

# Informing Resource-Poor Populations and the Delivery of Entitled Health and Social Services in Rural India

## A Cluster Randomized Controlled Trial

Priyanka Pandey, PhD

Ashwini R. Sehgal, MD

Michelle Riboud, PhD

David Levine, MD, ScD

Madhav Goyal, MD, MPH

**T**HE DELIVERY OF HEALTH AND SOCIAL SERVICES is often inadequate in developing countries such as India in part because of limited resources allocated by governments and donor agencies.<sup>1,2</sup> However, increased spending by itself may not be sufficient to improve outcomes. Efficiently targeting resources to impoverished communities and getting public workers to perform their duties have remained significant challenges for many public services worldwide.<sup>1,3-5</sup>

Inadequate service delivery may result from weak mechanisms of accountability in developing countries.<sup>1,6-8</sup> For example, 25% to 35% of publicly funded health workers and school teachers are absent on any given day but are rarely fired for repeated absences.<sup>9-11</sup> A number of developing countries, including India, are decentralizing control over local public services to local communities,<sup>12,13</sup> which is intended to increase service providers' accountability to the local community.<sup>7</sup> However, anecdotal reports and surveys indicate that communities and members of local government are uninformed of what services they are entitled to and what state-mandated controls they have over these

**Context** A lack of awareness about entitled health and social services may contribute to poor delivery of such services in developing countries, especially among individuals of low socioeconomic status.

**Objective** To determine the impact of informing resource-poor rural populations about entitled services.

**Design, Setting, and Participants** Community-based, cluster randomized controlled trial conducted from May 2004 to May 2005 in 105 randomly selected village clusters in Uttar Pradesh state in India. Households (548 intervention and 497 control) were selected by a systematic sampling design, including both low-caste and mid- to high-caste households.

**Intervention** Four to 6 public meetings were held in each intervention village cluster to disseminate information on entitled health services, entitled education services, and village governance requirements. No intervention took place in control village clusters.

**Main Outcome Measures** Visits by nurse midwife; prenatal examinations, tetanus vaccinations, and prenatal supplements received by pregnant women; vaccinations received by infants; excess school fees charged; occurrence of village council meetings; and development work in villages.

**Results** At baseline, there were no significant differences in self-reported delivery of health and social services. After 1 year, intervention villagers reported better delivery of several services compared with control villagers: in a multivariate analysis, 30% more prenatal examinations (95% confidence interval [CI], 17%-43%;  $P < .001$ ), 27% more tetanus vaccinations (95% CI, 12%-41%;  $P < .001$ ), 24% more prenatal supplements (95% CI, 8%-39%;  $P = .003$ ), 25% more infant vaccinations (95% CI, 8%-42%;  $P = .004$ ), and decreased excess school fees of 8 rupees (95% CI, 4-13 rupees;  $P < .001$ ). In a difference-in-differences analysis, 21% more village council meetings were reported (95% CI, 5%-36%;  $P = .01$ ). There were no improvements in visits by a nurse midwife or in development work in the villages. Both low-caste and mid- to high-caste intervention households reported significant improvements in service delivery.

**Conclusions** Informing resource-poor rural populations in India about entitled services enhanced the delivery of health and social services among both low- and mid- to high-caste households. Interventions that emphasize educating resource-poor populations about entitled services may improve the delivery of such services.

**Trial Registration** clinicaltrials.gov Identifier: NCT00421291

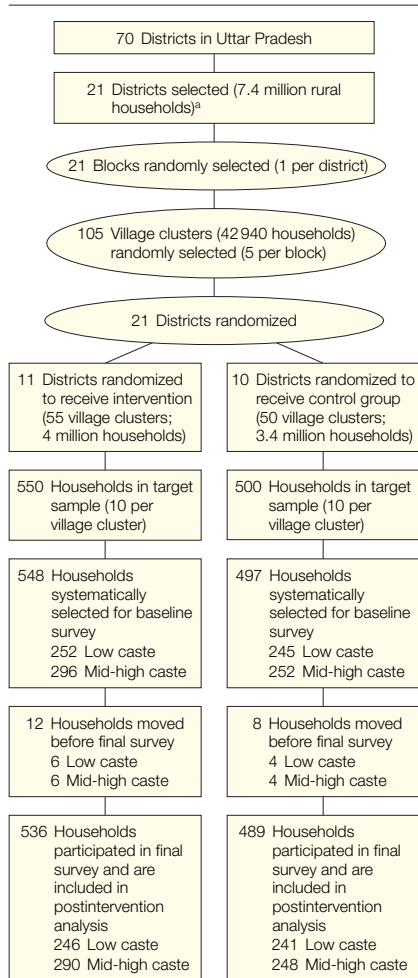
JAMA. 2007;298(16):1867-1875

www.jama.com

**Author Affiliations:** South Asia Human Development, the World Bank, Washington, DC (Drs Pandey and Riboud); Center for Reducing Health Disparities and Division of Nephrology, MetroHealth Medical Center, Case Western Reserve University, Cleveland, Ohio (Dr Sehgal); and the Division of General Internal

Medicine, Johns Hopkins School of Medicine, Baltimore, Maryland (Drs Levine and Goyal).

**Corresponding Author:** Madhav Goyal, MD, MPH, Division of General Internal Medicine, Johns Hopkins School of Medicine, 2024 E Monument St #1-500H, Baltimore, MD 21287 (madhav@jhmi.edu).

