Does Community Access Affect the Use of Health and Family Welfare Services in Rural India?

N. P. Das, Vinod K. Mishra, and P. K. Saha

ISSN 1026-4736

Does Community Access Affect the Use of Health and Family Welfare Services In Rural India?

ABSTRACT

Four out of ten Indians live in one of the four large northern states—Uttar Pradesh, Madhya Pradesh, Bihar, and Rajasthan. These states lag behind other states in their level of development and stage of demographic transition. Fertility, morbidity, and mortality are higher than in other states, and utilization of family planning and maternal and child health services is lower.

Based on data from India's first National Family Health Survey (NFHS-1), this report focuses on factors affecting utilization of family planning and maternal and child health services in the rural areas of these four states and in India as a whole, with particular attention to the effects of community (i.e., village) access to these services. The effects of community access to services merit special attention because it is often argued that poor access is an obstacle to service utilization, particularly in the less-developed regions of India.

This analysis of service utilization is based on the responses of currently married, rural women age 13–49 to survey questions in the following areas:
- *Three aspects of family planning—whether the respondent knows about all five main modern methods of family planning (female sterilization, male sterilization, intrauterine device (IUD), oral pill, and condom), whether she knows a source of supply for all five main modern methods, and whether she is currently using any method*
- *Three aspects of antenatal care—whether the respondent received an antenatal check-up during pregnancy, whether she received iron and folic acid tablets during pregnancy, and whether she received two or more injections of tetanus toxoid vaccine during pregnancy*
- *Two aspects of delivery care—whether the respondent received assistance from a health professional at the time of delivery and whether she delivered in a medical institution*
- *Two aspects of preventive child health care—immunization status of the respondent's child or children under age 4 at the time of the survey and whether the child/children received vitamin A supplementation*
- *Three aspects of curative child health care—treatment of acute respiratory infection (ARI), treatment of diarrhoea, and treatment of fever*

The analysis measures community access to health and family welfare services in terms of distance of the village to a health facility, availability of an all-weather road connecting the village to the outside world, regular visits in the village by health or family planning workers, and mass media or other educational activities in the village related to health or family welfare. The results of the multivariate analysis indicate that community access does not have much influence on utilization of family planning or maternal or child health services once household-level and individual-level socioeconomic and demographic variables are controlled. By contrast, household living standard, woman's education, woman's exposure to electronic mass media, and son preference are found to have substantial effects on the utilization of services, even after controlling for the potentially confounding effects of other predictor variables.

Woman's education emerges as the strongest predictor of utilization of family planning, antenatal-care, delivery-care, and preventive child-health services, but not curative child-health services. Treatment-seeking for the three major childhood diseases is not affected much by any of the community-access, socioeconomic, or demographic variables except sex of child, indicating that parents' propensity to seek treatment for their children's sicknesses does not depend much on their socioeconomic status or the accessibility of services. Parents are, however, somewhat more likely to seek treatment for boys who are sick than for girls. Son preference also has a considerable effect on use of family planning, inasmuch as women with any given number of living children are more likely to use family planning the more sons they have.

Overall, the findings indicate that, at India's current stage of development and demographic transition, variations in utilization of family planning and maternal and child health services are explained mainly by variations in household- and individual-level socioeconomic and demographic factors, not by variation in community access to services. Apparently family planning and maternal and child health services are available at a sufficient level in rural India so that further improvements in physical accessibility alone (e.g., decreasing the distance to a health facility) will not make a substantial difference in the propensity to use these services. The main factors affecting utilization appear to be demand factors, such as woman's education, exposure to mass media, and son preference. Quality of services may also be important, but the survey did not assess service quality.

N. P. Das, Vinod K. Mishra, and P. K. Saha

N. P. Das is a Joint Director in the Population Research Centre, M. S. University, in Vadodara, India. Vinod K. Mishra is a Fellow in Population and Health Studies at the East-West Center in Honolulu, Hawaii. P. K. Saha is a Chief Director in the Department of Family Welfare, Ministry of Health and Family Welfare, New Delhi, India.

CONTENTS

TABLES

FIGURES

Page

INTRODUCTION

The birth of the billionth Indian at the start of the new millennium signals a need to critically examine India's population policies and programmes. Although the country has recorded significant declines in fertility and mortality during the post-independence period, the demographic goals of replacement-level fertility, low maternal mortality, and low infant and child mortality are far from being realized. This is especially so in the large northern states[1] of Uttar Pradesh, Madhya Pradesh, Bihar, and Rajasthan, which lag behind other states in both level of development and stage of demographic transition. Female literacy, for example, ranges from 20–29% in these states, compared with 39% for India as a whole according to the 1991 census. To attain the national objectives of slowing the rate of population growth, improving the length and quality of life, and accelerating the pace of development, special attention must be devoted to these four large northern states, which together account for 40% of the country's population.

These four states are characterized by low awareness and utilization of health and family-welfare services in comparison with other states, and this limited knowledge and underutilization of services are often cited as reasons for poor demographic performance (Satia and Jejeebhoy 1991; anonymous 1987). Not much is known, however, about the factors affecting knowledge and utilization of services in these states. The limited research that has been done highlights the role of both programmatic and socioeconomic factors (Khan, Prasad, and Quaiser 1987; Bhatia 1988; Gupta 1988; Khan and Gupta 1988; Khan and Prasad 1988; Kanitkar and Mukherji 1988; Talwar 1988; Satia and Giridhar 1991; Premi 1993; Sawhney 1993; Fosu 1994).

Several studies stress the role of socioeconomic and demographic factors in influencing demand for and utilization of family planning and maternal and child health services (Ray et al. 1984; Khan and Gupta 1985; Kanitkar and Sinha 1989; Jain et al. 1992; Elo 1992; Swenson et al. 1993; Abdalla 1993; Govindasamy 1994; Khan, Soomro, and Soomro 1994; Barlow and Diop 1995; Govindasamy and Ramesh 1997; Ahmed and Mosley 1997; Regmi and Manandhar 1997). Many of these studies have shown that utilization of family planning and maternal and child health services is strongly affected by woman's education. Other factors that play a role are urban-rural residence, woman's work status, woman's status relative to men, religion, caste/tribe membership, household standard of living (or economic status of the household), and community development.

---

[1]For reasons of economy of language, we shall refer to these four states as 'the four northern states', even though Uttar Pradesh and Madhya Pradesh are usually classified as belonging to central India and Bihar to east India.

A number of studies have stressed the importance of access to family planning and health services as a factor affecting the utilization of these services (Rao and Richard 1984; Khan and Gupta 1985; Sarita and Tuominen 1993; Shelton and Davis 1996; Thomas and Maluccio 1996; Kumar, Singh, and Kaur 1997; Mroz et al. 1999). Historically, improving access has been widely accepted as a primary strategy for increasing the utilization of contraceptive and health services in developing countries. In recent years, field experience and data from both qualitative and quantitative studies have indicated that improvements in the quality of services can further increase service utilization. Programmes that maximize quality as well as access to services enhance client satisfaction, leading to greater utilization (Shelton and Davis 1996; Levine et al. 1992). It is argued that access helps determine whether a potential client makes contact with a service provider in the first place, while quality of care influences a client's decision concerning whether to accept or use the service or to continue using it (Bertrand et al. 1995). Many of the studies cited here have stressed outreach programmes such as home visits, mobile clinics, and community-based distribution systems as mechanisms to increase both the accessibility and quality of services provided.

Several earlier studies indicate that the quality of services plays an important role in their utilization. For example, Levine and others (1992) report that a general perception that services are of poor quality is an important reason for nonuse of family planning in Uttar Pradesh. Roy and Verma (1999), Khan, Gupta, and Patel (1999), and Gupte, Bandewar, and Pisal (1999) also find an effect of perceived service quality on the utilization of family-welfare services. So do UNECA (1989), Roberto (1993), Dennis, Flynn, and Martin (1995), Shrestha and Ittiravivongs (1994), Phommasack (1995), Visaria (1999), Townsend, Khan, and Gupta (1999), Patel, Patel, and Mehta (1999), and Satia and Sokhi (1999). In their review of recent evidence on the effectiveness of India's family planning programme, Koenig, Foo, and Joshi (1999) and Koenig and Khan (1999) highlight major shortcomings in the quality of services such as limited contraceptive choice, gaps in counseling and information provided to clients, poor clinical standards and procedures, and lack of follow-up and continuity of care. They argue, however, that access to services—quite apart from the issue of quality—continues to be a significant problem for much of India's rural population.

Some studies have presented evidence that the effects of inadequate access on service utilization are greater than the effects of socioeconomic factors such as education (Sawhney 1993; Elo 1992). Some have argued that as access improves, the effects of socioeconomic factors on utilization of services become less important (Rosenzweig and Schultz 1982; Govindasamy and Ramesh 1997). Other studies have argued that lack of motivation is the major factor in nonutilization of services and that provision of services alone cannot overcome this obstacle (Ray et al. 1984).

As this brief review illustrates, previous research provides conflicting evidence on the relative importance of programmatic (supply) and nonprogrammatic (demand)

factors affecting health-seeking behavior. Much of this research is based on small, nonrepresentative samples. Clearly there is a need for further research based on large, representative samples that use multivariate methods to estimate effects while controlling for potentially confounding variables by holding them constant. This report attempts to fill that gap.

The approach is to estimate net effects of both supply and demand factors affecting utilization of health and family-welfare services in the rural areas of Uttar Pradesh, Madhya Pradesh, Bihar, and Rajasthan and in India as a whole. More specifically, the report examines how community-access variables influence utilization of family planning, antenatal-care, delivery-care, and child health-care services, controlling for selected socioeconomic and demographic characteristics of households, women, and their children. A major goal of the research is to inform programme managers and policymakers of the potential effects of improved accessibility of family planning and maternal and child health services in the less-developed rural areas of India.

DATA AND METHODS

The analysis is based on data from India's 1992–93 National Family Health Survey (NFHS-1). NFHS-1 covered 25 states, including Delhi, representing 99% of the country's population. Data were collected from a nationally representative sample of 89,777 ever-married women age 13–49 years residing in 88,562 households. The NFHS-1 data are representative at the state level. The samples for the four northern states include 11,438 women residing in 10,110 households in Uttar Pradesh, 6,254 women residing in 5,857 households in Madhya Pradesh, 5,949 women residing in 4,748 households in Bihar, and 5,211 women residing in 5,014 households in Rajasthan.

The NFHS-1 sample design was self-weighting in some states, but in other states certain categories of respondents (e.g., those from urban areas) were oversampled, so that weights are needed to restore the correct proportions. The weights are designed to preserve the total numbers of households and ever-married women interviewed in each state, so that the weighted state total equals the unweighted state total. For tabulations at the national level, a different set of weights is required because sampling fractions vary from state to state. The all-India weights are designed to preserve the total numbers of households and ever-married women interviewed in the country as a whole. Thus there are two sets of weights, one that is used when the state is the unit for tabulation and another that is used when the whole country is the unit for tabulation. Details of the study design, including sampling frame and sample implementation, are provided in the basic survey reports for the four states (PRC, Lucknow, and IIPS 1995; PRC, Bhopal, and IIPS 1995; PRC, Patna, and IIPS 1995; PRC, Udaipur, and IIPS 1995) and for India as a whole (IIPS 1995).

Three types of questionnaires were administered in NFHS-1: the Household Questionnaire, the Woman's Questionnaire, and the Village Questionnaire. This report uses data from all three questionnaires. The Household Questionnaire provides basic demographic and socioeconomic information on households. For ever-married women of reproductive age (13–49 years), the Woman's Questionnaire provides information on socioeconomic and demographic characteristics, reproductive history, contraceptive behavior, fertility preferences, and maternal and child health care. The Village Questionnaire provides information on various amenities available in sampled villages, such as electricity, water, transportation, and education and health facilities.

Analytical framework

Contraceptive use. The first step in the analysis of contraceptive use is to identify the various factors that promote or deter contraceptive use among rural couples and to find measures for these factors constructed from the NFHS-1 data. In the four states that form the focus of this report, a high value is generally attached to a large family size, with a strong preference for sons. Thus, son preference is an important predictor variable in these four states. Other factors that affect contraceptive use, particularly among those who do not want any more children, are awareness of various methods, knowledge of where to obtain methods, availability of methods and access to services, misconceptions about how to use methods, degree of motivation to use methods, dislikes and fears associated with available methods, religious beliefs about the morality of contraception, familial attitudes about family planning, extent of husband-wife communication about family planning, and adverse health effects resulting from poor service delivery and poor follow-up. Motivation to use contraception is also affected by such demand-related factors as woman's education, woman's exposure to mass media, and household standard of living.

The present analysis focuses on the effects of community (i.e., village) access to family planning services on contraceptive use in rural areas. It is hypothesized that community access to services (a supply factor) has an influence on contraceptive use over and above the influence of demand factors such as woman's education and exposure to mass media. In view of likely differences in the adoption process between permanent and temporary contraceptive methods, the response variable—current contraceptive use—is broken down into three categories: using sterilization, using a temporary method, and not using any method. The effects of various supply and demand factors are then analyzed using multinomial logistic regression, which is an appropriate multivariate method when the response variable has more than two categories.

Learning about a method and about its source of supply are important steps in the adoption process. It is, therefore, of interest to analyze the determinants of these two knowledge variables as well as the determinants of method use. In the analysis

that follows, method knowledge is usually defined as knowledge of all five of the major modern contraceptive methods available in India—female sterilization, male sterilization, IUD, oral pill, and condom. Knowledge of source is usually defined as knowledge of a source of supply for each of these five methods. Each of these two knowledge variables is treated as a binary variable (knowledge or no knowledge). Thus, in the analyses of the determinants of knowledge, the appropriate multivariate method is simple (binary) logistic regression.

The sample for the analysis of contraceptive use is currently married women age 13–49 years who live in rural areas. The analysis includes three separate logistic regression analyses (two for knowledge and one for use) for each of the four states and for India as a whole with the following response variables:

- Knowledge of all five main modern contraceptive methods (yes/no)
- Knowledge of sources of supply of all five main modern contraceptive methods (yes/no)
- Among respondents who were not pregnant at the time of the survey, current use of contraception (using sterilization/using a temporary method/not using any method)

Based on data from NFHS-1, a woman's knowledge of contraception is categorized at three levels: (1) methods the woman reported on her own (which she could name spontaneously without probing), (2) methods she knew when asked specifically about each method (i.e., methods she recognized after probing), and (3) methods that she did not know. We consider that a woman knows about a method if she reported it on her own or if she recognized it after probing. The survey asked about knowledge and use of six modern methods (female sterilization, male sterilization, IUD, pill, injection, and condom) and two traditional methods (periodic abstinence/rhythm method and withdrawal). To measure a woman's knowledge of family planning methods, we focus on the five main modern methods. Injections are not included because very few women in India know about or use this method. Traditional methods are not included because it is questionable whether they have a major effect on fertility in India. A woman's knowledge of a source of supply of each modern method is measured by means of questions on whether the woman knew (either spontaneously or after probing) where she could go to get each method.

All respondents who knew at least one method of family planning were asked whether they had ever used each of the methods they knew. Ever-use of contraception was further probed by asking the woman whether she had ever used any method or tried in any way to delay or avoid pregnancy. Current use of any method was established by asking non-pregnant women whether they or their husbands were currently doing anything or using any method to delay or avoid pregnancy.

Use of maternal and child health services. Utilization of health services is a complex behavioral phenomenon, affected by a multitude of factors including availability, dis-

tance, cost, and quality of care, as well as personal attitudes and socioeconomic characteristics. These factors can be measured in terms of various community, household, and individual characteristics. In an attempt to understand the factors that determine women's utilization of health services, Chatterjee (1990) posited the role of need, permission, ability, and availability. He argued that when permission and ability interact with need, a demand for health services is generated. Actual utilization of health services occurs when this generated demand overlaps with availability. In the Indian context, the situation is further complicated by women's perceptions of illness, which are affected by their cultural conditioning to tolerate suffering. Because of this tolerance of suffering, the perceived need for health services can be small even when the actual need is great.

Another factor affecting women's health-seeking behavior is that, traditionally in rural India, pregnancy is considered a natural state rather than a condition requiring medical attention and care. Such perceptions and beliefs constitute the 'lay health culture' that is an intervening factor between the presence of a condition and its corresponding treatment. Postnatal care and infant and child health care are similarly affected by this culture, with the result that women often do not avail themselves of preventive or curative medical services intended to safeguard their own and their children's health and well-being. The lay health culture presumably has substantial effects on the utilization of maternal and child health services in regions of the country where poverty and illiteracy are widespread. The role of this culture is difficult to measure directly, but it is possible to control for a number of socioeconomic factors that affect its importance.

This study uses binomial logistic regression and multinomial logistic regression to analyze the importance of factors affecting utilization of maternal and child health services. The analysis of antenatal and delivery care is based on NFHS-1 data on births during the four years before the survey to ever-married women age 13–49 who live in rural areas. The analysis of child health care is based on the children of these women who were age 0–47 months at the time of survey. Ten response variables are used to indicate the utilization of maternal and child health services, five aspects of antenatal and delivery care and five aspects of preventive and curative child health care.

The five antenatal- and delivery-care indicators are:

- Antenatal check-up—woman received at least one pregnancy-related check-up provided by a doctor or a health worker in a health facility or at home (received/ not received)
- Iron and folic acid tablets—woman received iron and folic acid tablets during pregnancy (received/not received)
- Tetanus toxoid vaccine—woman received two or more tetanus toxoid injections during pregnancy (received/not received)

- Delivery assisted by a health professional—including a doctor, Auxiliary Nurse Midwife/Lady Health Visitor, or nurse/midwife (yes/no)
- Delivered in a medical institution—woman gave birth in a government hospital, private hospital/clinic, primary health centre, sub-centre, or maternity home (yes/no)

The five child health-care indicators are:

- Immunization status of child age 12–23 months—received BCG (tuberculosis), measles, and three doses each of DPT (diphtheria, pertussis, tetanus) and polio vaccines, excluding polio 0 (fully immunized/partially immunized/did not receive any immunization)
- Vitamin A supplement to child age 12–47 months—received at least one dose of vitamin A in liquid form (received/not received)
- Treatment of acute respiratory infections (ARI)—among children age 0–47 months who suffered from ARI during the two weeks before the survey, taken to a health facility or provider[2] for treatment (yes/no)
- Treatment of diarrhoea—among children age 0–47 months who suffered from diarrhoea during the two weeks before the survey, taken to a health facility or provider for treatment (yes/no)
- Treatment of fever—among children age 0–47 months who suffered from fever during the two weeks before the survey, taken to a health facility or provider for treatment (yes/no)

For each live birth in the four years before the survey, a woman was asked to provide information on these aspects of maternal and child health care through a set of specific questions on the Woman's Questionnaire (IIPS 1995). The analysis sample varies depending on the response variable under consideration.

