for workers, efforts to improve planning, supervision and monitoring, and design of tools to support these aspects of the programme. Improved equity in coverage for a few indictors in the comparison district is due to the fact that this district received

Table 3 Percentages of women practicing behaviours[a] at the household level by wealth quintile and concentration indices for intervention and comparison districts, baseline (2001–02) and endline (2004–05)

	Comparison			Intervention		
	Baseline ($n = 6196$)	Endline ($n = 6014$)	Change in CI[b]	Baseline ($n = 8756$)	Endline ($n = 7812$)	Change in CI[b]
Antenatal practices						
Birth preparation						
Poorest	13.0	9.5		5.3	18.4	
2nd quintile	13.5	10.3		6.0	19.0	
3rd quintile	15.5	14.1		6.7	21.7	
4th quintile	18.0	15.6		6.7	23.4	
Least poor	26.5	26.7		11.9	29.4	
Concentration index (95% CI)	0.3139 (0.2841, 0.3437)	0.3819 (0.3501, 0.4136)	0.0680 (0.0245, 0.1115)	0.3418 (0.2995, 0.3841)	0.2464 (0.2233, 0.2695)	−0.0954 (−0.1436, −0.0472)
Emergency preparation						
Poorest	7.9	21.4		11.7	44.5	
2nd quintile	11.9	27.1		13.4	48.1	
3rd quintile	11.8	26.3		14.1	50.3	
4th quintile	16.0	32.5		17.0	52.7	
Least poor	25.0	44.4		23.9	26.1	
Concentration index (95% CI)	0.3851 (0.3533, 0.4169)	0.2749 (0.2543, 0.2955)	−0.1102 (−0.1480, −0.0724)	0.3063 (0.2796, 0.3330)	0.1563 (0.1441, 0.1685)	−0.1500 (−0.1793, −0.1207)
Essential newborn care practices						
Clean cord care						
Poorest	32.1	38.7		28.7	67.8	
2nd quintile	34.7	37.0		32.4	68.0	
3rd quintile	35.2	39.2		31.8	67.5	
4th quintile	35.7	43.6		31.3	69.5	
Least poor	42.9	51.5		37.4	69.5	
Concentration index (95% CI)	0.1779 (0.1632, 0.1926)	0.1764 (0.1662, 0.1866)	−0.0015 (−0.0194, 0.0164)	0.1768 (0.1633, 0.1903)	0.0708 (0.0581, 0.0835)	−0.1060 (−0.1246, −0.0874)
Newborn dried and wrapped						
Poorest	8.8	3.8		17.2	43.1	
2nd quintile	8.9	3.1		18.4	44.7	
3rd quintile	9.0	3.6		19.4	43.5	
4th quintile	8.1	4.1		17.9	45.4	
Least poor	9.5	5.7		16.4	45.5	
Concentration index (95% CI)	0.1882 (0.1470, 0.2294)	0.2533 (0.1959, 0.3107)	0.0651 (−0.0056, 0.1358)	0.1616 (0.1400, 0.1832)	0.1194 (0.1112, 0.1276)	−0.0422 (−0.0653, −0.0191)
Newborn bath delayed						
Poorest	3.7	6.7		24.0	60.3	
2nd quintile	5.3	9.4		25.1	61.3	
3rd quintile	3.5	8.9		25.7	60.2	
4th quintile	3.5	8.1		24.0	59.2	
Least poor	3.9	10.0		17.9	54.6	
Concentration index (95% CI)	0.1735 (0.1045, 0.2425)	0.2382 (0.1927, 0.2837)	0.0647 (−0.0179, 0.1473)	0.1096 (0.0884, 0.1308)	0.0629 (0.0521, 0.0737)	−0.0467 (−0.0705, −0.0229)
Immediate breastfeeding						
Poorest	1.0	4.1		2.3	37.4	
2nd quintile	1.4	5.1		2.2	39.5	

(continued)

Table 3 Continued

	Comparison			Intervention		
	Baseline ($n = 6196$)	Endline ($n = 6014$)	Change in CI[b]	Baseline ($n = 8756$)	Endline ($n = 7812$)	Change in CI[b]
3rd quintile	2.1	5.0		2.4	39.2	
4th quintile	2.3	5.7		3.1	35.6	
Least poor	4.9	8.8		5.3	37.3	
Concentration index (95% CI)	0.4998 (0.4155, 0.5841)	0.3385 (0.2813, 0.3957)	−0.1613 (−0.2632, −0.0594)	0.3764 (0.3082, 0.4446)	0.1156 (0.0993, 0.1319)	−0.2608 (−0.3309, −0.1907)

[a]See Table 1 for indicator definitions.
[b]Endline concentration index value minus baseline value. A change in the negative direction signifies that the concentration index became closer to 0, and therefore the indicator became more equitable in distribution. Numbers in parentheses are 95% confidence intervals.

standard government health services that also promote aspects of maternal and child health care, particularly antenatal care, tetanus toxoid immunization and Integrated Management of Childhood Illness (IMCI).