**Figure.** Flow of Village Clusters and Households Through the Trial

<sup>a</sup>21 Districts selected in which previous surveys had been conducted by the authors.

services.<sup>4,8</sup> Local oversight committees rarely meet and committee members are also frequently unaware of service delivery issues. Widespread poverty and social divisions such as caste also make individual or collective action to improve service delivery difficult in these settings.<sup>14</sup>

Uttar Pradesh ranks 23 out of 32 states in India in terms of the proportion of people living below the poverty line.<sup>15</sup> The poverty line in India is defined as the amount of money needed to purchase one's caloric needs and does not include money required for clothing or shelter.<sup>15</sup> Nearly 35% of India lives on less than \$1 a day and repre-

sents a region with the greatest percentage of impoverished people next to sub-Saharan Africa.<sup>16</sup> The National Family Health Survey<sup>17</sup> found that only 64% of rural women in Uttar Pradesh receive antenatal care. Seventy-six percent of births are unassisted by a trained health care provider, and only 10% of rural women report receiving any postnatal care. Eighty percent of children younger than 2 years have not received their full immunizations. Although there is a paucity of detailed data at the district level on such services, other surveys in Uttar Pradesh find similar results.<sup>18,19</sup> Even though education is free, most individuals receive less than a high school education, and less than 60% of the population is literate.<sup>17,20</sup> In Uttar Pradesh, 26% of teachers are absent on any given day.<sup>21</sup>

Interventions that increase the accountability of public service sectors to the community may improve the quantity and quality of services delivered. One way to enhance the accountability may be to provide information that empowers stakeholders. For example, a recent newspaper campaign in Uganda that publicized diversion of primary school funds led to a reduction in embezzlement from 80% to 20%.<sup>22</sup> However, informational campaigns that involve random assignment to intervention and control groups and rigorous evaluation of outcomes are lacking.

We therefore sought to conduct a community-based randomized controlled trial to determine the impact of information delivery on receipt of health and social services. We hypothesized that if individuals have detailed information about public services they are legally entitled to, they may be empowered to demand these services from public workers and less likely to tolerate petty corruption from government workers.

## METHODS

### Setting and Sample Selection

We conducted this cluster randomized controlled trial from May 2004 to May 2005 in Uttar Pradesh, a state in northern India with a population of 170 million.<sup>20</sup> Of the 70 districts in this state,

we focused on 21 central, central-eastern, and southern districts in which we have previously conducted surveys. Districts consist of approximately 14 blocks and each block consists of about 65 village clusters. From a comprehensive list of blocks and village clusters, we used a random-number generator to randomly select 1 block within each district and then randomly select 5 village clusters within each block. We then randomly assigned districts to intervention and control arms. By randomly selecting only 5 village clusters of about 1000 in each district, we spread the selection of 105 village clusters over 21 districts to minimize any potential for contamination between intervention and control villages. Although the districts were adjacent to one another, no 2 blocks were adjacent to each other and the village clusters were far apart. Travel between them would be difficult. A village cluster (also referred to as a gram panchayat) is the smallest unit of government and consists of approximately 1 to 3 adjacent villages that elect a local head and council members. There are on average 956 village clusters per district. Each village cluster included in the study had on average 409 households and an average population of 2343.<sup>20</sup>

The districts were all drawn from a single state, and availability of and access to health and education services are largely determined by policy at the state level. The population is ethnically the same and similar in culture. The population speaks a single language, Hindi.

The FIGURE illustrates the flow of participants through the trial. Five village clusters from each of 21 eligible districts were randomly chosen for the intervention or to serve as control. We sampled 10 households per village cluster. We identified 5 low-caste (also referred to as scheduled caste) households from each village cluster by first selecting an arbitrary starting point in the main low-caste neighborhood and then selecting every fifth household from this starting point. We used a similar method to identify 5 mid- to high-

caste households from each village cluster. Villages are not designed in any systematic way and consist of numerous crisscrossing alleys and paths. In the intervention arm, 252 low-caste and 296 mid- to high-caste households were systematically selected for the baseline survey. Twelve intervention households moved before the final survey. In the control arm, 245 low-caste and 252 mid- to high-caste households were systematically selected for the baseline survey. Eight control households moved before the final survey.

Our cluster-randomized trial sample size calculations were based on a 5% significance level and 80% power. The sample size and power calculations are driven by the number of village clusters, rather than the number of households per village cluster. For proportional outcomes, to detect a 0.2 increase over a control proportion of 0.5 with 10 households per cluster and a conservative coefficient of variation of 0.5, we estimated needing 94 total clusters (47 per arm). Increasing the number of households above 10 does not significantly decrease the number of village clusters required. For school fees, to detect a 10-rupee decline from a control of 35 rupees with 10 children per cluster, standard deviation of 15 rupees, and a coefficient of variation of 0.5, we estimated needing 82 total clusters. Our actual sample size included 105 total clusters.<sup>23</sup>

### Baseline Survey

Households were invited to participate in a baseline survey if they had at least 1 child going to public primary school in the village. Children are not required to go to school, although they are guaranteed a right to basic education. A recent survey of 69 districts in Uttar Pradesh in 2005 found that 93% of all children aged 6 through 14 years are enrolled in school. Sixty-three percent of all children are enrolled in government schools.<sup>24</sup> In some villages, none of the mid- to high-caste households had children attending a public school. In this case, we included 5 mid- to high-caste families even if their chil-

dren did not attend a public school. In 3 intervention village clusters, we could not locate any low-caste households and selected mid- to high-caste households in their place. Five intervention clusters and 1 control village cluster had fewer than 5 low-caste households. A total of 21 additional mid- to high-caste households in intervention villages and 2 extra mid- to high-caste households in control villages were selected to maintain the overall sample size. This method resulted in a slightly uneven distribution of low-caste vs mid- to high-caste households. Of 548 households in intervention village clusters, 252 (46%) were low caste. Of 497 households in control village clusters, 245 (49%) were low caste.