Predictors and potential confounders: Definition and measurement. The multivariate analyses of the 13 response variables include a number of predictor variables measured at one of four levels—community, household, woman, or child. The community-level predictor variables, which are based on the NFHS-1 Village Questionnaire, include distance to a health facility (< 2 km/2–5 km/≥ 6 km), family-welfare/health worker visit (yes, no), availability of an all-weather road connecting the village (yes/no), and village media/educational activity (yes/no). In the analyses that follow, these four variables represent community access to health and family-welfare services and are the primary predictor variables. They will be referred to as the 'community-access variables'.

---

[2]Includes government/municipal hospital, private hospital/clinic, primary health centre, sub-centre, doctor, or other health professional.

Estimation of the effects of these variables on the utilization of family planning and maternal and child health services requires statistical controls for various socioeconomic and demographic factors that may be correlated with the community-access variables. Failure to control for these potentially confounding variables could bias estimates of the effects of the community-access variables. In these analyses, the following socioeconomic and demographic variables are included as controls: religion of household head (Hindu/Muslim/other), caste/tribe of household head (scheduled caste or scheduled tribe/other)[3], crowding in the household (< 3 persons per room/≥ 3 persons per room), electricity in the household (yes/no), house type (*kachcha/pucca* or semi-*pucca*)[4], age of woman at the time of survey (13–24/25–34/35–49), mother's age at childbirth (12–24/25–34/35–49), number and sex composition of living children (0 children/1 son and 0 daughters/0 sons and 1 daughter/2 sons and 0 daughters/1 son and 1 daughter/0 sons and 2 daughters/2+ sons and 3+ children/1 son and 2+ daughters/0 sons and 3+ daughters), woman's education (illiterate/literate below middle school complete/middle school complete or higher), woman's work status (working in addition to housework/not working in addition to housework), woman's exposure to electronic mass media (exposed/not exposed)[5], age of child in months at the time of the survey (0–11/12–23/24–35/36–47), sex of child (boy/girl), and birth order of child (1/2/3/4+).

Information on the five household-level variables is derived from the Household Questionnaire, and information on the nine woman- and child-level variables is derived from the Woman's Questionnaire. It should be noted that not all of the control variables are included in every regression. For example, the variable indicating number and sex composition of children is used only when the response variable is current use of family planning, and the variables indicating child's age and sex are used only in the analysis of health-seeking behavior relating to the three childhood diseases. Table 1 gives a complete listing of variables and their definitions.

Each control variable has a rationale for inclusion. For example, religion and caste/tribe variables control for cultural variation in health-seeking and contraceptive

---

[3]Scheduled castes (SC) and scheduled tribes (ST) are castes and tribes identified by the Government of India as socially and economically disadvantaged and in need of special protection from social injustice and exploitation.

[4]*Kachcha* houses are made from mud, thatch, or other low-quality materials; *pucca* houses are made from high-quality materials (such as bricks, tiles, cement, and concrete) throughout, including roof, walls, and floor; and semi-*pucca* houses are made from partly low-quality and partly high-quality materials.

[5]A woman is considered to be exposed to electronic mass media if she listens to radio at least once a week, watches television at least once a week, or goes to a cinema hall or theatre to see a movie at least once a month.

Table 1 Definitions of variables for ever-married women age 13–49 and their children born during the four years before NFHS-1

Variable	Definition
Family planning variables	
Knowledge of any method	
Yes	Woman has heard of at least one contraceptive method (modern or traditional)
No	Woman has not heard of any contraceptive method
Knowledge of five main modern methods	
Yes	Woman has heard of all five main modern contraceptive methods (female sterilization, male sterilization, IUD, pill, and condom)
No	Woman has not heard of all five main modern contraceptive methods
Knowledge of source of any modern method	
Yes	Woman knows a source where she can obtain at least one modern contraceptive method
No	Woman does not know any source where she can obtain a modern contraceptive method
Knowledge of source of five main modern methods	
Yes	Woman knows source for obtaining all five main modern contraceptive methods
No	Woman does not know source for obtaining all five main modern contraceptive methods
Current use of family planning	
Sterilization	Woman (or her husband) is sterilized
Any temporary method	Woman (or her husband) is using a temporary method of contraception (modern or traditional)
Not using any method	Woman is not using any contraceptive method
Antenatal- and delivery-care variables	
Received antenatal check-up	
Yes	Mother received an antenatal check-up while pregnant with the specified child born within the 4 years before the survey
No	Mother did not receive any antenatal check-up while pregnant with the specified child born within the 4 years before the survey
Received iron and folic acid tablets	
Yes	Mother received iron and folic acid tablets while pregnant with the specified child born within the 4 years before the survey
No	Mother did not receive iron and folic acid tablets while pregnant with the specified child born within the 4 years before the survey
Received two or more tetanus injections	
Yes	Mother received two or more tetanus injections while pregnant with the specified child born within the 4 years before the survey
No	Mother received less than two tetanus injections while pregnant with the specified child born within the 4 years before the survey
Received professional assistance at delivery	
Yes	Mother received assistance from a doctor, ANM/LHV[a], or nurse/midwife for delivery of the specified child born within the 4 years before the survey
No	Mother did not receive assistance from a doctor, ANM/LHV[a], or nurse/midwife for delivery of the specified child born within the 4 years before the survey
Delivered in a medical institution	
Yes	Mother delivered the specified child born within the 4 years before the survey in a medical institution
No	Mother did not deliver the specified child born within the 4 years before the survey in a medical institution
Child health-care variables	
Immunization status	
Full immunization	Child age 12–23 months received 3 doses of DPT, 3 doses of polio, 1 dose of BCG, and 1 dose of measles vaccine, not including polio 0
Partial immunization	Child age 12–23 months received some of the recommended immunizations, but not fully immunized
No immunization	Child age 12–23 months did not receive any of the recommended immunizations
Received vitamin A	
Yes	Child age 12–47 months received at least one dose of vitamin A supplement
No	Child age 12–47 months did not receive any vitamin A supplement

Table 1, cont. Definitions of variables for ever-married women age 13–49 and their children born during the four years before NFHS-1

Variable	Definition
Treatment sought for ARI	
Yes	Treatment sought from a health facility or provider for a child age 0–47 months when sick with acute respiratory infection (cough accompanied by short and rapid breathing) during the 2 weeks before the survey
No	No treatment sought for a child age 0–47 months when sick with acute respiratory infection during the two weeks before the survey
Treatment sought for diarrhoea	
Yes	Treatment sought from a health facility or provider for a child age 0–47 months when sick with diarrhoea during the 2 weeks before the survey
No	No treatment sought for a child age 0–47 months when sick with diarrhoea during the two weeks before the survey
Treatment sought for fever	
Yes	Treatment sought from a health facility or provider for a child age 0–47 months when sick with fever during the 2 weeks before the survey
No	No treatment sought for a child age 0–47 months when sick with fever during the 2 weeks before the survey
Community-access variables	
Distance to health facility	
< 2 km	Woman/child lives in a village that has a health facility (a primary health centre, sub-centre, government hospital, private hospital, dispensary/clinic, or NGO family planning/health clinic) in the village or within a distance of 2 km
2–5 km	Woman/child lives in a village with the nearest health facility 2–5 km away
≥ 6 km	Woman/child lives in a village with the nearest health facility 6 km or further away
Family welfare/health worker visit	
Yes	Woman/child lives in a village where a health or family welfare worker visited during the month before the survey
No	Woman/child lives in a village where no health or family welfare worker visited during the month before the survey
Village has all-weather road	
Yes	Woman/child lives in a village that is connected with the outside by an all-weather road
No	Woman/child lives in a village that is not connected by an all-weather road
Village media/educational activity	
Yes	Woman/child lives in a village where any film show, exhibition, drama/song performance, or group meeting relating to health and family welfare was held during the previous year or any leader's orientation training camp was ever held
No	Woman/child lives in a village where no such media or educational activity was held in the specified period
Household-level variables	
Religion	
Hindu	Woman/child lives in a household whose head is Hindu
Muslim	Woman/child lives in a household whose head is Muslim
Other	Woman/child lives in a household whose head belongs to a religion other than Hindu or Muslim
Caste/tribe[b]	
Scheduled caste/scheduled tribe	Woman/child lives in a household whose head belongs to a scheduled caste (SC) or scheduled tribe (ST)
Other	Woman/child lives in a household whose head does not belong to a scheduled caste (SC) or scheduled tribe (ST)
Crowding	
< 3 persons per room	Woman/child lives in a household with less than three persons per room
≥ 3 persons per room	Woman/child lives in a household with three or more persons per room
Electricity	
Yes	Woman/child lives in a household that uses electricity as the main source of lighting
No	Woman/child lives in a household that does not use electricity as the main source of lighting
House type[c]	
Kachcha	Woman/child lives in a *Kachcha* (low quality) house
Pucca or semi-*pucca*	Woman/child lives in a *pucca* (high quality) or semi-*pucca* house

Table 1, cont. Definitions of variables for ever-married women age 13–49 and their children born during the four years before NFHS-1

Variable	Definition
Individual woman-level variables	
Woman's age (in years)	
13–24	Woman's age is 13–24 years at the time of the survey
25–34	Woman's age is 25–34 years at the time of the survey
35–49	Woman's age is 35–49 years at the time of the survey
Woman's age at child birth (in years)	
12–24	Woman's age was 12–24 years at the time of birth of the specified child
25–34	Woman's age was 25–34 years at the time of birth of the specified child
35–49	Woman's age was 35–49 years at the time of birth of the specified child
Number and sex composition of living children	
No children	Woman has no living children at the time of the survey
One child	
One son	Woman has one living child: 1 son and 0 daughters
No son	Woman has one living child: 0 sons and 1 daughter
Two children	
Two sons	Woman has two living children: 2 sons and 0 daughters
One son	Woman has two living children: 1 son and 1 daughter
No son	Woman has two living children: 0 sons and 2 daughters
Three or more children	
Two or more sons	Woman has three or more living children: 2 or more sons and 0 or more daughters
One son	Woman has three or more living children: 1 son and 2 or more daughters
No son	Woman has three or more living children: 0 sons and 3 or more daughters
Woman's education	
Illiterate	Woman is illiterate
Literate, < middle complete	Woman is literate with less than a middle school education
Middle complete or higher	Woman is literate with a middle school or higher education
Woman's work status	
Not working	Woman is currently not working aside from her own household work
Working	Woman is currently working aside from her own household work
Woman's media exposure	
Yes	Woman watches television or listens to radio at least once a week or visits a cinema at least once a month
No	Woman does not watch television or listen to radio at least once a week or visit a cinema at least once a month
Individual child-level variables	
Child's age (in months)	
0–11	Child's age is 0–11 months at the time of the survey
12–23	Child's age is 12–23 months at the time of the survey
24–35	Child's age is 24–35 months at the time of the survey
36–47	Child's age is 36–47 months at the time of the survey
Child's sex	
Male	Child is a boy
Female	Child is a girl
Child's birth order	
1	Child is a first-order birth
2	Child is a second-order birth
3	Child is a third-order birth
4+	Child is a fourth- or higher-order birth

[a]ANM: auxiliary nurse midwife; LHV: lady health visitor.

[b]Scheduled castes (SC) and scheduled tribes (ST) are those castes and tribes identified by the Government of India as socially and economically disadvantaged and in need of protection from social injustice and exploitation.

[c]*Kachcha* houses are made from mud, thatch, or other low-quality materials. *Pucca* houses are made from high-quality materials (such as bricks, tiles, cement, and concrete) throughout, including roof, walls, and floor. Semi-*pucca* houses are made from partly low-quality materials and partly high-quality materials.

practices. Religion and caste/tribe are also likely to be associated with a woman's access to health care and family planning facilities. Controlling for household economic status through such indicators as house type, crowding, and electricity is important because household economic status affects access to and utilization of services. Similarly, woman's education, work status, and media exposure influence both access to and utilization of services.

Child's age is included because it is correlated with frequency of episodes of illness. Child's sex is included because in the Indian context boys are more likely than girls to receive treatment and care. Child's birth order is included because it is correlated with mother's childbearing and childrearing experience, which in turn is correlated with utilization of services.

RESULTS

The presentation of results is divided into four sections. The first section presents a statistical picture of socioeconomic and demographic conditions and availability of health infrastructure in Uttar Pradesh, Madhya Pradesh, Bihar, and Rajasthan and in India as a whole. The next three sections present analyses of the determinants of knowledge and use of family planning, use of antenatal and delivery services, and use of child health-care services. Each of these three sections first presents variations in the proportion using a service by state and by community-access variables. This is followed by multivariate analyses of the effects of community, household, and individual characteristics on service utilization.

The multivariate analyses are based on three sets of binomial or multinomial logistic regressions. In the first set, the units of analysis are currently married women age 13–49 living in rural areas. The regression analyses in this set examine the effects of community-access variables on women's contraceptive knowledge and use, with various socioeconomic and demographic variables controlled. In the second and third sets, the units of analysis are either births or children born to rural mothers during the four years before the survey. The regressions in the second set estimate the effects of community-access variables on antenatal and delivery care, and the regressions in the third set estimate the effects of community-access variables on each of the various aspects of child health care, again with controls for socioeconomic and demographic factors.

In reporting the results of the logistic regressions, we do not present coefficients or odds ratios. Instead, we use multiple classification analysis to transform the regression results into simple bivariate cross-tabulations of the response variable against the principal predictor variable, with the other predictor variables controlled by setting them at their mean values in underlying logistic regressions. For methodological details of this approach, see Retherford and Choe (1993).

Table 2 Selected demographic, socioeconomic, and health infrastructure indicators for four northern states and for India, 1991–93

Indicator	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Demographic indicators					
Population (millions) (Census, 1991)	139.0	66.0	86.0	44.0	846.0
Crude birth rate (NFHS-1, 1992–93)	35.9	31.6	32.1	27.0	28.7
Total fertility rate (NFHS-1, 1992–93)	4.8	3.9	4.0	3.6	3.4
Crude death rate (NFHS-1, 1992–93)	11.9	10.3	11.5	7.8	9.7
Infant mortality rate (NFHS-1, 1992–93)	100.0	85.0	89.0	73.0	79.0
Under-five mortality rate (NFHS-1, 1992–93)	141.3	130.3	127.5	102.6	109.3
Socioeconomic indicators					
Percent literate, females age 7+ (Census, 1991)	25.3	28.9	22.9	20.4	39.4
Percent urban (Census, 1991)	19.8	23.2	13.1	22.9	25.7
Per capita income (Rs.), 1992–93 (Ministry of Finance 1998)[a]	4,335	4,544	3,053	5,257	6,262
Health-infrastructure indicators (Ministry of Health and Family Welfare 1996)					
Population per PHC (thousands), 1993	30.0	43.0	34.0	24.0	30.0
Population per sub-centre (thousands), 1993	5.6	4.2	5.0	4.3	4.8
Population per ANM/female health worker (thousands), 1993	4.9	2.5	8.1	2.8	3.3

[a]Per capita net state domestic product at current prices.

Socioeconomic and demographic conditions and availability of health infrastructure

Uttar Pradesh, Madhya Pradesh, Bihar, and Rajasthan have relatively high birth and death rates, especially infant mortality rates, and much higher population growth rates than most other states of India (Das and Bhavsar 1991). In Table 2, Rajasthan's somewhat lower fertility and infant and child mortality rates appear to be an exception to this generalization, but it has been shown that NFHS-1 underestimated fertility and infant and child mortality for Rajasthan, as indicated by comparison with corresponding estimates from India's Sample Registration System (PRC, Udaipur, and IIPS 1995). According to the 1991 Census, Uttar Pradesh, Madhya Pradesh, Bihar, and Rajasthan account for 40% of India's population. Given the much higher than average fertility in these states, their population share is likely to rise to about 60% by the time the country's population stabilizes, sometime around the middle of the 21st century.

Table 2 also shows background information on selected socioeconomic and demographic characteristics. The four states are well below the national average on such indicators as female literacy, per capita income, and proportion urban. According to the 1991 Census, 20–23% of adult women were literate in Rajasthan and Bihar and 25–29% were literate in Uttar Pradesh and Madhya Pradesh, compared with 39% for the country as a whole (Figure 1). The relatively low levels of female literacy, per capita income, and urbanization reflect relatively low levels of economic development in these states.

The availability of public-sector health infrastructure in these states, including availability of primary health centres (PHCs), sub-centres, and auxiliary nurse mid-
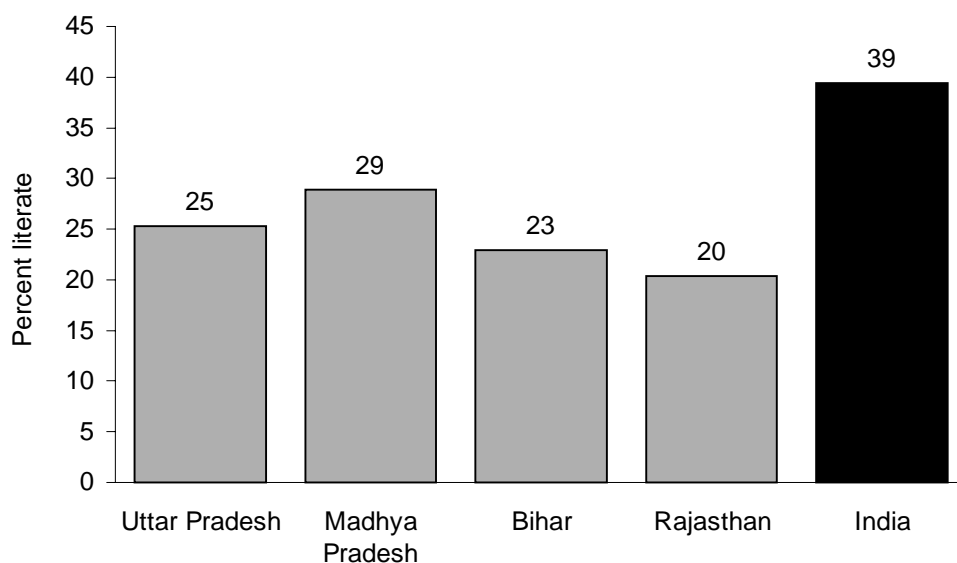
Figure 1 Female literacy in four northern states and India, 1991 Census

wives (ANMs), is more or less at par with the national average, as is also shown in Table 2. Exceptions are the lower availability of PHCs in Madhya Pradesh and the lower availability of sub-centres and ANMs in Uttar Pradesh and Bihar. This general level of availability that is similar to the national average is, perhaps, not surprising given that the Indian Government has a countrywide policy of providing a PHC for every 30,000 rural population and a sub-centre with one male multipurpose worker (MPW) and one female ANM for every 5,000 rural population. However, mere physical availability of these health facilities does not necessarily mean easy access to services. Many factors, such as lack of an all-weather road and poor transport facilities, may intervene to reduce accessibility.