Our findings are consistent with other similar child health programme evaluations. The Cambodian government contracted with NGOs to facilitate the delivery of primary care, and the result was improved, more equitable immunization coverage, use of a trained professional at birth, knowledge of modern birth spacing, and utilization of public health care facilities in the contracted districts (Bhushan *et al.* 2002; Schwartz and Bhushan 2004a; Schwartz and Bhushan 2004b). A wealth of evidence supports the ability of community-based workers and outreach programmes to reach the poor for home visits and education (Berman 1984; Berman *et al.* 1987; Jamil *et al.* 1999; Bishai *et al.* 2002; Bang *et al.* 2005; Gaudin and Yazbeck 2006), though these studies focus mostly on immunization coverage. Researchers in India examined both improvements in equity and overall performance, and found that improved equity could be achieved without compromising the overall efficiency of the programme (Gaudin and Yazbeck 2006). Our study is one of the first to examine equity with regard to community-based neonatal care.

Health care utilization proved more resistant to improvements in equity. This issue has been well-described in the maternal health literature with regard to antenatal care usage and skilled birth attendance (Bloom *et al.* 2001; Chowdhury *et al.* 2006; Karim *et al.* 2006), but relatively few studies have examined differentials in neonatal care-seeking by socio-economic status or evaluated programmes that sought to improve equity in neonatal care-seeking. Studies from Bangladesh have shown socio-economic differentials in use of maternal and newborn care, even when cost or accessibility were not a concern (Chowdhury *et al.* 2006; Karim *et al.* 2006). A study in Uttar Pradesh found that women's autonomy, specifically freedom of movement, was a strong factor in whether they accessed antenatal and delivery care (Bloom *et al.* 2001). Wagstaff offers a conceptual framework for understanding health inequalities which suggests that behaviours such as the use of health services are influenced by the quality and availability of health services, health financing, infrastructure such as roads, cultural norms, environment, household practices and social capital, among other factors (Wagstaff 2002). INHP attempted to affect household practices, cultural norms and social capital, but factors such as health financing and infrastructure

were beyond the scope of the programme. In order to make more substantial improvements in utilization of maternal and newborn health care, further research is needed to elucidate the barriers in access to care experienced by the poorest groups.

Another issue in achieving equity is the programme implementation strategy. Victora and colleagues suggested that two approaches can be considered to improve equity of child health programmes: (1) targeting to the poor, or (2) aiming for universal coverage (Victora *et al.* 2003). Targeting allows for a directed effort to reach the poorest, but it can be stigmatizing, logistically difficult or sometimes unethical. Criteria for identifying the poorest households may also be difficult in areas like rural Uttar Pradesh in which most households are poor and characteristics to distinguish the poorest and less poor are not easily recognizable. A universal coverage approach does not require identification of groups to target, but the programme may lose effectiveness because of inadequate coverage in the poorest groups. The programme evaluated here took a universal coverage approach, but also aimed to improve equity by enlisting community volunteers known as 'change agents' from hamlets that had previously been left out of the programme because of geographic isolation or poor socio-economic status. Coverage of household visitation and healthy practices were low in all quintiles to begin with (Baqui *et al.* 2007), so a universal coverage approach was a logical choice in order to improve overall coverage. The use of community-based health workers and additional volunteers facilitated increases in coverage in an equitable way. Further research is needed on whether programmes working in similar situations with low coverage and with a very large proportion of the population that are poor can achieve better results through a universal approach or by targeting to those most in need.

Although the indicators presented here improved in the equity of distribution among wealth quintiles in the NGO-facilitated district, the overall level of coverage remained unacceptably low. Even in the wealthiest quintile, less than 40% of women had a medically trained attendant at their delivery, began breastfeeding within an hour of delivery, or had a postnatal home visit from a community-based worker. The low coverage levels may be explained by a variety of factors. First, the intervention was evaluated after only 30 months of implementation; a longer period of implementation may be necessary to achieve universal coverage. Second, the multi-purpose workers who implemented the programme play

Table 4 Percentage of women utilizing health care[a] by wealth quintile and concentration indices for intervention and comparison districts, baseline (2001–02) and endline (2004–05)