We used the Indian census definition of a household, "a group of persons who commonly live together and would take their meals from a common kitchen," and the state government's definition for caste.<sup>25-28</sup> We asked each household's caste and used a comprehensive list provided by the government to identify which caste category, low or mid- to high caste, the household belonged to. Low caste refers to "untouchables" (also called scheduled castes), who are at the bottom of the caste and socioeconomic hierarchy.<sup>29</sup> The criterion for listing a person in this category is "extreme social, education and economic backwardness arising out of the traditional practice of untouchability."<sup>26</sup> Midcaste refers to "other backward classes," which are defined as certain castes of historically low socioeconomic status. "High caste" refers to all others. We chose half our sample from scheduled castes because they depend disproportionately on government services compared with the higher castes, who are more often able to afford private physicians and schools. Because overcharging school fees is widespread in villages, we chose households that had school-going children to assess any impact on this outcome. We focused on districts in northern India where we had previously conducted survey work because it gave us the insight and familiarity needed to

perform an informational campaign. The surveys were conducted by in-person interviews by a team of trained research assistants with experience in administering rural household surveys in Uttar Pradesh. Surveys were conducted in the local language of Hindi and were pilot tested in villages outside the sample village clusters before use. At baseline, we did not tell the households that any informational meetings would be done later, nor did they know that they would be reinterviewed at 1 year.

Both parents from each household were asked several questions about access to health and social services. Health services questions included whether a nurse midwife had come to the village in the past 4 weeks; whether there was a pregnant woman in the household within the past 12 months and, if so, whether she had received a prenatal examination, tetanus shots, and prenatal supplements (iron/folic acid tablets); and whether there was an infant younger than 1 year in the household and, if so, whether he or she had received any vaccinations. Social services questions included how many children went to primary school in the village for the previous academic year and how much in school fees they were charged, whether a village council meeting had occurred in the past 6 months, and whether development work was performed in the village.

### Intervention

An information campaign was conducted in each intervention village cluster in June 2004. The information campaign was conducted in 2 rounds in each village cluster, separated by a period of 2 weeks. Each round consisted of 2 to 3 meetings, as well as distribution of posters and leaflets. Residents were informed in advance about the dates and locations of meetings, and separate meetings were held in low- and mid- to high-caste neighborhoods. Each meeting lasted about an hour and consisted of a 15-minute audiotaped presentation that was played twice, opportunities to ask questions, and dis-

tribution of leaflets. People were notified that the information was collected from the government and distributed in the public interest by our research team and a nongovernmental organization based in Uttar Pradesh, Sahbhagi Shikshan Kendra.<sup>30</sup>

To ensure that the information campaigns were uniform, research assistants read a scripted introduction and were allowed to answer questions only to which the answers were already written on the leaflets. Any other questions or issues were not answered. The presentation, leaflets, and posters focused on the following information. Health services information included the specific days and hours a nurse midwife is available in the village; the obligation of the nurse midwife to provide free prenatal and postnatal care, including tetanus vaccines and prenatal supplements for mothers and health care and vaccinations for infants; health centers available for more specialized care; and where to complain about quality or quantity of health services. Social services information included how much school fees are for low- and mid- to high-caste children, sources and oversight of education funds, obligations of oversight committees, requirements for semiannual village governance meetings, organization and funding of village government and development work, right to obtain copies of village records, and where to complain about education or village governance problems.

The information in the presentation and leaflets was obtained from the Uttar Pradesh health, education, and village governance departments. According to headcounts of everyone attending our informational meetings, 14% of the residents of the entire village cluster attended in round 1 and 11% attended in round 2. If there was some overlap in attendance, we estimate that 14% to 25% of the residents of each intervention village cluster attended a presentation. We reached our target level of attendance, which was 250 people in each round (about 11% of the average village population). No

information campaign was held in the control villages.

#### Follow-up Survey

Baseline survey participants were re-interviewed 12 months later by research assistants who had no knowledge of the intervention. To maintain this blinding, intervention group subjects were not asked whether they attended an informational meeting.

Two years after our intervention, we conducted focus group meetings among 20 randomly selected intervention villages. We conducted 3 focus group meetings in each village, one from each of mid- to high caste, low caste, and low-caste women. Each meeting consisted of about 20 adult volunteer participants who were asked whether they remembered the information campaign, whether they had discussed the information with others afterward, whether any of the villagers took up service delivery issues with the service providers, why more significant changes did not occur in the village, and what could be done to improve our information campaign.

#### Analysis

Excess school fees were defined as the school fees paid by students minus the legal amount they can be charged (US \$1=45 rupees). The unit of analysis for this outcome was individual children. The unit of analysis for other outcomes (eg, visits by nurse midwife, development work in village) was households. For each outcome, we compared intervention and control groups, adjusting standard errors for clustering at the village level. We used the regress and cluster commands from Stata 9.2 statistical software (StataCorp, College Station, Texas) for these analyses.  $P < .05$  was set as the threshold for significance.

For 5 of 8 outcomes, comparing within-household changes from baseline to follow-up was not possible, because households that reported those outcomes at baseline were often not reporting on the same outcomes at 1 year. For example, a household reporting on

prenatal outcomes at baseline would no longer have a pregnant woman to report prenatal outcomes on at 1 year. For these, we additionally conducted a multivariate regression comparing intervention to control at 1 year, using a random-effects model in which random effects are at the village cluster level and standard errors are clustered at the village cluster level. The regression adjusts for total population of the village cluster, district size, household caste, and highest education attained in the household. For the 3 remaining outcomes of visits by nurse midwife, village council meetings, and development work in village, we conducted a within-household difference-in-differences analysis, using a random-effects model at the village cluster level and clustering for standard errors at the village cluster level.

Focus groups were analyzed by proportion of respondents to questions. Quotations representing dominant themes were recorded.

#### Ethical Considerations

Our informational campaign and surveys were approved by the village governance department of Uttar Pradesh and the institutional review board of Johns Hopkins University. Before conducting the surveys, we first approached the locally elected village head with the state permission and obtained permission from him. A research assistant then obtained verbal informed consent from both parents before administering the household survey. If the father of the household was not available, then another male adult was asked to substitute.

## RESULTS

### Baseline Characteristics

Intervention and control districts were similar in their socioeconomic indicators, and the mean characteristics are similar to the averages for the state (TABLE 1).<sup>20,24,31,32</sup> The districts ranged in size from 180 000 to 555 000 rural households and from 1.2 million to 3.7 million rural population.<sup>20</sup> Only 16% of their population lives in urban areas.