Knowledge and use of family planning services

Current levels. In order to make intelligent decisions about contraceptive use, couples need information about the range of methods available as well as information about their effectiveness, advantages and disadvantages, potential side effects, and correct use. Couples should also be informed about sources of supply where they can obtain various methods. India's Family Welfare Programme claims that it provides a cafeteria of contraceptive methods through a variety of sources so that couples can choose a method most suited to their needs. In this section, we first examine whether this official cafeteria approach is reflected in women's knowledge of various methods and their knowledge of sources of supply. Then we examine how their knowledge and current use of family planning varies by degree of community access to services. Finally, we employ multivariate analysis to assess the (adjusted) effects of community

Table 3 Percentage of currently married, rural women age 13–49 who know any family planning method, who know all five main modern methods (female sterilization, male sterilization, IUD, pill, and condom), who know a source of supply of any modern method, who know sources of supply of all five main modern methods, and who are currently using any family planning method, by state, NFHS-1, 1992–93

	Knowledge		Knowledge of source		Current use of family planning[a]	
State	Any method	All five modern methods	Any modern method	All five modern methods	Sterilization	Any temporary method
India	95	35	87	26	33	8
Four northern states						
Uttar Pradesh	95	36	74	22	14	5
Madhya Pradesh	86	23	76	16	34	3
Bihar	94	29	87	21	19	4
Rajasthan	85	21	73	14	28	3
Other major states						
Andhra Pradesh	96	19	93	16	46	1
Assam	97	42	89	33	15	30
Delhi	99	84	91	68	25	37
Goa	98	42	93	30	36	11
Gujarat	95	42	92	37	47	5
Haryana	99	55	98	48	41	11
Himachal Pradesh	99	51	97	43	51	11
Jammu Region of Jammu and Kashmir	100	56	97	52	33	18
Karnataka	99	35	96	25	48	5
Kerala	100	72	99	54	52	15
Maharashtra	97	34	94	28	55	4
Orissa	92	21	80	14	33	4
Punjab	100	68	99	66	39	24
Tamil Nadu	99	40	97	30	45	8
West Bengal	99	48	96	34	36	25

[a]Restricted to currently married, non-pregnant, rural women age 13–49.

Note: For definition of variables, see Table 1. Results for states incorporate state-level sample weights, and results for India incorporate national-level sample weights. Weights are calculated so that the total number of ever-married women age 13–49 (in a particular state or in the nation as a whole) is the same whether weighted or unweighted.

access to services on knowledge and use of services, controlling for the potentially confounding effects of a number of socioeconomic and demographic variables by holding these variables constant.

Table 3 and Figure 2 show that knowledge of at least one family planning method is nearly universal in rural areas of India (95%) and most major states, including the four northern states. Yet only 35% of rural women know about all five main modern contraceptive methods—female sterilization, male sterilization, IUD, oral pill, and condom. Similarly, 87% of rural women in India know a source of supply for at least one modern contraceptive method, but only 26% know sources of supply for all five methods. These findings indicate that the programme has not succeeded in informing women about the range of contraceptive options. Knowledge of all five modern methods and their sources of supply tends to be lower in the four northern states than the national average.

Knowledge of methods

Knowledge of source of supply
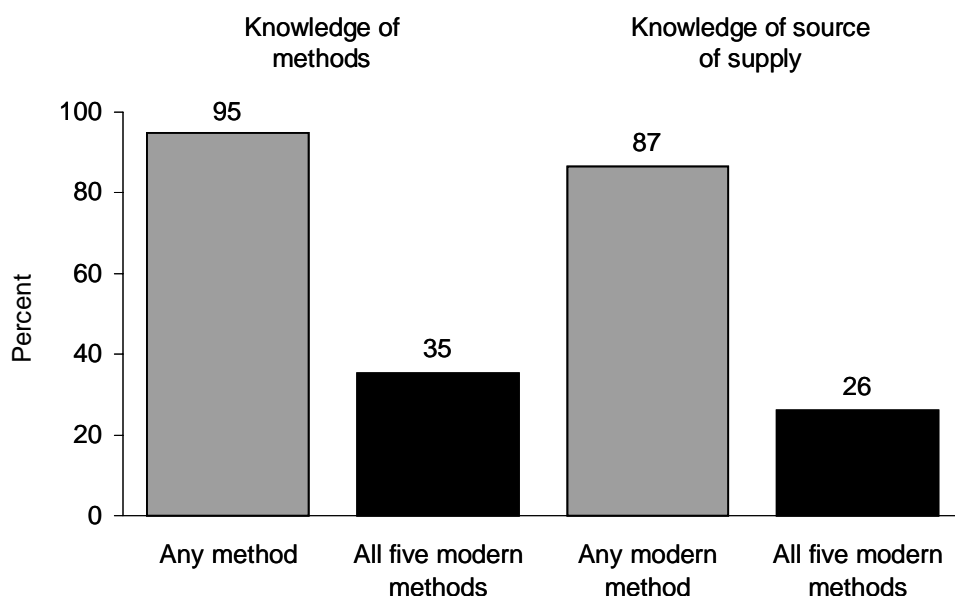
Figure 2 Percentage of currently married, rural women age 13–49 who know about family planning methods and sources of supply, India, NFHS-1, 1992–93

Table 3 also shows state variations in current contraceptive use among currently married rural women age 13–49, broken down into two categories—women who are sterilized (or whose husbands are sterilized) and women who are using (or whose husbands are using) any temporary method. In India as a whole, 41% of currently married rural women were using a contraceptive method at the time of the survey, with about one-fifth of this use accounted for by temporary methods. Use of contraception varies widely across states, however, with the four northern states having much lower levels of contraceptive use than most other states. Uttar Pradesh and Bihar, which are the two largest states in terms of population, have the lowest levels of contraceptive use (19 and 22%, respectively). Kerala and Tamil Nadu in the south have close to replacement-level fertility and a much higher contraceptive prevalence (67 and 53%, respectively), as shown in Figure 3. The use of temporary methods varies much more widely among states than the use of sterilization. In the four northern states, only 3–5% of currently married rural women use temporary methods. Table 3 also shows that the states with a higher proportion knowing all five main modern methods tend to have higher contraceptive prevalence and greater use of temporary methods.

Factors affecting knowledge and use of family planning. Table 4 shows the percent distribution of currently married rural women age 13–49 for each variable included in the analysis. In India as a whole, 44% of currently married rural women live within two kilometres of a health facility, and 26% live six or more kilometres away
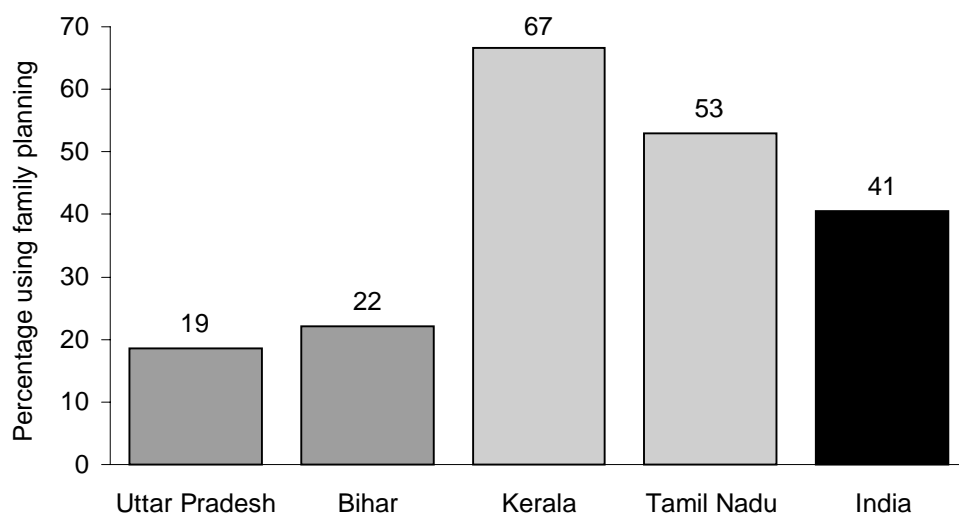
Figure 3 Percentage of currently married, non-pregnant, rural women age 13–49 currently using family planning, selected states and India, NFHS-1, 1992–93

from a facility. About one-half of these women live in villages that are not connected to the outside world by an all-weather road. About two-fifths live in villages that were not visited by a family-welfare or health worker during the month before the survey, and more than half live in villages where no health or family-welfare mass-media or educational activity occurred during the year before the survey. Eighty-four percent of the women live in Hindu households, and 24% live in scheduled-caste or scheduled-tribe households. About three-fifths live in *kachcha* houses, about three-fifths live in households without electricity, and about one-half live in households with more than three persons per room. Seventy-two percent of the women are illiterate, 64% are not working other than housework, and 57% are not regularly exposed to electronic mass media. The four northern states compare poorly with the country as a whole on most indicators of community access to health and family-welfare services and on most household- and individual-level indicators of socioeconomic development.

Table 5 shows the extent of knowledge of the five main modern methods, knowledge of sources of supply for these methods, and current use of contraception among currently married rural women age 13–49 by various indicators of community access to health and family-welfare services. As expected, in India as a whole, both knowledge and use of family planning are higher for women living in villages closer to health facilities, villages connected by an all-weather road, villages that had a health or family-welfare visit during the previous month, and villages that had a health or family-welfare mass-media or educational activity during the previous year. Distance from the nearest health facility and availability of an all-weather road have a greater effect on contraceptive knowledge than they do on use. By contrast, health or family-welfare visits to the village in the previous month have a greater effect on use. Whether

Table 4 Percentage distribution of currently married, rural women age 13–49 by selected community-access, socioeconomic, and demographic characteristics, four northern states and India, NFHS-1, 1992–93

Characteristic	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km	27	24	58	37	44
2–5 km	37	31	34	26	31
≥ 6 km	36	45	7	37	26
Family welfare/health worker visit					
Yes	57	76	12	57	61
No	43	24	88	43	39
Village has all-weather road					
Yes	39	25	51	44	51
No	61	75	49	56	49
Village media/educational activity					
Yes	23	47	17	29	44
No	77	53	83	71	56
Household-level variables					
Religion					
Hindu	88	96	82	93	84
Muslim	12	3	16	5	10
Other	1	2	1	2	5
Caste/tribe					
Scheduled caste/scheduled tribe	20	37	19	39	24
Other	80	63	81	61	76
Crowding					
< 3 persons per room	49	51	52	46	52
≥ 3 persons per room	51	49	48	54	48
Electricity					
Yes	22	58	10	46	42
No	78	42	90	54	58
House type					
Kachcha	61	89	76	49	59
Pucca or semi-*pucca*	39	11	24	51	41
Individual woman-level variables					
Woman's age (in years)					
13–24	35	38	36	32	34
25–34	33	34	35	37	35
35–49	32	28	29	32	31
Number and sex composition of living children					
No children	15	16	17	15	14
One child					
One son	8	9	8	9	8
No son	8	8	7	7	8
Two children					
Two sons	5	5	5	5	6
One son	8	9	8	8	10
No son	3	4	4	3	4
Three or more children					
Two or more sons	40	36	37	41	36
One son	11	11	12	11	12
No son	2	2	2	2	3
Woman's education					
Illiterate	82	84	83	89	72
Literate, < middle complete	9	11	10	7	17
Middle complete or higher	8	5	7	4	11
Woman's work status					
Not working	85	64	73	63	64
Working	15	36	27	37	36
Woman's media exposure					
Yes	28	30	23	22	43
No	72	70	77	78	57
Number of women	8,742	4,583	4,481	4,077	58,654

Note: For definition of variables, see Table 1.

Table 5 Unadjusted percentages of currently married, rural women age 13–49 who know all five main modern family planning methods (female sterilization, male sterilization, IUD, pill, and condom), who know sources of supply for all five main modern methods, and who are currently using any family planning method, by community-access variables, four northern states and India, NFHS-1, 1992–93

State/community characteristic	Knows all five main modern methods	Knows source of all five main modern methods	Currently using family planning[a]	
			Sterilization	Any temporary method
Uttar Pradesh				
Distance to health facility				
< 2 km	39	25	17	6
2–5 km	33	18	13	4
≥ 6 km	37	23	12	5
Family welfare/health worker visit				
Yes	38	22	14	6
No	34	20	13	3
Village has all-weather road				
Yes	38	24	16	6
No	35	20	12	4
Village media/educational activity				
Yes	42	27	18	7
No	34	20	12	4
Madhya Pradesh				
Distance to health facility				
< 2 km	35	26	37	3
2–5 km	18	12	33	3
≥ 6 km	19	14	33	3
Family welfare/health worker visit				
Yes	24	17	35	3
No	18	12	33	2
Village has all-weather road				
Yes	34	26	33	4
No	19	13	35	3
Village media/educational activity				
Yes	30	22	37	3
No	15	10	33	3
Bihar				
Distance to health facility				
< 2 km	30	22	19	4
2–5 km	27	19	18	3
≥ 6 km	29	18	14	5
Family welfare/health worker visit				
Yes	27	22	24	4
No	29	20	17	4
Village has all-weather road				
Yes	34	25	20	4
No	24	16	17	2
Village media/educational activity				
Yes	33	25	21	5
No	28	19	18	3
Rajasthan				
Distance to health facility				
< 2 km	22	15	26	3
2–5 km	18	10	28	3
≥ 6 km	23	15	29	4
Family welfare/health worker visit				
Yes	22	15	27	4
No	21	12	30	3
Village has all-weather road				
Yes	22	13	29	3
No	22	15	28	3

Table 5, cont. Unadjusted percentages of currently married, rural women age 13–49 who know all five main modern family planning methods (female sterilization, male sterilization, IUD, pill, and condom), who know sources of supply for all five main modern methods, and who are currently using any family planning method by community-access variables, four northern states and India, NFHS-1, 1992–93

| | | | Currently using family planning[a] | |
| | Knows all five main modern methods | Knows source of all five main modern methods | Sterilization | Any temporary method |
State/community characteristic				
Rajasthan, cont.				
Village media/educational activity				
Yes	23	14	28	4
No	21	14	28	3
India				
Distance to health facility				
< 2 km	42	32	36	10
2–5 km	32	23	31	7
≥ 6 km	29	20	31	5
Family welfare/health worker visit				
Yes	37	28	38	8
No	32	23	25	8
Village has all-weather road				
Yes	42	32	35	10
No	28	20	30	5
Village media/educational activity				
Yes	40	30	40	9
No	32	23	27	7

[a]Restricted to currently married, non-pregnant, rural women age 13–49.

Note: For definition of variables, see Table 1.

the village has had a health or family-welfare mass-media or educational activity during the previous year makes a substantial difference on both knowledge and use.

The effects of community access on knowledge and use of contraception are much smaller in each of the four northern states than at the national level. This occurs because states with high levels of knowledge and use also tend to have better community access. In other words, 'state', considered as a variable, is correlated with the community-access predictor variables. This means that, for India as a whole, the apparent effects of the community-access variables may actually be due in part to the effect of 'state' because the variable 'state' has not been statistically controlled (or, alternatively, because the various socioeconomic and demographic determinants that presumably capture variations by state have not been statistically controlled).