	Comparison			Intervention		
	Baseline (n = 6196)	Endline (n = 6014)	Change in CI[b]	Baseline (n = 8756)	Endline (n = 7812)	Change in CI[b]
Antenatal care						
TT immunization						
Poorest	42.0	47.9		35.2	63.4	
2nd quintile	48.8	54.5		40.7	66.1	
3rd quintile	52.3	60.6		44.8	69.1	
4th quintile	63.3	64.1		49.7	71.8	
Least poor	81.1	85.2		67.8	80.5	
Concentration index (95% CI)	0.2105 (0.1987, 0.2223)	0.1819 (0.1709, 0.1929)	−0.0286 (−0.0447, −0.0125)	0.2245 (0.2125, 0.2365)	0.1032 (0.0948, 0.1116)	−0.1213 (−0.1359, −0.1067)
IFA supplementation						
Poorest	4.0	4.7		3.0	22.3	
2nd quintile	4.2	5.8		4.8	19.5	
3rd quintile	5.9	6.7		4.5	21.0	
4th quintile	7.0	7.5		4.4	20.7	
Least poor	11.6	16.1		8.2	23.1	
Concentration index (95% CI)	0.4199 (0.3691, 0.4707)	0.4348 (0.3891, 0.4805)	0.0149 (−0.0534, 0.0832)	0.3494 (0.2980, 0.4008)	0.1690 (0.1445, 0.1935)	−0.1804 (−0.2373, −0.1235)
ANC						
Poorest	14.3	14.5		9.3	27.0	
2nd quintile	16.9	20.7		11.2	30.5	
3rd quintile	19.4	21.4		14.1	32.5	
4th quintile	25.1	27.2		17.3	35.3	
Least poor	44.4	51.9		30.3	51.3	
Concentration index (95% CI)	0.3737 (0.3508, 0.3966)	0.3819 (0.3609, 0.4029)	0.0082 (−0.0229, 0.0393)	0.3963 (0.3714, 0.4212)	0.2454 (0.2289, 0.2619)	−0.1509 (−0.1807, −0.1211)
Delivery care						
Medically trained birth attendant						
Poorest	8.6	9.5		7.4	13.7	
2nd quintile	10.2	13.9		10.3	16.5	
3rd quintile	13.4	16.9		12.7	18.7	
4th quintile	17.1	20.9		16.9	23.9	
Least poor	35.9	46.3		33.2	38.7	
Concentration index (95% CI)	0.4506 (0.4230, 0.4782)	0.4519 (0.4284, 0.4754)	0.0013 (−0.0350, 0.0376)	0.4468 (0.4225, 0.4711)	0.3515 (0.3295, 0.3539)	−0.0953 (−0.1281, −0.0625)
Newborn care						
Newborn check-up						
Poorest	3.7	3.5		0.7	14.5	
2nd quintile	4.4	5.7		1.5	16.4	
3rd quintile	5.3	6.8		1.2	17.7	
4th quintile	5.1	8.9		1.5	19.2	
Least poor	11.7	20.2		3.8	29.8	
Concentration index (95% CI)	0.4196 (0.3653, 0.4739)	0.5113 (0.4711, 0.5515)	0.0917 (0.0318, 0.1516)	0.4730 (0.3862, 0.5598)	0.2928 (0.2677, 0.3179)	−0.1802 (−0.2706, −0.0898)

ANC = antenatal care; IFA = iron-folic acid; TT = tetanus toxoid.

[a]See Table 1 for indicator definitions.

[b]Endline concentration index value minus baseline value. A change in the negative direction signifies that the concentration index became closer to 0, and therefore the indicator became more equitable in distribution. Numbers in parentheses are 95% confidence intervals.

a variety of roles, and commitment to the goals of this programme may have been overshadowed by other responsibilities. Constraints of the government infrastructure may also limit performance. For example, in a study on the quality of family planning services in Uttar Pradesh, auxiliary nurse midwives reported that their performance was restricted by inadequate supplies, training, and financial and managerial support, and that limited time and transportation and security concerns kept them from visiting villages regularly (Khan *et al*. 1999). More extensive improvements in health system functioning are necessary to achieve higher levels of coverage and quality.

This analysis is limited by the available data. We used a wide array of measures of socio-economic status, yet in the principle component analysis, the data showed truncation and clustering of asset scores, suggesting that the population was relatively homogenous with regard to wealth (McKenzie 2003; Vyas and Kumaranayake 2006). Nonetheless, the concentration index is a good indicator for measuring equity in distribution of health indicators, because it takes into account the experiences of the entire population at once, rather than just comparing the richest to the poorest group, and it is sensitive to changes in the distribution across wealth groups (Wagstaff *et al*. 1991). Additional limitations include the use of self-reported data with relatively long recall periods that could lead to some recall error, though this should not have been different between study districts. Finally, the improvements in indicators were limited, which may have limited our ability to detect changes in equity.

Conclusions and implications

Programmes may be able to reach the poor effectively by strengthening their community-based and outreach components, especially in rural areas. NGO facilitation of government programmes can help to improve coverage in an equitable way, though the ability to change government functioning may be limited. When community-based workers increased coverage equally regardless of wealth status, the poorest group was equally capable of changing household practices to improve their health. However, the poorest segments of the population were most disadvantaged with regard to utilization of facility-based services since issues related to accessibility and to cost are involved. In this regard, programmes need to identify and address barriers to care utilization in the poorest segments of the population and should consider providing safety nets for the poor.

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