One third of their population lives below the poverty line, which is an income of \$90 per capita per year.<sup>20</sup> The infant mortality rate is 89 per 1000 live births.<sup>31</sup> Only 46% of children are immunized. Although most children are enrolled in school, the literacy rate is only 56%.<sup>24</sup>

The village clusters were characterized by substantial numbers of low-caste residents, a low literacy rate, less than universal access to electricity, and few primary schools (Table 1). Treatment and control village clusters did not differ in their demographic and developmental characteristics.

Our baseline survey indicated no significant differences between treatment and control households with respect to the health, education, and governance outcomes (TABLE 2). However, it did indicate inadequate delivery of relevant services for both groups. Only about two thirds of households had been visited by a nurse midwife,

**Table 1.** Baseline Characteristics of Intervention and Control Districts and Village Clusters

| District Characteristic                                | Intervention Districts (n = 11)        | Control Districts (n = 10)        | P Value          |
|--|--|-----------------------------------|------------------|
| No. of village clusters per district, mean             | 1028                                   | 877                               | .29              |
| Rural population, mean                                 | 2 325 264                              | 2 146 041                         | .62              |
| No. of rural households, mean                          | 365 644                                | 342 311                           | .66              |
| Population below poverty line, %                       | 33.46                                  | 34.53                             | .79              |
| Infant mortality rate, deaths/1000 live births         | 88.82                                  | 89.5                              | .85              |
| Children immunized, %                                  | 46.36                                  | 46.44                             | .99              |
| Children not enrolled in any school, %                 | 5                                      | 5 <sup>a</sup>                    | .99              |
| Children enrolled in private school, %                 | 27                                     | 24 <sup>a</sup>                   | .88              |
| Literate, %  | 55.4                                   | 57.32                             | .63              |
| Village Cluster Characteristic                         | Intervention Village Clusters (n = 55) | Control Village Clusters (n = 50) |                  |
| Female, No. (%)  | 57 598 (47)                            | 72 155 (47)                       | .65              |
| Low caste, No. (%)                                     | 26 066 (21)                            | 35 976 (25)                       | .24              |
| Literacy rate, No. (%)                                 | 49 359 (52)                            | 65 871 (52)                       | .64              |
| Access to electricity, No. (%)                         | 40 (75) <sup>b</sup>                   | 38 (77) <sup>c</sup>              | .80              |
| Population density, mean, persons/km <sup>2</sup>      | 794                                    | 674                               | .34              |
| No. of primary schools per village cluster, mean       | 1.6                                    | 1.7                               | .67              |
| Remoteness from nearest main road, mean, km            | 1.8                                    | 1.4                               | .36              |
| Maximum education level of household, mean grade level | 7.1                                    | 6.7                               | .22 <sup>d</sup> |

<sup>a</sup>Missing data for 1 control district.  
<sup>b</sup>Missing data for 2 village clusters.  
<sup>c</sup>Missing data for 1 village cluster.  
<sup>d</sup>P value based on standard errors clustered at the village cluster level.

**Table 2.** Baseline and Final Health and Social Services Among All Households<sup>a</sup>

| Outcome  | Baseline                          |                              |                                  |                      | Postintervention                  |                              |                                  |                      | Difference in Differences <sup>b</sup>           |                      |
|--|-----------------------------------|------------------------------|----------------------------------|----------------------|-----------------------------------|------------------------------|----------------------------------|----------------------|--|----------------------|
|  | Intervention Households (n = 548) | Control Households (n = 497) | Difference (95% CI) <sup>c</sup> | P Value <sup>d</sup> | Intervention Households (n = 536) | Control Households (n = 489) | Difference (95% CI) <sup>c</sup> | P Value <sup>d</sup> | Δ Intervention - Δ Control (95% CI) <sup>c</sup> | P Value <sup>d</sup> |
| Visited by nurse midwife, %                          | 63                                | 72                           | -9 (-22 to 4)                    | .17                  | 63                                | 61                           | 3 (-11 to 16)                    | .71                  | 12 (-4 to 27)                                    | .15                  |
| No. of households with pregnant women                | 144                               | 105                          |                                  |                      | 168                               | 102                          |                                  |                      |  |                      |
| Received prenatal examination, %                     | 52                                | 46                           | 6 (-14 to 26)                    | .54                  | 70                                | 43                           | 27 (13 to 40)                    | <.001                |  |                      |
| Received tetanus vaccine, %                          | 55                                | 59                           | -4 (-23 to 15)                   | .65                  | 66                                | 42                           | 24 (9 to 39)                     | .002                 |  |                      |
| Received prenatal supplements, %                     | 49                                | 50                           | -1 (-22 to 19)                   | .89                  | 64                                | 44                           | 20 (5 to 35)                     | .01                  |  |                      |
| No. of households with infant(s)                     | 171                               | 166                          |                                  |                      | 149                               | 79                           |                                  |                      |  |                      |
| Received ≥1 vaccination, %                           | 53                                | 47                           | 6 (-10 to 22)                    | .49                  | 72                                | 46                           | 26 (10 to 43)                    | .002                 |  |                      |
| No. of children in primary school                    | 1039                              | 808                          |                                  |                      | 954                               | 789                          |                                  |                      |  |                      |
| Excess school fees, rupees/y                         | 28                                | 31                           | -3 (-9 to 4)                     | .41                  | 18                                | 26                           | -8 (-12 to -4)                   | <.001                |  |                      |
| Village council meeting occurred in previous 6 mo, % | 31                                | 36                           | -5 (-19 to 8)                    | .41                  | 37                                | 22                           | 15 (4 to 27)                     | .008                 | 21 (5 to 36)                                     | .01                  |
| Development work in village, %                       | 43                                | 31                           | 11 (-1 to 24)                    | .06                  | 66                                | 57                           | 8 (-4 to 21)                     | .18                  | -3 (-18 to 12)                                   | .71                  |

Abbreviation: CI, confidence interval.  
<sup>a</sup>Blank cells indicate that a difference-in-difference analysis could not be conducted, as explained in the "Methods."  
<sup>b</sup>Using a random-effects regression model.  
<sup>c</sup>Differences may not exactly add because of rounding.  
<sup>d</sup>P values based on standard errors clustered at the village cluster level.