Table 6 shows the adjusted effects of the community-access variables on knowledge of all five main modern methods of contraception. In this context 'adjusted effects' refers to differences within the set of adjusted percentages for categories of a predictor variable. 'Adjusted' means that the other predictor variables in the table have been controlled by holding them constant. As mentioned earlier, the adjusted results are derived by logistic regression. There is one such regression for each of the four states and one for India as a whole. Each of the five logistic regressions contains all the predictor variables shown in the table. For any given state or for India, adjusted

Table 6 Adjusted effects of community access and other predictor variables on knowledge of all five main modern family planning methods (female sterilization, male sterilization, IUD, pill, and condom) among currently married, rural women age 13–49, four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage with knowledge of all five main modern methods				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km†	36	27	27	19	36
2–5 km	33	20	30	19	34
≥ 6 km	39	21	36	26	34
Family welfare/health worker visit					
Yes	37	21	24	23	35
No†	36	25	29	20	36
Village has all-weather road					
Yes	36	27	32*	18	38*
No†	36	21	25	24	33
Village media/educational activity					
Yes	42	31*	27	22	35
No†	35	16	29	21	35
Household-level variables					
Religion					
Hindu†	36	22	29	21	34
Muslim	37	39*	29	31	42*
Other	29	24	17	16	42*
Caste/tribe					
Scheduled caste/scheduled tribe	30*	18*	20*	17*	30*
Other†	38	25	31	25	37
Crowding					
< 3 persons per room†	35	23	27	23	35
≥ 3 persons per room	38	21	31	20	35
Electricity					
Yes	44*	24	45*	26*	38*
No†	34	20	27	18	34
House type					
Kachcha†	36	21	27	17	34
Pucca or semi-*pucca*	37	34*	34*	26*	38*
Individual woman-level variables					
Woman's age (in years)					
13–24†	35	20	25	22	31
25–34	40*	25*	31*	24	40*
35–49	33	21	30*	19	35*
Woman's education					
Illiterate†	32	19	25	19	28
Literate, < middle complete	49*	31*	47*	38*	48*
Middle complete or higher	65*	62*	61*	57*	69*
Woman's work status					
Not working†	36	22	30	19	38
Working	35	22	25	26*	30*
Woman's media exposure					
Yes	52*	30*	41*	39*	45*
No†	31	19	25	18	29
Number of women	8,138	4,284	4,497	3,615	58,501

†Reference category

*$p < .05$

Notes: The units of analysis are currently married, rural women age 13–49. For definition of variables, see Table 1. Adjusted effects are estimated by logistic regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.
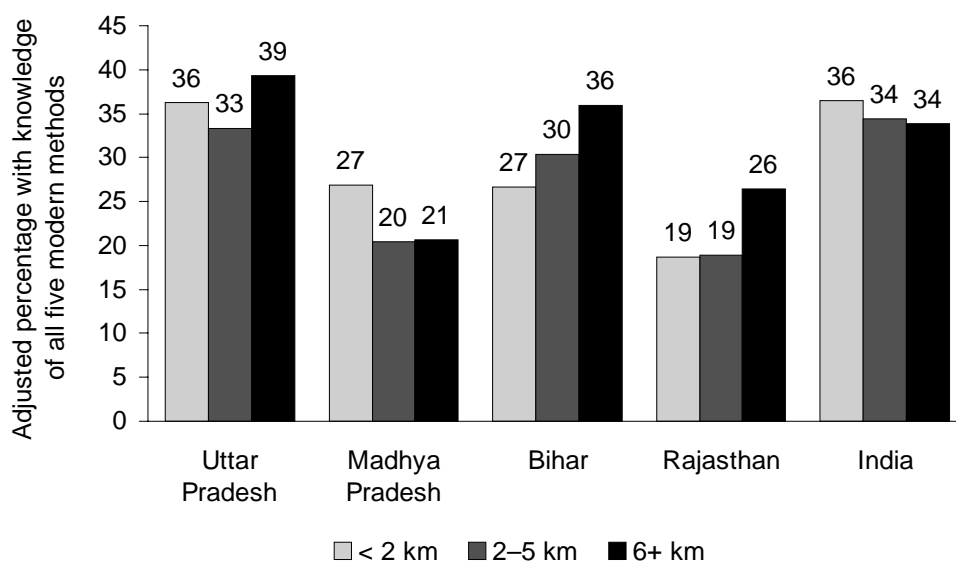
Figure 4 Adjusted effects of distance to a health facility on knowledge of all five main modern family planning methods among currently married, rural women age 13–49, four northern states and India, NFHS-1, 1992–93

percentages for categories of any single predictor variable are calculated from the underlying logistic regression by holding constant all the other predictor variables in the table. This is done by setting them equal to their mean values in the subsample of women on which the regression is based. Thus, for any given predictor variable, the set of control variables includes all of the other predictor variables shown in the table.[6]

Table 6 shows that community-access variables have little effect on woman's knowledge of the five modern contraceptive methods in each of the four northern states and in India as a whole. None of the four community-access variables has a consistent effect across states or for India. The effects of distance to a health facility and the effects of family-welfare/health worker visit to the village are all small, statistically nonsignificant, and often not in the expected direction (Figure 4). The effects of all-weather road are statistically significant and in the expected direction for Bihar and for India but not for the other states. Village media/educational activity has a statistically significant effect in the expected direction for Madhya Pradesh but not for the other states or for India.

---

[6]The adjusted percentages incorporate one further adjustment. The constant term in the underlying logistic regression for a particular state or for India is 'corrected' so that when mean values of all the predictor variables are substituted into the regression, the percentage with knowledge of all five methods that is predicted from the regression is the same as the raw percentage calculated directly from the sample. The equation with the corrected constant term is then used to compute the column of adjusted percentages for that state or for India, as shown in the table.
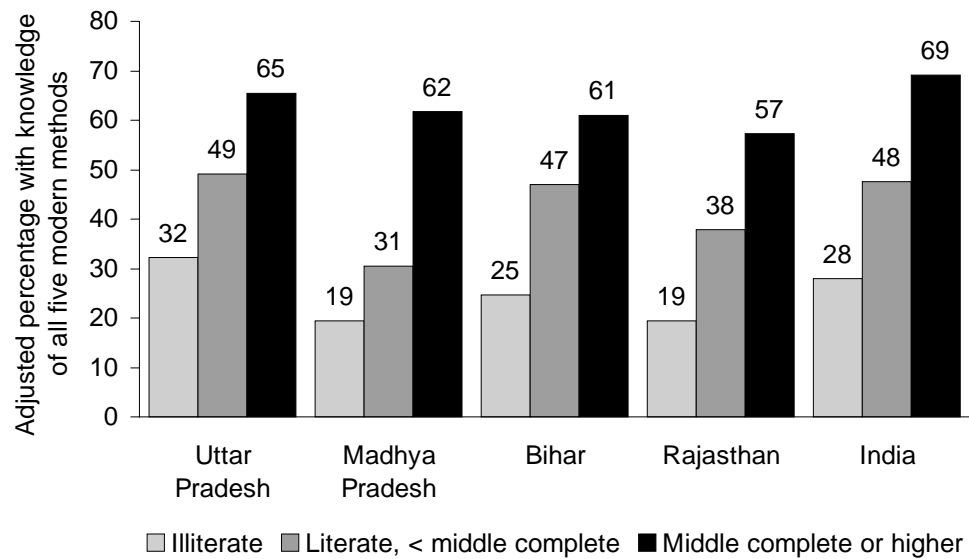
Figure 5 Adjusted effects of woman's education on knowledge of all five main modern family planning methods among currently married, rural women age 13–49, four northern states and India, NFHS-1, 1992–93

By contrast, several household and individual socioeconomic characteristics have large and statistically significant effects on knowledge of the five main modern methods, even after the other variables are controlled. One surprising finding is that knowledge of family planning methods tends to be greater among Muslim women than among Hindu women or women belonging to other religions. Women belonging to a scheduled caste or scheduled tribe have significantly lower knowledge of family planning than do other women. Household crowding has no impact on knowledge. The two household economic-status variables—electricity in the household and house type—generally have positive and significant adjusted effects on knowledge.

Among the individual-level variables, woman's age, education, and media exposure have substantial effects on knowledge. Women in their prime reproductive ages (25–34) have greater knowledge than younger (13–24) or older (35–49) women. The adjusted effects of education and media exposure are particularly strong. In India as a whole, women with middle school complete or higher education are more than twice as likely to know all five main modern methods as are illiterate women. The effect of education is also strong in each of the four northern states (Figure 5). Knowledge is also much higher among women who are regularly exposed to electronic mass media than among women who are not regularly exposed. This large effect of media exposure is independent of the effect of education.

Table 7 shows the adjusted effects of the community-access variables and other predictor variables on woman's knowledge of sources of contraceptive supply. As in Table 6, the adjusted effects of community-access variables are generally small, statis-

tically nonsignificant, and inconsistent in direction. Among the household-level variables, caste/tribe, house type, and electricity have substantial effects on knowledge of sources. Among the individual-level variables, woman's education and media exposure again have large and statistically significant effects on knowledge of sources of supply in each of the four states and in India as a whole.

Table 8 shows the adjusted effects of the community-access variables and other predictor variables on current use of contraception. The analysis in this table is restricted to currently married, non-pregnant, rural women age 13–49 years at the time of the survey. Two additional individual-level variables are included among the predictor variables—number and sex composition of living children and knowledge of the five main modern family planning methods. These are known to influence contraceptive use. Because the response variable has three categories—sterilization, temporary method, or no method—multinomial logistic regression is used instead of simple binary logistic regression. The methodology for transforming multinomial logistic regression results into adjusted percentages is basically the same as in the case of simple binary logistic regression (for details, see Retherford and Choe 1993).

Table 8 and Figure 6 show that distance to a health facility has effects on contraceptive use that are mostly small, inconsistent in direction, and statistically nonsignificant when other predictor variables are held constant. This is true both for overall contraceptive use and for sterilization and temporary methods considered separately. In India as a whole, the adjusted effects of family-welfare/health worker visit, availability of an all-weather road, and village mass-media or educational activity are also small, but they are in the expected direction with one minor exception. The effects of these variables in individual states, however, are again mostly small, statistically nonsignificant, and sometimes not in the expected direction.

Table 8 also shows adjusted effects of other predictor variables on contraceptive use. With predictor variables other than religion controlled, Muslim women are much less likely to use contraception (especially sterilization) than Hindu women or women of other religions, although, as we saw earlier, their knowledge of contraceptive methods tends to be greater than that of other women. The adjusted effects of caste/tribe membership on contraceptive use are mostly small and not statistically significant. Crowding in the household, which did not show much relationship with knowledge, tends to have a statistically significant negative effect on the use of sterilization but not on the use of temporary methods. Availability of electricity in the household tends to have a positive effect on current contraceptive use, but this effect is weaker than the effect on the two knowledge variables.

Table 8 shows that woman's age has a strong positive effect on the use of sterilization, but the effect of age on the use of temporary methods tends to be negative. This is to be expected, because as women age and complete family building, they tend to shift from temporary spacing methods to sterilization. Contraceptive use de-

Table 7 Adjusted effects of community access and other predictor variables on knowledge of sources of supply of all five main modern family planning methods (female sterilization, male sterilization, IUD, pill, and condom) among currently married, rural women age 13–49, four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage with knowledge of sources of supply of all five main modern methods				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km†	21	18	19	13	27
2–5 km	19	15	21	10	25
≥ 6 km	25	15	24	18	25
Family welfare/health worker visit					
Yes	22	15	20	16	26
No†	21	17	20	11	27
Village has all-weather road					
Yes	22	20	23*	11	28*
No†	21	15	17	16	24
Village media/educational activity					
Yes	27*	23*	18	12	26
No†	20	11	20	14	26
Household-level variables					
Religion					
Hindu†	21	15	20	14	25
Muslim	25	31*	19	16	31*
Other	24	20	14	5	35*
Caste/tribe					
Scheduled caste/scheduled tribe	19	13	15*	10*	22*
Other†	22	18	21	16	27
Crowding					
< 3 persons per room†	20	15	19	14	26
≥ 3 persons per room	23	16	21	13	26
Electricity					
Yes	29*	19*	34*	16*	30*
No†	20	13	19	12	23
House type					
Kachcha†	20	15	19	10	24
Pucca or semi-*pucca*	23	23*	24	18*	28*
Individual woman-level variables					
Womans'age (in years)					
13–24†	20	15	18	14	23
25–34	23*	17	21	15	29*
35–49	22	15	21	12	26*
Woman's education					
Illiterate†	18	14	17	12	20
Literate, < middle complete	31*	21*	35*	24*	37*
Middle complete or higher	51*	40*	51*	37*	57*
Woman's work status					
Not working†	22	16	21	11	28
Working	18	16	17	18*	23*
Woman's media exposure					
Yes	31*	23*	32*	26*	34*
No†	18	13	17	11	21
Number of women	8,144	4,287	4,497	3,615	58,517

†Reference category

*$p < .05$

Notes: The units of analysis are currently married, rural women age 13–49. For definition of variables, see Table 1. Adjusted effects are estimated by logistic regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.

Table 8 Adjusted effects of community access and other predictor variables on current use of sterilization and temporary contraception among currently married, non-pregnant, rural women age 13–49, four northern states and India, NFHS-1, 1992–93

	Adjusted percentage currently using contraception									
	Uttar Pradesh		Madhya Pradesh		Bihar		Rajasthan		India	
Characteristic	Ster.	Temp.	Ster.	Temp.	Ster.	Temp.	Ster.	Temp.	Ster.	Temp.
Community-access variables										
Distance to health facility										
< 2 km†	15	4	36	2	18	4	26	3	34	8
2–5 km	14	5	34	4*	20	3	29	3	32*	8
≥ 6 km	12*	5	35	3	17	7*	29	4	32*	7*
Family welfare/ health worker visit										
Yes	14	6*	35	3	23*	4	28	4	36*	7*
No†	13	4	35	2	18	3	29	3	28	9
Village has all-weather road										
Yes	16*	6*	32	4	19	4	25*	3	34*	9*
No†	12	4	36	3	17	3	31	3	32	7
Village media/educational activity										
Yes	18*	6*	38*	3	20	3	29	3	39*	8*
No†	12	4	32	3	18	4	28	3	29	8
Household-level variables										
Religion										
Hindu†	16	5	35	3	25	3	30	3	36	7
Muslim	4*	3*	37	2	3*	5	9*	6	14*	12*
Other	17	6	15*	16*	15	7	33	8	33	14*
Caste/tribe										
Scheduled caste/ scheduled tribe	13	5	34	4	16	2	23*	5*	31*	7*
Other†	14	5	36	3	19	4	32	3	34	8
Crowding										
< 3 persons per room†	16	4	37	3	20	4	33	3	35	8
≥ 3 persons per room	12*	5	33	3	16*	3	25*	3	31*	7*
Electricity										
Yes	15	5	37*	3	17	6*	33*	4*	37*	7*
No†	13	5	32	3	18	3	24	3	30	8
House type										
Kachcha†	13	4	35	3	18	4	27	3	32	8
Pucca or semi-*pucca*	14	6*	37	4	19	3	30	4	34	7*
Individual woman-level variables										
Woman's age (in years)										
13–24†	5	5	16	4	8	4	13	3	20	9
25–34	17*	5	45*	3	26*	5	34*	3	39*	8*
35–49	27*	4	52*	2	29*	2	41*	3	41*	6
Number and sex composition of living children										
No children†	1	2	2	1	3	2	1	2	2	3
One child										
One son	9*	3*	5	4*	4	8*	5	5*	10*	10*
No son	1	3*	15*	4*	3	9*	7	4	8*	8*
Two children										
Two sons	36*	6*	72*	1*	35*	17*	54*	2	57*	7*
One son	15*	6*	50*	2*	21*	11*	35*	6*	43*	9*
No son	6*	4*	20*	3*	9*	11*	3	3	24*	8*
Three or more children										
Two or more sons	40*	5	68*	3*	45*	5*	69*	2*	62*	5*
One son	17*	6*	52*	2*	27*	8*	40*	3*	49*	8*
No son	2	5*	31*	3*	1	0	13*	6	26*	8*
Woman's education										
Illiterate†	13	4	33	3	17	3	28	3	31	6
Literate, < middle complete	17*	9*	46*	4*	27*	5*	37*	4	40*	11*
Middle complete or higher	19*	8*	41	4	26*	9*	27	10*	32*	17*

Table 8, cont. Adjusted effects of community access and other predictor variables on current use of sterilization and temporary contraception among currently married, non-pregnant, rural women age 13–49, four northern states and India, NFHS-1, 1992–93

| | Adjusted percentage currently using contraception | | | | | | | | | |
| | Uttar Pradesh | | Madhya Pradesh | | Bihar | | Rajasthan | | India | |
Characteristic	Ster.	Temp.	Ster.	Temp.	Ster.	Temp.	Ster.	Temp.	Ster.	Temp.
Individual women-level variables, cont.										
Woman's work status										
Not working†	13	5	34	3	18	3	28	3	28	9
Working	15	4	37	3	19	4	28	3	42*	7
Woman's media exposure										
Yes	15	5	36	4	23*	7*	33*	3	39*	9*
No†	13	5	35	3	17	3	27	3	29	7
Woman's knowledge of all five modern family planning methods										
Yes	17*	10*	36	7*	22*	6*	36*	6*	34*	13*
No†	12	3	35	2	17	3	26	3	32	6
Number of women	7,355		3,853		4,027		3,285		53,204	

†Reference category

*p< .05

Ster.: Sterilization; Temp.: Any temporary method

Notes: The units of analysis are currently married, non-pregnant, rural women age 13–49. For definition of variables, see Table 1. Adjusted effects are estimated by multinomial logit regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.

pends not only on the number of living children but also on the sex composition of living children. Among Indian women with two living children, the adjusted proportion using any modern contraception increases from 32% for women with no living sons to 65% for women with two living sons (Figure 7). A rather similar pattern is observed for women with three or more living children. The number and sex composition of living children has a greater effect on sterilization than on the use of temporary methods. The results also indicate that son preference is stronger in the four large northern states than in India as a whole.

Education has a large effect on contraceptive use that is independent of all other factors included in the analysis (Table 8). The effect of education on current use is somewhat smaller, however, than its effect on the two knowledge indicators. This smaller effect probably occurs because the analysis of current use controls for number and sex composition of living children and for woman's knowledge of contraceptive methods. In India as a whole, women who work in addition to housework are considerably more likely to use family planning than are women who do not, but this effect is not observed in the four northern states considered individually. Regular exposure to electronic mass media has a positive effect on current contraceptive use in India and in the four northern states, but its effect is not statistically significant in Uttar Pradesh or Madhya Pradesh. As expected, knowledge of all five main modern methods has a
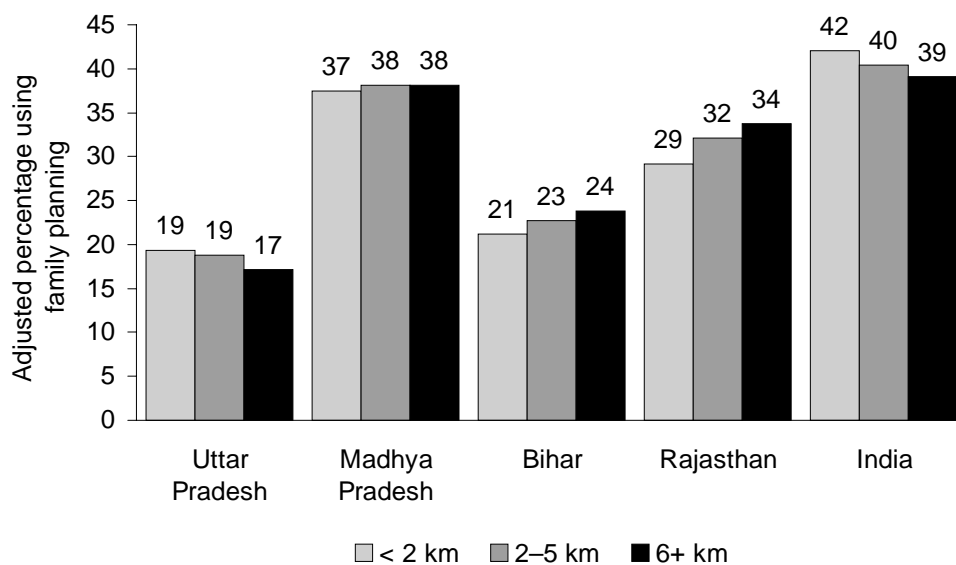
Figure 6 Adjusted effects of distance to a health facility on current use of family planning among currently married, non-pregnant, rural women age 13–49, four northern states and India, NFHS-1, 1992–93
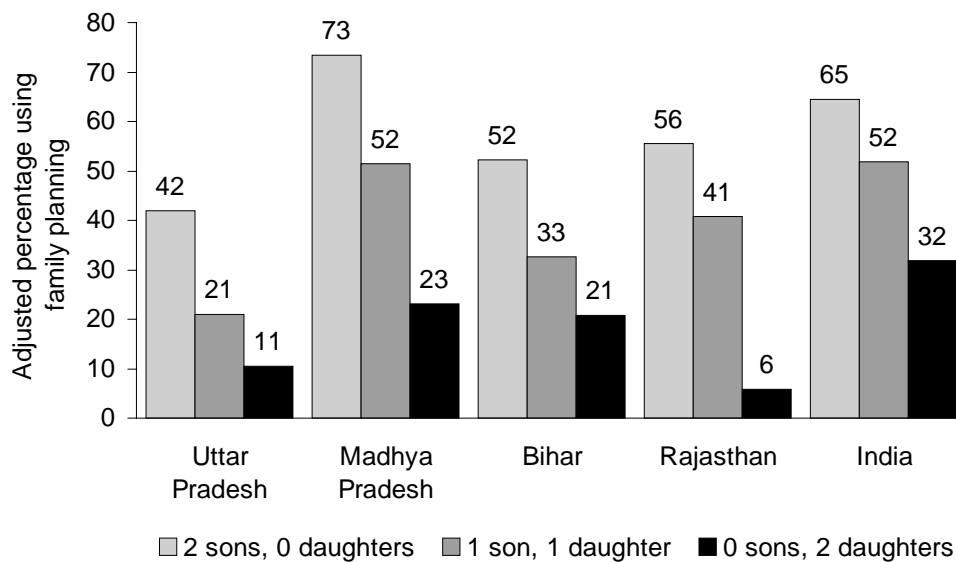
Figure 7 Adjusted effects of sex composition of children on current use of family planning among currently married, non-pregnant, rural women age 13–49, with two living children, four northern states and India, NFHS-1, 1992–93

large positive effect on current contraceptive use, especially the use of temporary methods, even after controlling for community access and socioeconomic and demographic variables. The finding that knowledge of the five methods has a large effect on contraceptive use should be interpreted with caution, however, because there is some reverse causation. It is likely that some current users may have educated themselves about the various methods after deciding to use contraception rather than before.

In sum, community-access variables (distance of the village to a health facility, availability of an all-weather road connecting the village to the outside world, regular visits in the village by health or family planning workers, and mass-media or other educational activities in the village related to health or family welfare) do not appear to have much effect on knowledge of contraceptive methods, knowledge of sources of supply, or contraceptive use. Apparently India's health and family-welfare infrastructure is such that further improvements in physical accessibility alone will not make much difference in knowledge and use of services. The main variables affecting contraceptive knowledge and use appear to be demand factors, such as woman's education and exposure to mass media. The quality of services may also play an important role, but NFHS-1 does not provide information on service quality.

Use of antenatal and delivery care services

Current levels. Antenatal care comprises a variety of preventive measures during pregnancy, including regular check-ups, tetanus toxoid injections, iron and folic acid tablets, and educating women about nutrition, delivery care, and postpartum care. Antenatal care may enable women to have a safe delivery even in cases of high-risk pregnancies. In addition to good antenatal care, medical attention at the time of delivery is important for the safety and well being of both mother and child. Giving birth under the supervision of qualified health professionals or in medical institutions is an important aspect of delivery care.

This analysis of the utilization of antenatal and delivery services focuses on women who gave birth during the four years before NFHS-1. The analysis includes three indicators of antenatal care during the pregnancy—received an antenatal check-up at home or in a health facility, received iron and folic acid tablets, and received two or more tetanus toxoid injections. It also includes two indicators of delivery care—received assistance from a health care professional at the time of delivery and gave birth in a medical institution. We first examine how these measures of antenatal and delivery care vary among the four northern states and for India as a whole. Second, we examine how each of these measures of antenatal and delivery care varies by community access to health and family-welfare services. Third, we estimate the adjusted effects of community-access variables and other predictor variables on the utilization of each of these five antenatal and delivery services.

Table 9 Percentage utilization of selected antenatal and delivery services among rural women age 13–49 who gave birth during the four years before the survey, by state, NFHS-1, 1992–93

State	Antenatal check-up	Iron tablets	Tetanus injections	Delivery assistance	Institutional delivery
India	57	45	48	25	16
Four northern states					
Uttar Pradesh	41	25	33	12	7
Madhya Pradesh	47	40	37	23	8
Bihar	33	18	27	14	8
Rajasthan	29	27	24	18	7
Other major states					
Andhra Pradesh	85	75	72	40	21
Assam	46	37	32	14	7
Delhi	77	64	70	33	27
Goa	97	89	83	87	86
Gujarat	73	66	56	32	24
Haryana	69	56	60	24	11
Himachal Pradesh	74	70	47	22	13
Jammu Region of Jammu and Kashmir	77	68	66	25	18
Karnataka	83	73	67	41	26
Kerala	98	91	90	88	86
Maharashtra	79	70	66	38	25
Orissa	60	48	51	16	10
Punjab	87	71	81	45	21
Tamil Nadu	94	82	88	61	49
West Bengal	74	54	68	23	21

Note: For definition of variables, see Table 1. Results for states incorporate state-level sample weights and results for India as a whole incorporate national-level sample weights. Weights are calculated so that the total number of ever-married women age 13–49 (in a particular state or in the nation as a whole) is the same whether weighted or unweighted, but this does not necessarily hold for births in the last four years, as in this table.

Table 9 shows the differences among states in utilization of antenatal and delivery care. In India as a whole, mothers do not receive any antenatal check-up for 43% of births, mothers do not receive iron and folic acid tablets for 55% of births, and mothers do not receive two or more tetanus toxoid injections for 52% of births. Many fewer women receive these three antenatal-care services in the four northern states than in most other states of India, although utilization is somewhat higher in Madhya Pradesh than in the other three northern states. Figure 8 illustrates the large state-level differences in antenatal care by comparing the proportion of mothers receiving each of the three antenatal-care services in Uttar Pradesh and Bihar with the proportions receiving these services in the two comparatively advanced southern states of Kerala and Tamil Nadu, as well as in India as a whole. A much higher proportion of women receive antenatal care in Kerala and Tamil Nadu than in Uttar Pradesh or Bihar.

Table 9 and Figure 9 show that, for the country as a whole, only one in four births was attended by a health professional, and only one in six births was delivered in a medical institution. Use of delivery services is even lower in the four northern states. Figure 9 illustrates the large state-level differences in delivery care by comparing the proportion of mothers receiving each of the two delivery-care services in Uttar Pradesh and Bihar with the proportion in Kerala and Tamil Nadu, as well as in India as a
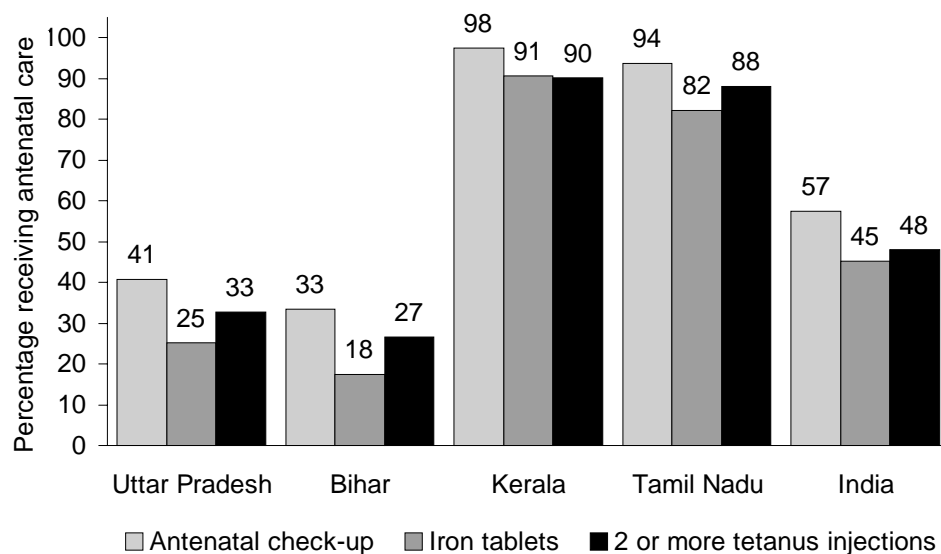
Figure 8 Utilization of antenatal care services among rural women age 13–49 who gave birth during the four years before the survey, selected states and India, NFHS-1, 1992–93
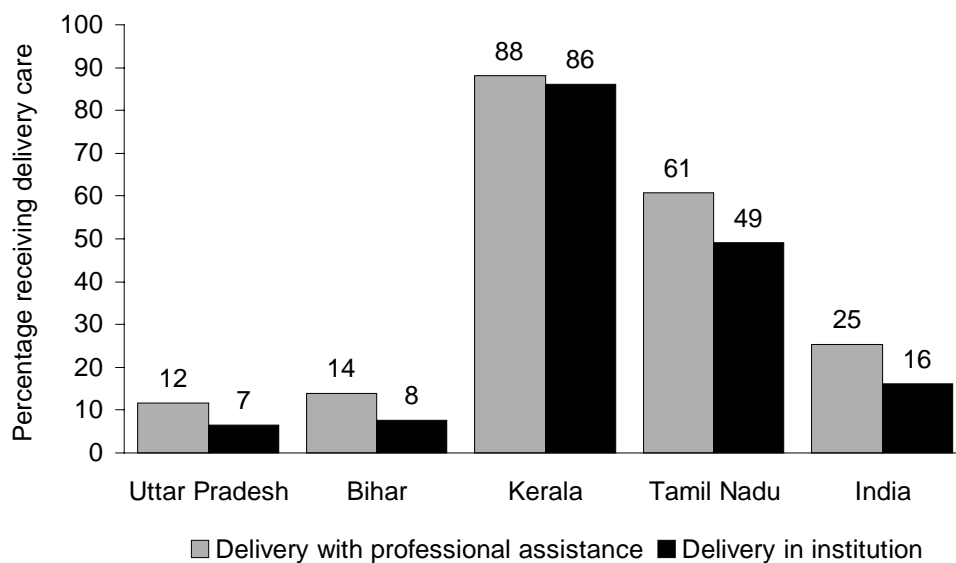
Figure 9 Utilization of delivery care services among rural women age 13–49 who gave birth during the four years before the survey, selected states and India, NFHS-1, 1992–93

Table 10 Percentage distribution of children born to rural women age 13–49 during the four years before the survey by selected community-access, socioeconomic, and demographic variables, four northern states and India, NFHS-1, 1992–93

Characteristic	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km†	26	23	56	37	42
2–5 km	37	29	35	28	31
≥ 6 km	37	48	8	35	27
Family welfare/health worker visit					
Yes	57	77	13	55	59
No	43	23	88	45	41
Village has all-weather road					
Yes	39	26	52	46	49
No	61	74	48	54	51
Village media/educational activity					
Yes	23	46	18	28	41
No	77	54	82	72	59
Household-level variables					
Religion					
Hindu	86	96	78	93	82
Muslim	13	3	21	5	13
Other	0	1	1	2	5
Caste/tribe					
Scheduled caste/scheduled tribe	22	41	18	43	26
Other	78	59	82	57	74
Crowding					
< 3 persons per room	42	45	42	40	43
≥ 3 persons per room	58	55	58	60	57
Electricity					
Yes	20	56	9	44	38
No	80	44	91	56	62
House type					
Kachcha	63	89	77	47	62
Pucca or semi-*pucca*	37	11	23	53	38
Individual woman-level variables					
Woman's age at child birth (in years)					
12–24	52	64	56	58	62
25–34	38	31	37	35	33
35–49	10	5	7	7	6
Woman's education					
Illiterate	84	85	84	88	74
Literate, < middle complete	8	9	9	8	16
Middle complete or higher	8	6	7	4	11
Woman's work status					
Not working	86	65	75	64	69
Working	14	35	25	36	32
Woman's media exposure					
Yes	26	28	22	22	39
No	74	72	78	78	61
Individual child-level variables					
Child's age (in months)					
0–11	26	27	26	27	26
12–23	28	26	26	24	26
24–35	22	23	22	24	23
36–47	24	24	26	25	25
Child's sex					
Male	51	52	51	52	51
Female	49	48	49	48	49

Table 10, cont. Percentage distribution of children born to rural women age 13–49 during the four years before the survey by selected community-access, socioeconomic, and demographic variables, four northern states and India, NFHS-1, 1992–93

Characteristic	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Individual child-level variables, cont.					
Child's birth order					
1	22	27	23	27	26
2	20	23	20	22	23
3	16	17	16	16	18
4+	43	33	41	35	33
Number of children	6,544	2,972	2,881	2,457	35,795

Note: For definition of variables, see Table 1.

whole. As in the case of antenatal care, the proportions receiving delivery care are several times larger in Kerala and Tamil Nadu than in Uttar Pradesh or Bihar.

Factors affecting use of antenatal and delivery care services. Table 10 shows the percent distribution of children born to rural mothers in the four years before NFHS-1 by each of several factors that might affect utilization of antenatal and delivery services. The percent distributions shown in the table are quite similar to the percent distributions of currently married rural women age 13–49 by these same characteristics discussed earlier in Table 4. One difference is that this analysis of antenatal and delivery services is based on woman's age at the time of childbirth rather than woman's age at the time of the survey. In India as a whole, mother's age at childbirth was 12–24 years for 62% of births in the four years before the survey. It was 25–34 years for 33% of these births, and it was 35 years or higher for 6% of births. The table also shows percent distributions of these children by child's age, sex, and birth order. Children are more or less uniformly distributed in the four one-year age groups. There are slightly more boys than girls in India as a whole and in each of the four northern states. About one-third of all births in India's rural areas are of birth order four or higher. The proportion of births at these high birth orders is somewhat larger in Uttar Pradesh (43%) and Bihar (41%) than in the country as a whole, reflecting the relatively high fertility in these two states.

Table 11 shows unadjusted percentages of women using antenatal and delivery services for their births in the four years before the survey by community-access variables. The table gives this information for rural areas in each of the four northern states and for India as a whole. The table shows a strong, consistent relationship between each of the five maternal health-care indicators and the four community-access indicators. In other words, the community-access variables have large effects on antenatal and delivery care. In India as a whole, 65% of rural mothers[7] living within

Table 11 Percentage utilization of selected antenatal and delivery services among rural women age 13–49 who gave birth during the four years before the survey, by community-access variables, four northern states and India, NFHS-1, 1992–93

State/community characteristic	Unadjusted percentage utilizing service				
	Antenatal check-up	Iron tablets	Tetanus injections	Delivery assistance	Institutional delivery
Uttar Pradesh					
Distance to health facility					
< 2 km	49	30	43	15	10
2–5 km	39	25	29	11	7
≥ 6 km	36	21	28	11	5
Family welfare/health worker visit					
Yes	43	28	35	12	6
No	37	21	29	11	7
Village has all-weather road					
Yes	46	27	38	14	8
No	37	23	29	10	6
Village media/educational activity					
Yes	45	29	39	16	8
No	39	24	31	11	6
Madhya Pradesh					
Distance to health facility					
< 2 km	59	49	52	33	14
2–5 km	43	36	34	23	6
≥ 6 km	46	37	33	17	5
Family welfare/health worker visit					
Yes	49	41	39	23	9
No	44	38	34	21	3
Village has all-weather road					
Yes	53	44	46	27	12
No	46	38	35	21	6
Village media/educational activity					
Yes	50	41	39	22	8
No	45	39	36	23	7
Bihar					
Distance to health facility					
< 2 km	38	19	30	17	9
2–5 km	27	15	23	9	5
≥ 6 km	29	20	21	11	8
Family welfare/health worker visit					
Yes	36	19	26	18	11
No	33	17	27	13	7
Village has all-weather road					
Yes	40	21	32	17	9
No	26	13	20	11	6
Village media/educational activity					
Yes	41	25	33	22	15
No	32	16	25	12	6
Rajasthan					
Distance to health facility					
< 2 km	32	31	28	17	6
2–5 km	28	24	23	20	9
≥ 6 km	27	26	23	18	7
Family welfare/health worker visit					
Yes	34	33	28	20	8
No	22	19	20	16	7
Village has all-weather road					
Yes	30	27	26	21	10
No	28	27	23	15	5
Village media/educational activity					
Yes	34	32	30	21	8
No	26	24	22	17	7

Table 11, cont. Percentage utilization of selected antenatal and delivery services among rural women age 13–49 who gave birth during the four years before the survey, by community-access variables, four northern states and India, NFHS-1, 1992–93

	Unadjusted percentage utilizing service				
State/community characteristic	Antenatal check-up	Iron tablets	Tetanus injections	Delivery assistance	Institutional delivery
India					
Distance to health facility					
< 2 km	65	51	56	32	22
2–5 km	53	41	44	22	13
≥ 6 km	52	41	42	20	11
Family welfare/health worker visit					
Yes	65	54	56	31	20
No	46	33	38	17	10
Village has all-weather road					
Yes	65	52	56	32	22
No	50	39	40	19	10
Village media/educational activity					
Yes	70	58	60	35	24
No	49	37	40	19	11

Note: For definition of variables, see Table 1.

two kilometres of a health facility received at least one antenatal check-up, compared with 52% of mothers living six or more kilometres from a health facility. Fifty-one percent of mothers living within two kilometres of a health facility received iron and folic acid tablets, compared with 41% of mothers living six or more kilometres from a facility. Fifty-six percent of mothers living within two kilometres of a health facility received two or more tetanus toxoid injections, compared with 42% of mothers living six or more kilometres from a facility. Thirty-two percent of mothers living within two kilometres of a health facility received assistance from a health professional at the time of delivery, compared with 20% of mothers living six or more kilometres from a facility. The unadjusted effect of distance to a health facility on the proportion giving birth in medical institutions is especially large. Mothers living within two kilometres of a health facility are twice as likely to give birth in a medical institution as are mothers living six or more kilometres from a health facility. Effects of the other three community-access variables on each of the five antenatal- and delivery-care indicators are similarly positive and strong, and the effects on institutional deliveries are especially large. The unadjusted effects of community-access variables on antenatal and delivery care tend to be weaker in the four northern states considered individually than in the country as a whole.