**Table 3.** Baseline and Final Health and Social Services Among Low-Caste Households

| Outcome  | Baseline                          |                              |                                  |                      | Postintervention                  |                              |                                  |                      |
|--|-----------------------------------|------------------------------|----------------------------------|----------------------|-----------------------------------|------------------------------|----------------------------------|----------------------|
|  | Intervention Households (n = 252) | Control Households (n = 245) | Difference (95% CI) <sup>a</sup> | P Value <sup>b</sup> | Intervention Households (n = 246) | Control Households (n = 241) | Difference (95% CI) <sup>a</sup> | P Value <sup>b</sup> |
| Visited by nurse midwife, %                          | 66                                | 73                           | -7 (-21 to 7)                    | .32                  | 60                                | 60                           | -1 (-16 to 14)                   | .93                  |
| No. of households with pregnant women                | 63                                | 52                           |                                  |                      | 83                                | 52                           |                                  |                      |
| Received prenatal examination, %                     | 57                                | 43                           | 14 (-8 to 37)                    | .21                  | 67                                | 45                           | 22 (5 to 40)                     | .01                  |
| Received tetanus vaccine, %                          | 60                                | 55                           | 5 (-17 to 27)                    | .66                  | 63                                | 50                           | 13 (-5 to 31)                    | .17                  |
| Received prenatal supplements, %                     | 51                                | 47                           | 4 (-19 to 27)                    | .71                  | 63                                | 47                           | 15 (-5 to 36)                    | .13                  |
| No. of households with infant(s)                     | 78                                | 86                           |                                  |                      | 78                                | 36                           |                                  |                      |
| Received ≥1 vaccination, %                           | 53                                | 47                           | 5 (-13 to 24)                    | .55                  | 72                                | 46                           | 26 (3 to 49)                     | .03                  |
| No. of children in primary school                    | 524                               | 395                          |                                  |                      | 468                               | 373                          |                                  |                      |
| Excess school fees, rupees/y                         | 32                                | 37                           | -5 (-13 to 3)                    | .25                  | 22                                | 31                           | -10 (-15 to -5)                  | <.001                |
| Village council meeting occurred in previous 6 mo, % | 33                                | 39                           | -5 (-20 to 9)                    | .46                  | 38                                | 20                           | 18 (5 to 31)                     | .006                 |
| Development work in village, %                       | 50                                | 29                           | 21 (7 to 35)                     | .004                 | 67                                | 60                           | 7 (-7 to 21)                     | .34                  |

Abbreviation: CI, confidence interval.

<sup>a</sup>Differences may not exactly add because of rounding.<sup>b</sup>P values based on standard errors clustered at the village cluster level.

about half of pregnant women and infants had received specific health services, and children were charged excess school fees of about 30 rupees per year. Moreover, only about one third of households reported that a village council meeting had occurred or that development work in the village was performed.

### Changes in Health and Social Services

After 1 year, intervention villagers noted increased delivery of several services compared with control villagers, and most outcomes either worsened or remained unchanged in the control villages (Table 2). Changes among low-caste and mid- to high-caste households were generally similar (TABLE 3 and TABLE 4). However, the differences between intervention and control low-caste households were not statistically significant for tetanus vaccinations and receipt of prenatal supplements (Table 3).

In a multivariate random-effects regression comparing intervention villagers with control villagers at 1 year (TABLE 5), in absolute percentage points villagers in the intervention group reported increased prenatal examinations (30%;  $P < .001$ ), tetanus vaccinations (27%;  $P < .001$ ), prenatal

supplements (24%;  $P = .003$ ), infant vaccinations (25%;  $P = .004$ ), and decreased excess school fees (8 rupees;  $P < .001$ ). When differences were calculated in change from baseline to final assessment between intervention and control groups for the 3 outcomes in which this was possible, village council meetings occurred 21% more often in intervention than control ( $P = .01$ ) groups. There were no significant differences between intervention and control groups in visits by nurse midwives or in development work (Table 2).

### Focus Groups

Sixty-two percent (694/1118) of participants in 60 focus groups remembered the information campaign. Of those who remembered, at least 25% stated that they had taken up service delivery issues with individual service providers, although only 5% had brought it up in the village council meeting; 43% reported that service delivery improved in health and education services after the information campaign. However, less than 8% reported that there was any change in the functioning of the village council meetings.

Forty percent of focus group participants (278 members) stated that they had discussed the information with oth-

ers. Of the 276 members who said they had not discussed the information with others, 58% believed it was futile, 20% said they did not understand the information well enough, and 9% said they were scared. When we asked why more significant change did not occur in village improvement activities, a prominent theme was that the elected village head tended to be unapproachable. Typical responses from mid to high castes were that the "village head's work is done for his own men." Low castes responded similarly, also citing caste as a reason.

When asked how we could improve the information campaign, many reported that information campaigns should occur every few months and that the village head, as well as the village secretary, should participate.

### COMMENT

We found that providing a structured informational program to villagers in north Indian districts about entitled services enhanced the delivery of health and social services among low- and mid- to high-caste households. Improvements occurred in prenatal services, infant vaccinations, excess school fees, and occurrence of village council meetings. Although nurse midwife visits did not increase, 20% to 25% more

**Table 4.** Baseline and Final Health and Social Services Among Mid- to High-Caste Households

| Outcome  | Baseline                          |                              |                                  |                      | Postintervention                  |                              |                                  |                      |
|--|-----------------------------------|------------------------------|----------------------------------|----------------------|-----------------------------------|------------------------------|----------------------------------|----------------------|
|  | Intervention Households (n = 296) | Control Households (n = 252) | Difference (95% CI) <sup>a</sup> | P Value <sup>b</sup> | Intervention Households (n = 290) | Control Households (n = 248) | Difference (95% CI) <sup>a</sup> | P Value <sup>b</sup> |
| Visited by nurse midwife, %                          | 60                                | 71                           | -11 (-27 to 4)                   | .16                  | 66                                | 61                           | 5 (-9 to 20)                     | .47                  |
| No. of households with pregnant women                | 81                                | 53                           |                                  |                      | 85                                | 50                           |                                  |                      |
| Received prenatal examination, %                     | 49                                | 50                           | -1 (-25 to 23)                   | .92                  | 72                                | 40                           | 32 (13 to 50)                    | .001                 |
| Received tetanus vaccine, %                          | 51                                | 64                           | -13 (-37 to 12)                  | .30                  | 69                                | 34                           | 35 (14 to 56)                    | .001                 |
| Received prenatal supplements, %                     | 47                                | 54                           | -7 (-33 to 19)                   | .59                  | 65                                | 41                           | 25 (5 to 44)                     | .02                  |
| No. of households with infant(s)                     | 93                                | 80                           |                                  |                      | 71                                | 43                           |                                  |                      |
| Received ≥1 vaccination, %                           | 53                                | 47                           | 6 (-15 to 27)                    | .59                  | 73                                | 47                           | 27 (5 to 49)                     | .02                  |
| No. of children in primary school                    | 515                               | 413                          |                                  |                      | 486                               | 416                          |                                  |                      |
| Excess school fees, rupees/y                         | 24                                | 25                           | -1 (-7 to 5)                     | .81                  | 15                                | 21                           | -6 (-10 to -2)                   | .001                 |
| Village council meeting occurred in previous 6 mo, % | 28                                | 33                           | -5 (-19 to 9)                    | .48                  | 36                                | 23                           | 13 (1 to 25)                     | .03                  |
| Development work in village, %                       | 37                                | 34                           | 3 (-11 to 17)                    | .68                  | 65                                | 55                           | 10 (-4 to 24)                    | .15                  |

Abbreviation: CI, confidence interval.

<sup>a</sup>Differences may not exactly add, because of rounding.<sup>b</sup>P values based on standard errors clustered at the village cluster level.

households in intervention villages reported that women were receiving prenatal services and that their infants were being immunized, suggesting that the nurse midwife was performing more duties when a visit did occur.

Although most outcomes either worsened or remained unchanged in control villages, almost all outcomes improved in intervention villages, suggesting that in an environment in which some services are generally worsening, at a minimum, the intervention prevented services from worsening.

Prenatal outcomes worsened in control villages, possibly a consequence of fewer nurse midwife visits, which may fluctuate from year to year, depending on local factors. The nonavailability of supplies or supervision, which can be affected by changes in the state government, may reduce her incentives to visit villages. The state government did change that year, with a new chief minister and political party for the state. Although most policies remained the same, the degree of implementation could change as a consequence of the new leadership. Intervention villages reported having 5% more pregnant women at 1 year compared with control, which could be explained by a few more new marriages or slightly increased fertility that year.

**Table 5.** Multivariate Differences Among All Households at Follow-up<sup>a</sup>

| Outcome  | Difference Between Intervention and Control (95% CI) | P Value <sup>b</sup> |
|--|--|----------------------|
| Visited by nurse midwife, %                          | 2 (-13 to 16)  | .80                  |
| Pregnant women, %                                    |  |                      |
| Received prenatal examination                        | 30 (17 to 43)  | <.001                |
| Received tetanus vaccine                             | 27 (12 to 41)  | <.001                |
| Received prenatal supplements                        | 24 (8 to 39)   | .003                 |
| Infants in family, %                                 |  |                      |
| Received ≥1 vaccination                              | 25 (8 to 42)   | .004                 |
| Children in primary school                           |  |                      |
| Excess school fees, rupees/y                         | -8 (-13 to -4)                                       | <.001                |
| Village council meeting occurred in previous 6 mo, % | 14 (3 to 26)   | .01                  |
| Development work in village, %                       | 8 (-5 to 21)   | .22                  |

Abbreviation: CI, confidence interval.

<sup>a</sup>Using a random-effects regression model and adjusting for district population, village cluster population, household caste, and education.<sup>b</sup>P values based on standard errors clustered at the village cluster level.

Development work in the villages increased in both arms and may have been influenced by new elections for village leadership that were due 3 months after our final survey. It is common for spending activity for development work in villages to increase just before local elections. It is unlikely that a shift in resources within the village clusters explains the increase in development work and decrease in prenatal services. Funds for village development work come directly to the village cluster accounts and are managed by the elected village head. Nurse midwives do not report to

the village head and receive their supplies separately. Village council meetings worsened in the control groups and are supposed to be a forum for evaluating complaints and progress in the village cluster. However, with village elections upcoming, providing such a forum might have been perceived by the village head as hindering his chances for reelection and may therefore not have been called.

Teachers may get away with overcharging school fees because parents do not know the actual fee schedule and may be illiterate. The actual fees are between 0 and 12 rupees per child per

year, depending on the child's grade and caste.<sup>33</sup> At 1 year, intervention households reported being overcharged 10 rupees less, whereas there was no appreciable decrease in charges for control households.

Focus groups suggest that the improvements resulted from increased communication among villagers and between villagers and service providers in intervention villages. However, there was little dialogue with the village leadership because of a sense of futility, as well as fear.

Previous work on this topic has described widespread deficiencies in service delivery.<sup>34</sup> However, few randomized trials of interventions to improve public service delivery have been conducted.<sup>35</sup> Our findings highlight the importance of empowering communities to facilitate individual and collective action,<sup>1,34</sup> which is especially important because a number of developing countries, including India, have decentralized control over public services to local communities.<sup>12,13</sup>

Empowerment often requires significant resources to involve community members in gaining control over issues that concern them.<sup>14</sup> Although we informed villages about their rights to services, as well as how to complain, we did not advocate that they demand those services or that they complain. Significant improvements in basic services we observed suggest that villagers are capable of some degree of self-empowerment once they are given the correct information. However, significant barriers to collective action were apparent and clearly warrant further studies.