When socioeconomic and demographic variables are controlled, however, the adjusted effects of community-access variables on utilization of antenatal and delivery care generally become small and statistically nonsignificant. By contrast, mother's

---

[7]A mother is counted more than once if she had more than one birth during the four years before the survey.

Table 12 Adjusted effects of community access and other predictor variables on the likelihood that a rural mother received an antenatal check-up for births during the four years before the survey, four northern states and India, NFHS-1, 1992–93

	Adjusted percentage receiving an antenatal check-up				
Characteristic	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km†	44	54	36	27	60
2–5 km	41	44	30	29	56
≥ 6 km	37	46	33	29	56*
Family welfare/health worker visit					
Yes	42	48	32	35*	62*
No†	39	47	34	21	52
Village has all-weather road					
Yes	43	46	37*	27	60*
No†	38	48	30	30	55
Village media/educational activity					
Yes	42	49	33	30	63*
No†	40	46	34	28	53
Household-level variables					
Religion					
Hindu†	41	46	33	28	57
Muslim	34*	69*	34	33	55
Other	43	93*	48	31	68*
Caste/tribe					
Scheduled caste/scheduled tribe	37	46	30	29	55*
Other†	41	49	34	29	59
Crowding					
< 3 persons per room†	40	44	34	31	57
≥ 3 persons per room	40	50	34	27	58
Electricity					
Yes	43	53*	47*	36*	64*
No†	40	41	32	23	54
House type					
Kachcha†	39	47	33	29	55
Pucca or semi-*pucca*	43*	54	36	28	61*
Individual woman-level variables					
Woman's education					
Illiterate†	37	44	30	26	51
Literate, < middle complete	51*	57*	49*	41*	70*
Middle complete or higher	63*	85*	67*	56*	81*
Woman's work status					
Not working†	42	49	35	29	56
Working	31*	45	31	28	61*
Woman's media exposure					
Yes	48*	52	44*	39*	68*
No†	38	46	31	26	51
Individual child-level variables					
Child's birth order					
1†	47	50	40	35	65
2	41*	48	37	28*	59*
3	37*	48	39	29	58*
4+	38*	45	27*	24*	50*
Number of births	6,245	2,715	2,913	2,175	35,943

†Reference category

*p< .05

Notes: The units of analysis are births to rural mothers during the four years before the survey. For definition of variables, see Table 1. Adjusted effects are estimated by logistic regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.

Figure 10 Adjusted effects of distance to a health facility on the likelihood that a rural mother received an antenatal check-up for births during the four years before the survey, four northern states and India, NFHS-1, 1992–93

socioeconomic characteristics continue to have large effects. The results of these multivariate analyses are presented in Tables 12–16 and Figures 10–14.

Table 12 and Figure 10 present adjusted effects of community access and other predictor variables on the likelihood of receiving an antenatal check-up. The units of analysis are births to rural mothers in the four years before the survey. The results show that, in India as a whole, each of the four community-access variables has a small, positive, and statistically significant effect on the proportion of mothers receiving antenatal check-ups, even after controlling for the other predictor variables. The adjusted effects are, however, considerably smaller than the unadjusted effects shown in Table 11. In the four northern states, the effects of the community-access variables on the proportion receiving an antenatal check-up are small and are not statistically significant. As shown in Figure 10, for example, in three out of the four northern states there is no clear relationship between distance to a health facility and the proportion receiving an antenatal check-up.

Several of the socioeconomic and demographic variables have large effects on the likelihood of receiving an antenatal check-up, even after controlling for other variables. For the country as whole, most of these variables have statistically significant effects, but in the four northern states considered individually, only availability of electricity in the household, mother's education, and mother's media exposure consistently have large, positive, statistically significant effects. As with contraceptive knowledge and use, woman's education and regular exposure to electronic mass media emerge as the strongest predictors. In each of the four northern states, mothers who
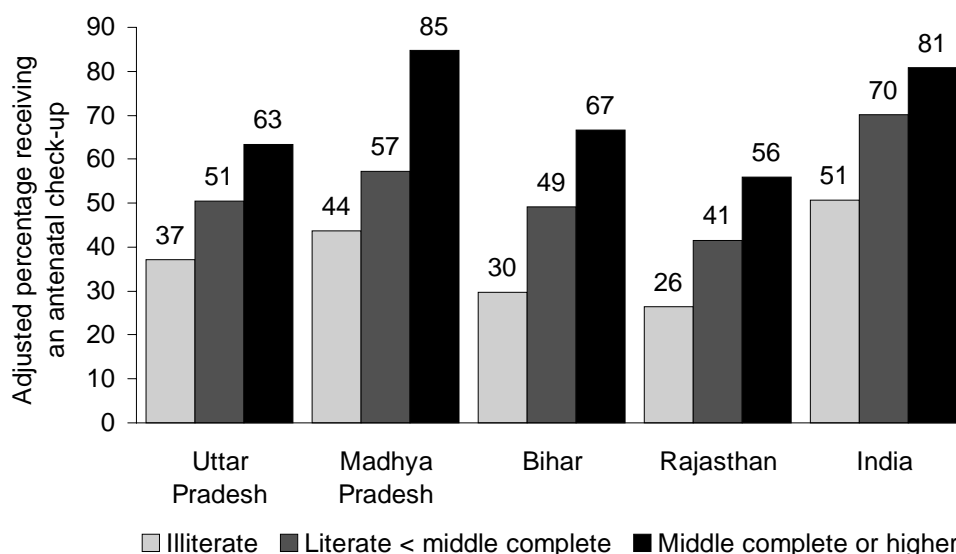
Figure 11 Adjusted effects of mother's education on the likelihood that a rural mother received an antenatal check-up for births during the four years before the survey, four northern states and India, NFHS-1, 1992–93

have completed at least middle school education are about twice as likely to receive an antenatal check-up as are illiterate mothers, as shown in Figure 11. Table 12 also shows that mothers of first births are more likely than mothers of higher-order births to receive an antenatal check-up.

Table 13 shows the adjusted effects of community access and other predictor variables on the likelihood that a woman received iron and folic acid tablets during pregnancy. With other predictor variables controlled, distance of the village to a health facility does not have any effect on the likelihood of receiving iron and folic acid tablets. The adjusted effects of the other three community-access variables—availability of an all-weather road, visit by a health or family-welfare worker, and mass-media or educational activity—are positive and significant for India as a whole, but much weaker than the unadjusted effects. In the four northern states, the effects of these community-access variables are mostly small, statistically nonsignificant, and at times in the unexpected direction. Among the household- and individual-level variables, the adjusted effects of availability of electricity in the household, mother's education, mother's exposure to mass media, and birth order of child tend to be large and statistically significant. As in the case of antenatal check-ups, mother's education and media exposure are the strongest predictors of the likelihood of receiving iron and folic acid tablets. In this instance, the effect of education tends to be stronger in the four northern states than in the country as a whole.

Table 14 shows the adjusted effects of community access and other predictor variables on the likelihood of receiving two or more tetanus toxoid injections during pregnancy. Results are similar to those presented in Tables 12 and 13 for antenatal

Table 13 Adjusted effects of community access and other predictor variables on the likelihood that a rural mother received iron and folic acid tablets during pregnancy for births during the four years before the survey, four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage receiving iron and folic acid tablets				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km†	27	46	17	26	46
2–5 km	25	37	17	24	45
≥ 6 km	23	39	23	30	45
Family welfare/health worker visit					
Yes	27	40	15	34*	50*
No†	22	41	18	19	39
Village has all-weather road					
Yes	25	37	20*	24	48*
No†	25	41	15	29	43
Village media/educational activity					
Yes	27	40	21	28	52*
No†	24	40	17	26	41
Household-level variables					
Religion					
Hindu†	25	39	17	26	46
Muslim	20*	59	18	34	41*
Other	33	88*	9	21	55*
Caste/tribe					
Scheduled caste/scheduled tribe	22	40	13	28	45
Other†	26	40	18	26	46
Crowding					
< 3 persons per room†	25	38	16	26	45
≥ 3 persons per room	24	41	18	27	46
Electricity					
Yes	26	45*	18	35*	52*
No†	24	34	17	21	41
House type					
Kachcha†	24	39	17	27	44
Pucca or semi-*pucca*	26	50	18	27	49*
Individual woman-level variables					
Woman's education					
Illiterate†	22	37	14	25	40
Literate, < middle complete	33*	53*	36*	42*	58*
Middle complete or higher	47*	62*	50*	51*	66*
Woman's work status					
Not working†	26	40	18	27	43
Working	19*	39	16	26	51*
Woman's media exposure					
Yes	34*	46	24*	42*	56*
No†	22	38	16	23	39
Individual child-level variables					
Child's birth order					
1†	29	40	22	32	51
2	25*	43	17	27	48*
3	22*	39	21	26*	46*
4+	23*	38	14*	23*	39*
Number of births	6,244	2,715	2,910	2,174	35,934

†Reference category

*p< .05

Notes: The units of analysis are births to rural mothers during the four years before the survey. For definition of variables, see Table 1. Adjusted effects are estimated by logistic regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.
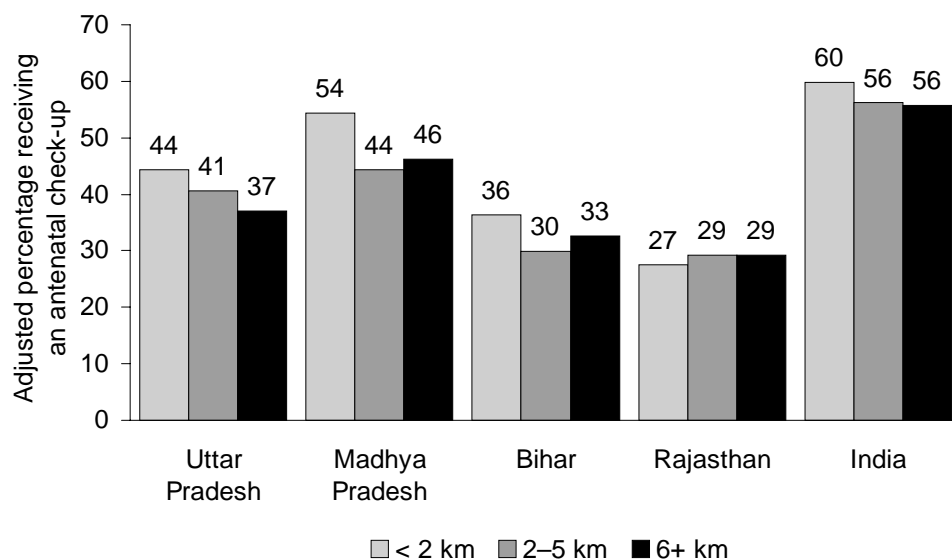
Table 14 Adjusted effects of community access and other predictor variables on the likelihood that a rural mother received two or more tetanus toxoid injections during pregnancy for births during the four years before the survey, four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage receiving two or more tetanus toxoid injections				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km†	39	48	28	23	51
2–5 km	30*	35	25	24	47*
≥ 6 km	30*	34	24	25	46*
Family welfare/health worker visit					
Yes	33	37	22	27	52*
No†	31	38	28	20	43
Village has all-weather road					
Yes	35	36	30*	23	52*
No†	31	38	23	25	45
Village media/educational activity					
Yes	36	38	27	28	54*
No†	32	37	27	22	45
Household-level variables					
Religion					
Hindu†	33	36	27	24	48
Muslim	26	74*	27	35	46
Other	41	70*	37	22	58*
Caste/tribe					
Scheduled caste/scheduled tribe	30	35	23	24	45*
Other†	33	39	28	24	50
Crowding					
< 3 persons per room†	34	37	24	23	48
≥ 3 persons per room	32	38	29	25	49
Electricity					
Yes	38*	44*	38*	31*	54*
No†	31	29	26	19	45
House type					
Kachcha†	31	37	26	23	46
Pucca or semi-*pucca*	36*	46	31	25	52*
Individual woman-level variables					
Woman's education					
Illiterate†	29	35	23	22	42
Literate, < middle complete	40*	49*	40*	38*	62*
Middle complete or higher	60*	63*	59*	60*	73*
Woman's work status					
Not working†	34	40	28	24	48
Working	22*	33	23	24	49
Woman's media exposure					
Yes	38*	42	35*	37*	58*
No†	30	36	25	21	42
Individual child-level variables					
Child's birth order					
1†	39	40	34	28	56
2	35	41	27*	27	51*
3	32*	38	32	26	49*
4+	29*	33*	22*	19*	40*
Number of births	6,226	2,697	2,901	2,150	35,780

†Reference category

*p< .05

Notes: The units of analysis are births to rural mothers during the four years before the survey. For definition of variables, see Table 1. Adjusted effects are estimated by logistic regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.

check-ups and iron and folic acid tablets. In India as a whole, the adjusted effects of each of the four community-access variables are in the expected direction and statistically significant, but they are considerably smaller than the unadjusted effects shown in Table 11. The adjusted effects of community-access variables in the four northern states tend to be small, statistically nonsignificant, and sometimes in the unexpected direction. Electricity in the household, mother's education, mother's media exposure, and child's birth order consistently have statistically significant effects in the expected direction, with mother's education being the strongest predictor.

Tables 15–16 and Figures 12–14 show the adjusted effects of community access and other predictor variables on delivery care—whether the mother received assistance from a health professional (doctor, ANM/LHV, nurse/midwife) at the time of delivery and whether she delivered in a medical institution.

Table 15 and Figure 12 show that the adjusted proportion of women receiving assistance at delivery declines as distance to a health facility increases. For India as a whole, the proportion receiving assistance at delivery is higher for births in villages with an all-weather road, for births in villages with regular visits by health and family-welfare workers, and for births in villages with mass-media and educational activities. The adjusted effects of these variables are, however, much weaker than the unadjusted effects shown in Table 11. In the four northern states, the adjusted effects of community access on delivery assistance are much smaller than in India as a whole, and, for the most part, they are not statistically significant.

Once again, among the socioeconomic and demographic variables, electricity in the household, mother's education, mother's media exposure, and child's birth order have statistically significant effects in the expected direction. Mother's education has the strongest effect of all the predictor variables included in the analysis, with mothers who have at least completed middle school being two to three times as likely to receive delivery assistance as illiterate mothers (Figure 13). The adjusted effects of the other socioeconomic variables are generally small and not statistically significant.

Table 16 shows the adjusted effects of community access and other predictor variables on the likelihood of giving birth in a medical institution. The adjusted effects of the community-access variables on institutional delivery are similar to those presented in Table 15 for assistance at delivery. In India as a whole, mothers living in villages within two kilometres of a health facility are more likely to give birth in a medical institution than are mothers living six or more kilometres from a health facility. Also, mothers living in villages with an all-weather road, in villages with regular visits by health and family-welfare workers, and in villages with mass-media or other educational activities are more likely to deliver in medical institutions than are other mothers. The effects are rather small, however. In the four northern states, the adjusted effects of community-access variables on institutional delivery are generally small, not statistically significant, and sometimes in the unexpected direction.

Table 15 Adjusted effects of community access and other predictor variables on the likelihood that a rural mother received assistance from a health professional during delivery for births during the four years before the survey, four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage receiving assistance at delivery				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km†	11	29	16	15	27
2–5 km	12	25	10*	22	25
≥ 6 km	11	19*	15	20	23*
Family welfare/health worker visit					
Yes	11	23	15	20	28*
No†	12	22	14	17	22
Village has all-weather road					
Yes	14	22	14	21	28*
No†	10	23	14	16	23
Village media/educational activity					
Yes	15*	21	17	21	31*
No†	11	24	13	17	22
Household-level variables					
Religion					
Hindu†	12	22	15	18	26
Muslim	8	32	11	23	20*
Other	15	42	3	17	33*
Caste/tribe					
Scheduled caste/scheduled tribe	7*	23	14	18	22*
Other†	13	22	14	19	26
Crowding					
< 3 persons per room†	11	23	16	21	26
≥ 3 persons per room	11	23	12*	17	24*
Electricity					
Yes	16*	28*	17	24*	32*
No†	11	18	13	15	22
House type					
Kachcha†	11	21	13	19	24
Pucca or semi-*pucca*	12	39*	16	18	28*
Individual woman-level variables					
Woman's education					
Illiterate†	10	21	12	16	21
Literate, < middle complete	16*	32*	24*	34*	35*
Middle complete or higher	28*	38*	40*	53*	49*
Woman's work status					
Not working†	12	23	14	20	25
Working	10	23	13	16	26
Woman's media exposure					
Yes	15*	24	19*	22	32*
No†	10	22	13	17	22
Individual child-level variables					
Child's birth order					
1†	18	30	22	25	36
2	10*	20*	12*	18*	26*
3	9*	22*	18	17*	23*
4+	10*	20*	10*	15*	19*
Number of births	6,227	2,716	2,911	2,161	35,923