The total cost of the intervention was only \$4000, which amounts to about \$0.22 per household in a village cluster. If the government or local organizations could disseminate this information on radio or newspapers, the costs could be lower.

Strengths of our study include a large sample size in a state that shares many of the same service delivery issues as other Indian states,<sup>34</sup> the use of a practical intervention that can eas-

ily be adapted to other regions, and a rigorous cluster randomized controlled trial design. However, our intervention was not successful in increasing visits by nurse midwives or development work, indicating that further work is needed to determine how to improve these outcomes. In addition, low-caste households appeared to benefit less than mid- to high-caste households in 2 areas, tetanus vaccinations and prenatal supplements, suggesting that low-caste households have greater barriers to individual or collective action or that they are inadequately informed of the importance of these services.

Several limitations must be considered in interpreting our results. First, the data collected were based on self-report because there are no reliable written records on nurse midwife visits, prenatal services, vaccinations, or excess school fees. Although there are registers of village governance meetings, these are frequently falsified. Second, it is possible that intervention villagers were more likely to pay attention to service delivery than control villagers (recall bias). Third, our data do not include any morbidity or mortality outcomes. However, prenatal care has a documented association with morbidity and mortality outcomes.<sup>36,37</sup> Fourth, we focused on villages in only 1, albeit large, geographic region. The content and dissemination of this intervention should be tailored to the circumstances of other Indian states and other developing countries. Future work may involve refining the nature and manner of information campaigns, accounting for the literacy levels of various communities, enhancing community oversight of services, targeting lower socioeconomic households better, and evaluating for sustainability. Sustainability outcomes may depend on targeting interventions in primary education and governance, along with health.<sup>38</sup>

Seventy percent of India's population lives in the villages and would benefit from improved basic services.<sup>20</sup> Interventions that educate resource-poor

populations about entitled services may improve the delivery of services. Such interventions are promising and low-cost means to improve the health and welfare of individuals in developing countries.

**Author Contributions:** Drs Pandey and Goyal had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

**Study concept and design:** Pandey, Riboud, Levine, Goyal.

**Acquisition of data:** Pandey, Levine, Goyal.

**Analysis and interpretation of data:** Pandey, Sehgal, Riboud, Levine, Goyal.

**Drafting of the manuscript:** Pandey, Levine, Goyal.

**Critical revision of the manuscript for important intellectual content:** Pandey, Sehgal, Riboud, Levine, Goyal.

**Statistical analysis:** Pandey, Sehgal, Levine, Goyal.

**Obtained funding:** Pandey, Riboud, Levine, Goyal.

**Administrative, technical, or material support:** Pandey, Riboud, Levine, Goyal.

**Study supervision:** Pandey, Sehgal, Levine, Goyal.

**Financial Disclosures:** None reported.

**Funding/Support:** We gratefully acknowledge financial support from Sahbhagi Shikshan Kendra (a non-governmental organization based in Uttar Pradesh) and the World Bank.

**Role of the Sponsor:** The funding organizations aided in design of the study. They had no role in the collection, management, analysis, or interpretation of the data or in the preparation of the manuscript. World Bank approved the manuscript.

**Disclaimer:** The findings, interpretations, and conclusions expressed here are entirely those of the authors, and they do not necessarily represent the views of the World Bank, its executive directors, or the countries they represent.

**Acknowledgment:** We would like to thank Mitch Feldman, MD, MPhil, for critical revisions and participants at research seminars at the World Bank, Johns Hopkins, and Economics of Education conference in Dijon, France, for their helpful comments. Dr Feldman received no compensation for his contribution.

## REFERENCES

1. World development report. World Bank. 2004. <http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTWDRS/EXTWDR2004/0,,menuPK:477704~pagePK:64167702~piPK:64167676~theSitePK:477688,00.html>. Accessed September 18, 2007.
2. Abbasi K. The World Bank and world health: focus on South Asia, I: Bangladesh. *BMJ*. 1999;318(7190):1066-1069.
3. Reinikka R, Smith N. Public expenditure tracking surveys in education. International Institute for Educational Planning, UNESCO. <http://www.unesco.org/iiep/PDF/pubs/Reinikka.pdf>. Accessed September 18, 2007.
4. Comptroller and Auditor General of India. Report of the Comptroller and Auditor General of India on the Union Government 2001. [http://cag.nic.in/html/reports/civil/2001\\_book3/index.htm](http://cag.nic.in/html/reports/civil/2001_book3/index.htm). Accessed September 18, 2007.
5. Transparency International. Global corruption report 2006: corruption and health. [http://www.transparency.org/publications/gcr/download\\_gcr/download\\_gcr\\_2006](http://www.transparency.org/publications/gcr/download_gcr/download_gcr_2006). Accessed September 18, 2007.
6. Center for Democracy and Governance. A handbook on fighting corruption. February 1999. [http://www.usaid.gov/our\\_work/democracy\\_and\\_governance/publications/pdfs/pnace070.pdf](http://www.usaid.gov/our_work/democracy_and_governance/publications/pdfs/pnace070.pdf). Technical