†Reference category

*p< .05

Notes: The units of analysis are births to rural mothers during the four years before the survey. For definition of variables, see Table 1. Adjusted effects are estimated by logistic regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.
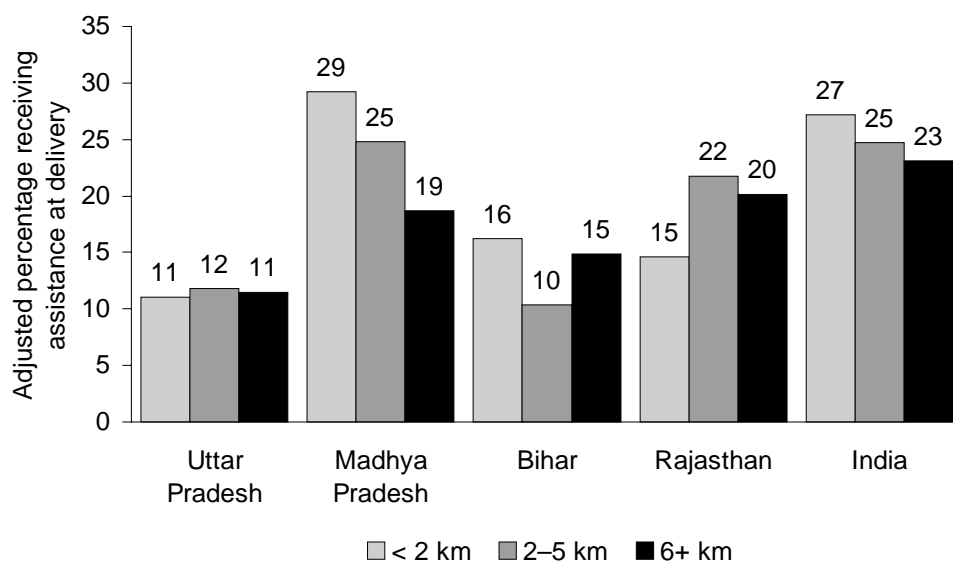
Figure 12 Adjusted effects of distance to a health facility on the likelihood that a rural mother received assistance at delivery from a health professional for births during the four years before the survey, four northern states and India, NFHS-1, 1992–93
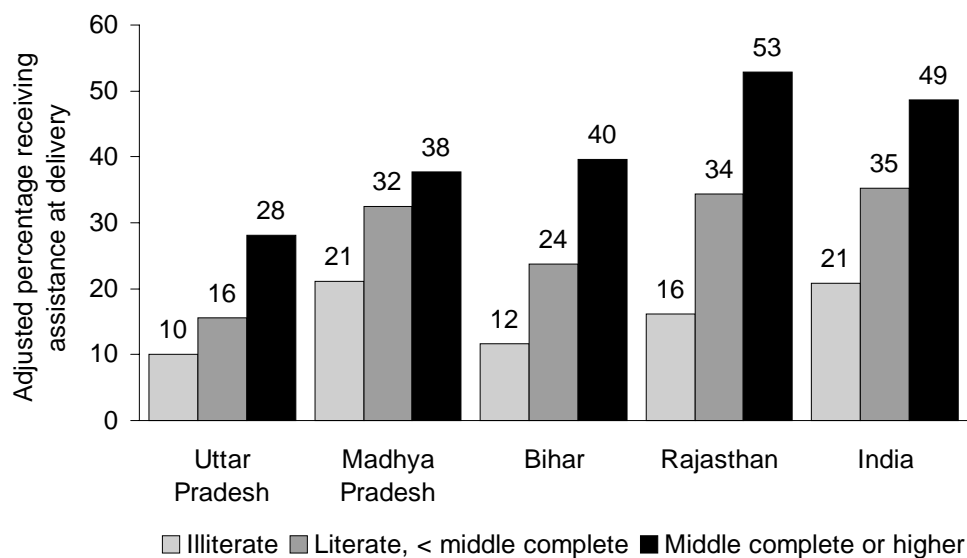
Figure 13   Adjusted effects of mother's education on the likelihood that a rural mother received assistance at delivery from a health professional for births during the four years before the survey, four northern states and India, NFHS-1, 1992–93

Table 16 Adjusted effects of community access and other predictor variables on the likelihood that a rural mother gave birth in a medical institution for births during the four years before the survey, four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage giving birth in a medical institution				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km†	9	9	8	5	17
2–5 km	7	8	6	11*	16
≥ 6 km	5*	7	12	8	14*
Family welfare/health worker visit					
Yes	6	9*	7	7	18*
No†	8	4	7	8	13
Village has all-weather road					
Yes	7	8	7	10*	19*
No†	6	7	7	6	14
Village media/educational activity					
Yes	7	7	12*	8	21*
No†	6	8	6	7	13
Household-level variable					
Religion					
Hindu†	7	7	8	7	16
Muslim	3*	14	5	10	13*
Other	11	12	NE	18*	20*
Caste/tribe					
Scheduled caste/scheduled tribe	3*	6	4*	8	12*
Other†	8	8	8	7	17
Crowding					
< 3 persons per room†	7	8	9	7	18
≥ 3 persons per room	6	7	6*	8	15*
Electricity					
Yes	8	10*	11	11*	18*
No†	6	5	7	6	15
House type					
Kachcha†	6	7	7	7	14
Pucca or semi-*pucca*	7	20*	9	8	19*
Individual woman-level variable					
Woman's education					
Illiterate†	6	6	6	7	12
Literate, < middle complete	8	18*	16*	14*	26*
Middle complete or higher	18*	18*	27*	21*	39*
Woman's work status					
Not working†	7	8	9	9	16
Working	6	6	4*	6	15
Woman's media exposure					
Yes	9*	9	8	9	21*
No†	6	7	7	7	13
Individual child-level variable					
Child's birth order					
1†	11	15	12	10	25
2	6*	7*	7*	6*	16*
3	6*	5*	8	6*	14*
4+	5*	5*	5*	8	11*
Number of births	6,245	2,716	2,913	2,176	35,941

NE = Not estimated due to small number of cases

†Reference category; *p< .05

Notes: The units of analysis are births to rural mothers during the four years before the survey. For definition of variables, see Table 1. Adjusted effects are estimated by logistic regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.

Among socioeconomic and demographic variables, mother's education stands out as having the largest effect on the likelihood that a mother will have an institutional delivery. In each of the four northern states and in the country as a whole, mothers who have at least completed middle school are three to four times more likely to deliver in medical institutions than are illiterate mothers. First-order births are more likely to be delivered in medical institutions than are second- or higher-order births (Figure 14). The adjusted effects of electricity in the household and media exposure are small compared with the effects of these variables on the other maternal-care indicators discussed earlier. Caste/tribe emerges as having significant effects in Uttar Pradesh, Bihar, and India as a whole—women who belong to scheduled castes or scheduled tribes are significantly less likely to deliver in a medical institution than are other women.

In sum, the analysis of factors affecting utilization of maternal-care services shows that community-access variables have large unadjusted effects on each of the antenatal- and delivery-care indicators. The adjusted effects of community access, however, tend to be weak and statistically nonsignificant, especially in the four northern states considered individually. By contrast, availability of electricity in the household, mother's education, mother's exposure to mass media, and child's birth order consistently have large and significant effects in the expected directions. Mother's education, in particular, emerges as the most important predictor of utilization of each of the five antenatal and delivery services considered. Although the adjusted effects of community access on antenatal and delivery care tend to be weaker in the four northern states than in India as a whole, the adjusted effects of mother's education tend to be stronger in the four northern states.

Overall, these findings indicate that at this stage of India's development, it is not physical availability of services but demand variables such as education and media exposure that are the main factors affecting utilization of maternal health services. The quality of these services is probably also an important factor, but unfortunately NFHS-1 did not collect information on service quality.

Use of child health services

Current levels. Vaccination of children against six serious but preventable diseases—tuberculosis, diphtheria, pertussis (whooping cough), tetanus, poliomyelitis, and measles—is considered essential for promoting child health and survival. Under its Universal Immunization Programme, the Government of India has been providing free vaccination services against these six diseases for about two decades. The government also provides free oral doses of vitamin A supplementation to children under age five. According to government guidelines, vitamin A should be given to children every six months from age nine months to five years.
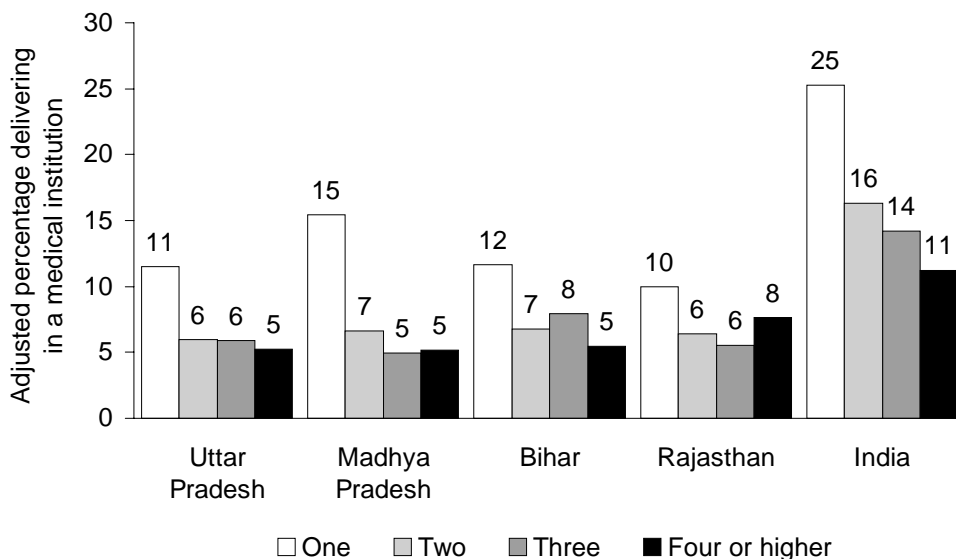
Figure 14 Adjusted effects of child's birth order on the likelihood that a rural mother gave birth in a medical institution for births during the four years before the survey, four northern states and India, NFHS-1, 1992–93

In this section we examine factors affecting utilization of these two preventive child-health services. We also examine utilization of health services for treating three major childhood diseases, namely acute respiratory infections (ARI), diarrhoea, and fever. ARI and diarrhoea are the top two causes of childhood morbidity and mortality in India and worldwide, and fever from various types of infection also affects a majority of children in India every year. In this analysis, child immunization, vitamin A supplementation, treatment of acute respiratory infections, treatment of diarrhoea, and treatment of fever are the response variables.

This analysis is based on children born to rural mothers during the four years before the survey. The analysis of immunization status is limited to children age 12–23 months, however, because the immunization schedule for the six major diseases is usually completed during the first year of life. The analysis of vitamin A supplementation is restricted to children age 12–47 months because vitamin A supplementation is not recommended for children below nine months of age. The analyses of treatment of ARI, diarrhoea, and fever are restricted to children age 0–47 months who suffered from these diseases during the two weeks before the survey.

We begin by examining state differentials in the use of each of the five categories of child-health services. This is followed by analyses of the unadjusted and adjusted effects of community access and other predictor variables on the use of each of these services.

Table 17 Percentage utilization of selected child-health services for rural children age 0–47 months at the time of the survey, by state, NFHS-1, 1992–93

State	Fully immunized[a]	Vitamin A[b]	ARI treatment	Diarrhoea treatment	Fever treatment
India	31	20	65	58	64
Four northern states					
Uttar Pradesh	17	8	66	63	68
Madhya Pradesh	26	17	65	64	64
Bihar	9	6	72	54	59
Rajasthan	16	14	55	51	62
Other major states					
Andhra Pradesh	40	37	64	60	66
Assam	17	9	39	34	29
Delhi	56	32	NC	80	93
Goa	75	63	93	71	89
Gujarat	46	42	76	60	74
Haryana	52	36	81	63	85
Himachal Pradesh	61	52	79	70	81
Jammu Region of Jammu and Kashmir	63	24	76	69	72
Karnataka	50	37	74	62	79
Kerala	54	67	82	67	74
Maharashtra	66	22	73	58	72
Orissa	35	10	56	44	52
Punjab	58	28	92	85	92
Tamil Nadu	60	39	68	50	71
West Bengal	31	20	65	79	56

[a]Children age 12–23 months

[b]Children age 12–47 months

NC = Not calculated because there are no cases on which to base a percentage

Note: For definition of variables, see Table 1. Results for states incorporate state-level sample weights and results for all India incorporate national-level sample weights. Weights are calculated so that the total number of ever-married women age 13–49 (in a particular state or in the nation as a whole) is the same whether weighted or unweighted. But this does not necessarily hold for children born in the last four years, as in this table.

Table 17 shows proportions using each of the five child-health services. In India as a whole, slightly less than one out of three children age 12–23 months was fully immunized at the time of NFHS-1, and only one out of five children age 12–47 months had received at least one dose of vitamin A. Among children under age four, treatment was sought for 65% of children who were sick with ARI, 58% of children who were sick with diarrhoea, and 64% of children who were sick with fever during the two weeks before the survey. Child immunization and vitamin A supplementation are much lower in Uttar Pradesh, Madhya Pradesh, Bihar, and Rajasthan than in most other states. Figure 15 shows that the proportion fully immunized and the proportion who received vitamin A supplementation are several times higher in the southern states of Kerala and Tamil Nadu than in the northern states of Uttar Pradesh and Bihar. By contrast, there is little variation among states in the proportions seeking curative treatment for the three childhood diseases. Treatment seeking is about the same in the four northern states as the national average and not much lower than in the southern states (Figure 16).
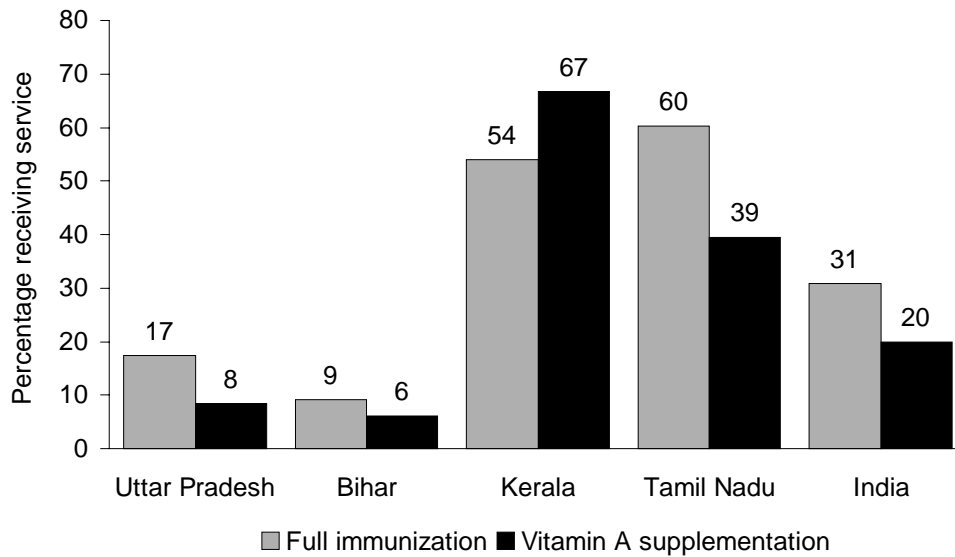
Figure 15 Utilization of preventive child-health services (children age 12–23 months who received full immunization coverage and children age 12–47 months who received vitamin A supplementation), rural areas of selected states and India, NFHS-1, 1992–93
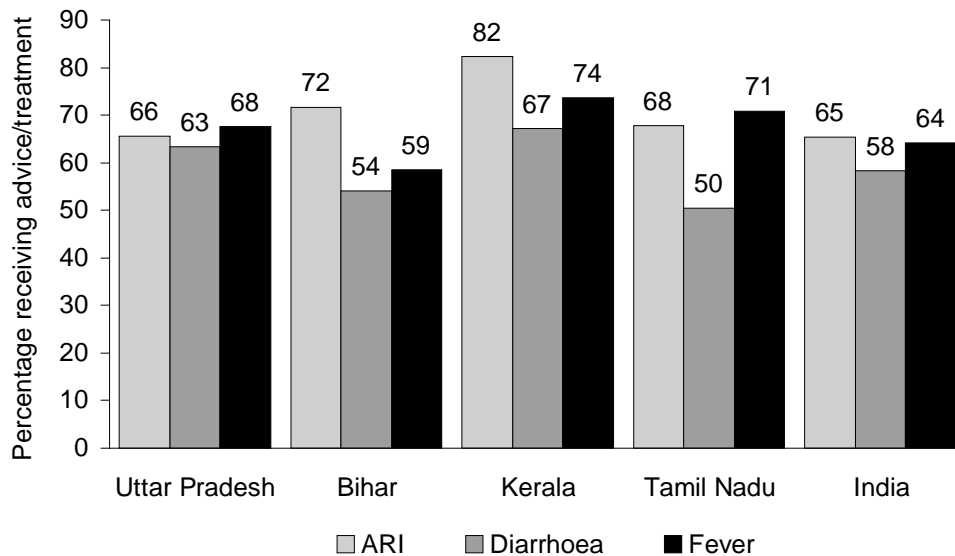
Figure 16 Utilization of curative child-health services (children age 0–47 months who received medical advice or treatment when ill with ARI, diarrhoea, or fever during the two weeks before the survey), rural areas of selected states and India, NFHS-1, 1992–93

Table 18 Percentage utilization of selected child-health services for children age 0–47 months at the time of the survey, by community-access variables, rural areas of four northern states and India, NFHS-1, 1992–93

State/community characteristic	Unadjusted percentage utilizing service				
	Fully immunized[a]	Vitamin A[b]	ARI treatment	Diarrhoea treatment	Fever treatment
Uttar Pradesh					
Distance to health facility					
< 2 km	25	9	78	63	70
2–5 km	15	10	65	69	69
≥ 6 km	15	7	57	58	64
Family welfare/health worker visit					
Yes	21	10	66	67	68
No	14	7	65	60	67
Village has all-weather road					
Yes	20	9	76	59	70
No	16	8	59	66	66
Village media/educational activity					
Yes	22	12	70	61	73
No	17	8	65	64	66
Madhya Pradesh					
Distance to health facility					
< 2 km	37	23	78	76	76
2–5 km	22	14	45	72	58
≥ 6 km	22	16	68	55	60
Family welfare/health worker visit					
Yes	27	17	62	66	66
No	22	17	72	53	51
Village has all-weather road					
Yes	33	23	71	74	66
No	23	15	64	61	63
Village media/educational activity					
Yes	28	22	55	66	62
No	24	13	75	62	64
Bihar					
Distance to health facility					
< 2 km	10	6	69	62	64
2–5 km	6	6	65	46	49
≥ 6 km	13	6	95	43	65
Family welfare/health worker visit					
Yes	12	5	72	62	71
No	9	6	71	52	56
Village has all-weather road					
Yes	12	7	78	63	66
No	7	5	66	44	51
Village media/educational activity					
Yes	16	9	66	63	71
No	8	5	72	52	55
Rajasthan					
Distance to health facility					
< 2 km	14	16	62	42	66
2–5 km	14	12	52	66	66
≥ 6 km	21	15	48	45	57
Family welfare/health worker visit					
Yes	17	17	50	51	66
No	15	8	61	52	58
Village has all-weather road					
Yes	18	10	53	46	65
No	15	17	56	57	61
Village media/educational activity					
Yes	14	17	52	55	66
No	17	12	56	51	62

Table 18, cont. Percentage utilization of selected child-health services for children age 0–47 months at the time of the survey, by community-access variables, rural areas of four northern states and India, NFHS-1, 1992–93

State/community characteristic	Unadjusted percentage utilizing service				
	Fully immunized[a]	Vitamin A[b]	ARI treatment	Diarrhoea treatment	Fever treatment
India					
Distance to health facility					
< 2 km	36	23	70	62	67
2–5 km	27	18	63	58	62
≥ 6 km	27	18	62	53	62
Family welfare/health worker visit					
Yes	39	25	68	62	69
No	20	13	62	54	57
Village has all-weather road					
Yes	36	25	70	62	68
No	26	16	61	55	60
Village media/educational activity					
Yes	41	28	68	61	69
No	24	14	64	57	60

[a]Children age 12–23 months

[b]Children age 12–47 months

Note: For definition of variables, see Table 1.