- publication series # PN-ACE-070. Accessed September 18, 2007.
7. Bardhan P. Decentralization of governance and development. *J Econ Perspect*. 2002;16(4):185-205.
  8. Bardhan P, Mookherjee D. Decentralizing antipov-erty program delivery in developing countries. *J Public Econ*. 2005;89(4):675-704.
  9. Chaudhury N, Hammer J, Kremer M, Muralidharan K, Rogers H. Missing in action: teacher and health worker absence in developing countries. *J Econ Perspect*. 2006;20(1):91-116.
  10. World Bank. Teachers skipping work [World Bank Web site]. <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/0,,contentMDK:20848416~pagePK:146736~piPK:146830~theSitePK:223547,00.html>. Accessed September 18, 2007.
  11. World Bank. Teachers and doctors: missing in action [World Bank Web site]. <http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:20861757~pagePK:64257043~piPK:437376~theSitePK:4607,00.html>. Accessed September 18, 2007.
  12. Countries in South Asia and decentralization reform. World Bank. [World Bank Web site]. <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/EXTSAREGTOPPRISECDEV/EXTSAREGTOPDECENTRALIZATION/0,,contentMDK:20255286~menuPK:496914~pagePK:34004173~piPK:34003707~theSitePK:496900,00.html>. Accessed September 18, 2007.
  13. Constitution of India. 73rd amendment. 1992. <http://indiacode.nic.in/coiweb/amend/amend73.htm>. Accessed September 18, 2007.
  14. Gaiha R, Kaushik PD, Kulkarni V. Jawahar Rozgar Yojana, panchayats, and the rural poor in India. *Asian Surv*. 1998;38(10):928-949.
  15. National human development report 2001. Planning Commission, Government of India. <http://planningcommission.nic.in/reports/genrep/reportsf.htm>. Accessed September 18, 2007.
  16. Chen S, Ravallion M. How have the world's poor-est fared since the early 1980s? The World Bank. 2004. [http://www.worldbank.org/research/povmonitor/MartinPapers/How\\_have\\_the\\_poorest\\_fared\\_since\\_the\\_early\\_1980s.pdf](http://www.worldbank.org/research/povmonitor/MartinPapers/How_have_the_poorest_fared_since_the_early_1980s.pdf). Accessed September 18, 2007.
  17. National Family Health Survey. International Institute for Population Sciences. India. <http://www.nfhsindia.org/factsheet.html>. Accessed September 18, 2007.
  18. Baqui AH, Williams EK, Darmstadt GL, et al. New-born care in rural Uttar Pradesh. *Indian J Pediatr*. 2007;74(3):241-247.
  19. Sharan M, Strobino D, Ahmed S. Intrapartum oxytocin use for labor acceleration in rural India. *Int J Gynaecol Obstet*. 2005;90(3):251-257.
  20. Office of the Registrar General. Census of India 2001. <http://www.censusindia.net>. Accessed September 18, 2007.
  21. Kremer M, Chaudhury N, Rogers FH, Muralidharan K, Hammer J. Teacher absence in India: a snapshot. *J Eur Econ Assoc*. 2005;3(2-3):658-667.
  22. Reinnika R, Svensson J. Local capture: evidence from a central government transfer program in Uganda. *Q J Econ*. 2004;119(2):679-705.
  23. Hayes RJ, Bennett S. Simple sample size calculation for cluster-randomized trials. *Int J Epidemiol*. 1999;28(2):319-326.
  24. Annual status of education report: Pratham. 2005, rural. <http://www.pratham.org/aser-report/Aser%20Full%20Report%202005.pdf>. Accessed September 18, 2007.
  25. Census terms. Census of India 2001. <http://www.censusindia.net/census2001/history/censusterm.html>. Accessed September 18, 2007.
  26. Ministry of Social Justice and Empowerment; Government of India. Frequently asked questions in scheduled castes division. <http://socialjustice.nic.in/schedule/faq.htm#sc1>. Accessed September 18, 2007.
  27. Census of India 2001. List of scheduled castes and scheduled tribes. <http://www.censusindia.net/results/upscst.PDF>. Accessed September 18, 2007.
  28. National Commission for Backward Classes, Government of India. Central list of other backward classes. <http://ncbc.nic.in/html/faq6.html>. Accessed September 18, 2007.
  29. Hoff K, Pandey P. Belief systems and durable inequalities: an experimental investigation of Indian caste. The World Bank. 2004. [http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2004/07/22/000112742\\_20040722150100/Rendered/PDF/wps3351.pdf](http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2004/07/22/000112742_20040722150100/Rendered/PDF/wps3351.pdf). Policy Research Working Paper 3351. Accessed September 18, 2007.
  30. Sahbhagi Shikshan Kendra. <http://www.sahbhagi.org/>. Accessed September 18, 2007.
  31. Debroy B, Bhandari L, eds. *District-Level Depri-vation in the New Millennium*. Delhi, India: Konark Publishers; 2003.
  32. Planning Commission, Government of India. Pov-erty estimates for 1999-2000. [http://planningcommission.nic.in/reports/articles/ncsxn/ar\\_pvrtty.htm](http://planningcommission.nic.in/reports/articles/ncsxn/ar_pvrtty.htm). Accessed September 18, 2007.
  33. *Uttar Pradesh Basic Shiksha Parishad, Niyam San-grah, 1972-2002 [Uttar Pradesh Basic Education Council, Collection of Rules, 1972-2002]*. Lucknow, Ut-tar Pradesh, India: Uttar Pradesh Basic Education Office; 2002/2003.
  34. Transparency International India, Centre for Me-dia Studies. India Corruption Study 2005 to improve governance, vol I: key highlights. <http://www.cmsindia.org/cms/events/corruption.pdf>. Accessed Sep-tember 18, 2007.
  35. Olken BA. Monitoring corruption: evidence from a field experiment in Indonesia. <http://www.nber.org/~bolken/corruptionexperiments.pdf>. Accessed September 18, 2007.
  36. Institute of Medicine; Committee to Study the Pre-vention of Low Birth Weight. *Preventing Low Birth Weight*. Washington, DC: National Academy Press; 1985.
  37. Expert Panel on the Content of Prenatal Care. *Caring for Our Future: The Content of Prenatal Care*. Wash-ington, DC: Public Health Service; 1989.
  38. Flanagin A, Winker MA. Theme issue on pov-erty and human development: call for papers on interven-tions to improve health among the poor. *JAMA*. 2006;296(24):2970-2971.