Factors affecting use of child health services. Table 18 shows the unadjusted effects of community access on the use of each of the five child-health services. For India as a whole, use of each of these services is higher for children living in villages near a health facility, villages with an all-weather road, villages that had a health or family-welfare worker visit in the previous month, and villages that had a community-level mass-media or educational activity in the previous year. The effects of the community-access variables on the use of child-health services are rather weak, however. The effects are even weaker and sometimes in the unexpected direction in the four northern states.

Table 19 shows the adjusted effects of community access and other predictor variables on the likelihood that a rural child age 12–23 months has received all recommended vaccinations. In the four northern states, the adjusted effects of the community-access variables are weak, not statistically significant, and inconsistent in direction. In Figure 17, for example, the adjusted effect of distance to a health facility on the proportion of children receiving full immunization is positive in two states and negative in the other two. Overall, the results indicate that community access to health services has little effect on whether children are immunized. In India as a whole, the effect of distance to a health facility is small and not statistically significant. The effects of the other three community-access variables are statistically significant but much smaller than the unadjusted effects shown in Table 18.

Table 19 also shows that Muslim children and children belonging to scheduled castes and scheduled tribes tend to have lower adjusted immunization rates than do other children. Household crowding, by contrast, does not appear to have any effect.

Table 19 Adjusted effects of community access and other predictor variables on the likelihood that a child age 12–23 months received partial or full immunization, rural areas of four northern states and India, NFHS-1, 1992–93

| | Adjusted percentage receiving partial or full immunization | | | | | | | | | |
| | Uttar Pradesh | | Madhya Pradesh | | Bihar | | Rajasthan | | India | |
Characteristic	Partial	Full	Partial	Full	Partial	Full	Partial	Full	Partial	Full
Community-access variables										
Distance to health facility										
< 2 km†	37	26	30	31	34	10	30	13	35	32
2–5 km	40	15*	35	25	39	7	30	14	37	30
≥ 6 km	31*	15*	42	24	24	21	33	23*	34	30
Family welfare/ health worker visit										
Yes	37	20*	36	25	35	9	31	20*	34*	36*
No†	35	15	38	27	35	9	31	12	35	24
Village has all-weather road										
Yes	40	17	42	25	36	10	36	17	36*	32*
No†	34	18	34	26	34	8	28	16	34	30
Village media/educational activity										
Yes	38	20	38	26	35	11	37	12	36*	35*
No†	35	17	35	26	35	9	29	18	34	29
Household-level variables										
Religion										
Hindu†	40	19	36	25	37	9	31	17	36	32
Muslim	28*	7*	48	26	27	11	33	12	31*	20*
Other	NE	11	11	77	24	57*	31	20	31	41*
Caste/tribe										
Scheduled caste/ scheduled tribe	34*	10*	33*	23	37	3*	29	17	34*	27*
Other†	36	21	39	28	34	12	33	16	35	32
Crowding										
< 3 persons per room†	35	22	33	32	35	9	31	16	35	31
≥ 3 persons per room	36	15*	39	21*	35	10	32	17	35	31
Electricity										
Yes	37	19	37	30*	27	24*	36*	21*	33*	40*
No†	36	17	36	22	36	8	28	13	36	26
House type										
Kachcha†	35	18	38	25	32	10	32	14	36	29
Pucca or semi-*pucca*	37	18	23	37	45*	7	31	18	34	34*
Individual woman-level variables										
Woman's education										
Illiterate†	34	15	34	24	32	7	29	15	34	26
Literate, < middle complete	31	30*	53*	28*	41*	23*	47	17	35*	41*
Middle complete or higher	49*	37*	35	47*	45*	30*	51*	33*	35*	52*
Woman's work status										
Not working†	37	18	34	27	NE	NE	33	16	36	29
Working	29*	17	41	24	NE	NE	28	16	34	34*
Woman's media exposure										
Yes	37	24*	43*	31*	38	9	36	21	37*	37*
No†	35	16	34	23	34	10	30	15	33	27

Children in households with electricity are more likely to be fully immunized than are other children except in Uttar Pradesh. In India as a whole, children living in *pucca* and semi-*pucca* houses are more likely to be fully immunized than are children living in *kachcha* houses, but this relationship is not observed in the four northern states. Mother's education has a large positive effect on child immunization rates in each of the four northern states and in the country as a whole. Children of mothers who have at least completed middle school are two to four times as likely to be fully immunized as are children of illiterate mothers

Table 19, cont. Adjusted effects of community access and other predictor variables on the likelihood that a child age 12–23 months received partial or full immunization, rural aeas of four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage receiving partial or full immunization									
	Uttar Pradesh		Madhya Pradesh		Bihar		Rajasthan		India	
	Partial	Full	Partial	Full	Partial	Full	Partial	Full	Partial	Full
Individual child-level variables										
Child's sex										
Male†	37	22	38	29	40	11	31	19	36	33
Female	35*	14*	34*	22*	31*	8	31	14	34*	29*
Child's birth order										
1†	37	20	26	32	37	10	31	19	34	37
2	37	18	39	23	35	11	33	21	36	33
3	36	19	45*	22	40	8	34	17	35	31*
4+	35	16	39*	24	32	9	29	12	35*	25*
Number of children	1,558		654		710		497		8,571	

†Reference category

*p< .05

NE = Not estimated due to small number of cases

Notes: The units of analysis are rural children age 12–23 months at the time of the survey. For definition of variables, see Table 1. Adjusted effects are estimated by multinomial logit regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.

Figure 17 Adjusted effects of distance to a health facility on the likelihood that a child age 12–23 months received all recommended immunizations, rural areas of four northern states and India, NFHS-1, 1992–93

Figure 18 Adjusted effects of mother's education on the likelihood that a child age 12–23 months received all recommended immunizations, rural areas in four northern states and India, NFHS-1, 1992–93
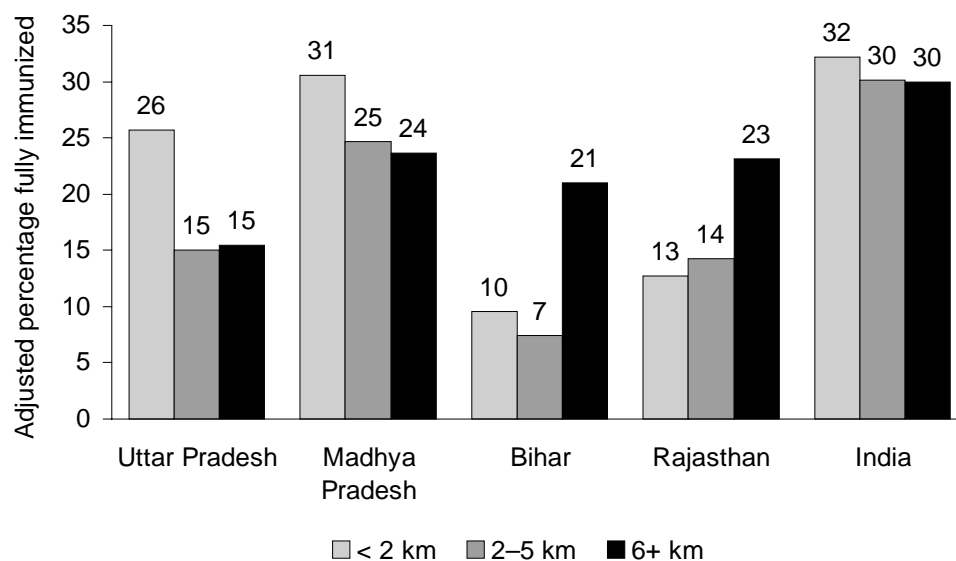

Figure 19 Adjusted effects of sex of child on the likelihood that a child age 12–23 months received all recommended immunizations, rural areas of four northern states and India, NFHS-1, 1992–93
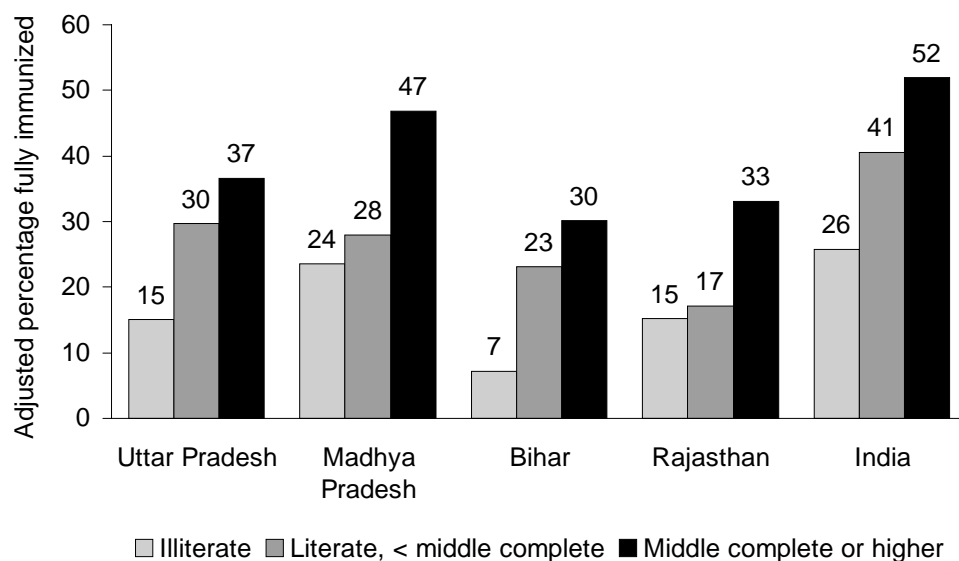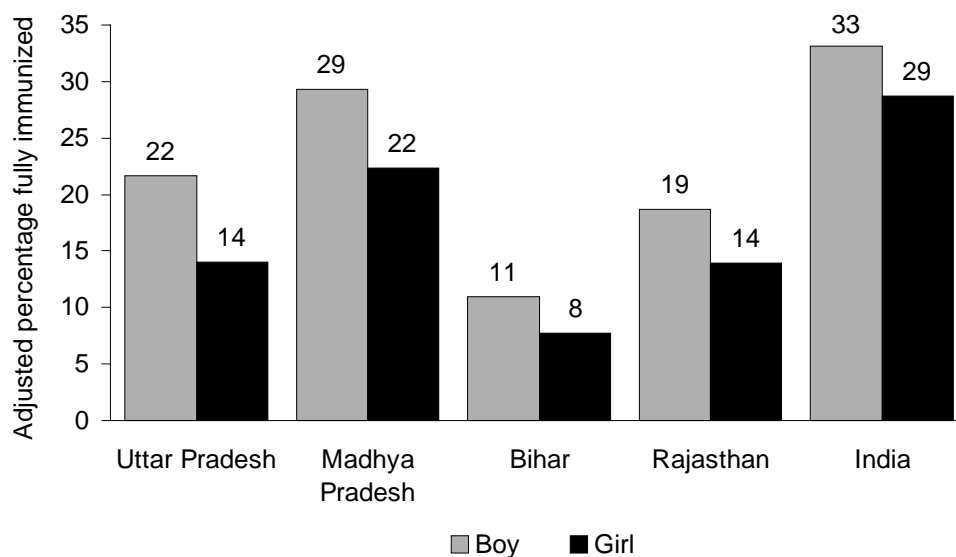
Table 20 Adjusted effects of community access and other predictor variables on the likelihood that a child age 12–47 months received vitamin A supplementation, rural areas of four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage receiving vitamin A supplementation				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km†	8	18	5	12	19
2–5 km	11	16	7	11	21
≥ 6 km	8	19	7	17	20
Family welfare/health worker visit					
Yes	9	16	4	21*	23*
No†	8	22	6	7	16
Village has all-weather road					
Yes	9	21*	6	10	22*
No†	8	16	6	17	18
Village media/educational activity					
Yes	12*	23	9	14	25*
No†	8	14	5	13	17
Household-level variables					
Religion					
Hindu†	9	17	6	14	20
Muslim	7	19	5	12	18
Other	11	34	5	17	23
Caste/tribe					
Scheduled caste/scheduled tribe	7	20	3	13	20
Other†	9	16	7	14	20
Crowding					
< 3 persons per room†	8	19	6	14	21
≥ 3 persons per room	9	16	6	13	20
Electricity					
Yes	11*	21*	9	19*	24*
No†	8	14	6	10	18
House type					
Kachcha†	8	17	7	17	18
Pucca or semi-pucca	10	19	4	11*	23*
Individual woman-level variables					
Woman's education					
Illiterate†	8	16	5	12	18
Literate, < middle complete	12*	29*	8	23*	25*
Middle complete or higher	18*	35*	21*	30*	28*
Woman's work status					
Not working†	9	20	6	12	19
Working	9	14*	5	17	23*
Woman's media exposure					
Yes	11	20	9*	17	25*
No†	8	17	5	13	17

(Figure 18). Children of mothers regularly exposed to electronic mass media are also much more likely to be fully immunized than are children of mothers not regularly exposed, except in Bihar. Child's sex has a statistically significant effect on immunization status, with boys much more likely to be fully immunized than girls (Figure 19).

Table 20 shows the adjusted effects of community access and other predictor variables on the likelihood that a rural child age 12–47 months has received vitamin A

Table 20, cont. Adjusted effects of community access and other predictor variables on the likelihood that a child age 12–47 months received vitamin A supplementation, rural areas of four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage receiving vitamin A supplementation				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Individual child-level variables					
Child's age (in months)					
12–23†	8	18	6	16	19
24–35	11*	17	4	12	21*
36–47	7	17	7	13	21*
Child's sex					
Male†	9	22	6	14	21
Female	8	14*	5	13	19*
Child's birth order					
1†	9	16	7	19	22
2	7	21	4	15	21
3	13*	17	4	15	22
4+	8	17	7	10*	17*
Number of children	4,025	1,776	1,954	1,456	24,099

†Reference category

*$p < .05$

Notes: The units of analysis are rural children age 12–47 months at the time of the survey. For definition of variables, see Table 1. Adjusted effects are estimated by logistic regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.

supplementation. In India as a whole, distance to a health facility has no significant effect on the likelihood of children receiving vitamin A, but the effects of the other three community characteristics are positive and significant. None of the community-access variables has consistent effects on vitamin A supplementation in the four northern states, however.

Among the socioeconomic and demographic variables, availability of electricity in the household and mother's education are the only variables that consistently have large and statistically significant effects on the likelihood that a rural child received vitamin A supplementation. The adjusted effect of mother's education is particularly strong. Mother's media exposure also has positive effects, but in three of the four states these effects are not statistically significant.

Table 21 shows the adjusted effects of community access and other predictor variables on treatment of ARI. The analysis is limited to children under four years old who suffered from ARI during the two weeks before the survey. In each of the four northern states and in India as a whole, distance to a health facility has little effect on the proportion of children receiving medical advice or treatment when sick with ARI. Availability of an all-weather road has a positive, statistically significant effect on ARI treatment in Uttar Pradesh, Madhya Pradesh, and the country as a whole. In general, however, the community-access variables do not have statistically significant effects

Table 21 Adjusted effects of community access and other predictor variables on the likelihood that a child age 0–47 months received advice or treatment from a health facility or provider when sick with acute respiratory infection (ARI) during the two weeks before the survey, rural areas of four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage receiving advice of treatment for ARI				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km†	69	63	63	60	67
2–5 km	70	16*	63	71	65
≥ 6 km	57	82	97	36	64
Family welfare/health worker visit					
Yes	64	59	68	48	67
No†	69	82	71	62	64
Village has all-weather road					
Yes	75*	92*	86	49	69*
No†	60	58	57	58	62
Village media/educational activity					
Yes	67	51*	62	38	66
No†	66	76	73	61	65
Household-level variables					
Religion					
Hindu†	65	NE	73	NE	65
Muslim	72	NE	62	NE	64
Other	NE	NE	NE	NE	69
Caste/tribe					
Scheduled caste/scheduled tribe	69	75	82	30*	64
Other†	65	56	68	71	66
Crowding					
< 3 persons per room†	66	65	65	62	62
≥ 3 persons per room	66	65	77	50	68*
Electricity					
Yes	72	78	95	43	68
No†	65	47	68	63	64
House type					
Kachcha†	65	65	70	67	64
Pucca or semi-*pucca*	68	55	74	42	69
Individual woman-level variable					
Woman's education					
Illiterate†	64	57	72	56	63
Literate, < middle complete	74	93*	58	29	71*
Middle complete or higher	74	48	NE	77	67
Woman's work status					
Not working†	68	73	70	56	66
Working	55	46	72	49	63
Woman's media exposure					
Yes	56	66	81	74*	66
No†	69	65	67	46	65

on the likelihood of receiving ARI treatment. Among the socioeconomic and demographic variables, sex of child is the only factor that has a consistently positive effect, with a higher proportion of boys receiving advice or treatment for ARI than girls. Even for sex of child, however, the adjusted effect is not statistically significant in three of the four northern states. The adjusted effects of the other predictor variables tend to

Table 21, cont. Adjusted effects of community access and other predictor variables on the likelihood that a child age 0–47 months received advice or treatment from a health facility or provider when sick with acute respiratory infection (ARI) during the two weeks before the survey, rural areas of four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage receiving advice of treatment for ARI				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Individual child-level variables					
Child's age (in months)					
0–11†	64	74	55	28	66
12–23	73	63	80	68*	70
24–35	59	63	50	52	62
36–47	63	41	80	68	62
Child's sex					
Male†	72	74	73	61	71
Female	57*	50	67	46	58*
Child's birth order					
1†	70	82	85	63	73
2	70	53	74	21	63*
3	64	54	84	47	63*
4+	63	58	44*	66	61*
Number of children	406	128	113	113	2,278

†Reference category

*$p < .05$

NE = Not estimated due to small number of cases

Notes: The units of analysis are rural children age 0–47 months at the time of the survey who suffered from ARI during the two weeks before the survey. For definition of variables, see Table 1. Adjusted effects are estimated by logistic regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.

be small, not statistically significant, and sometimes inconsistent in direction. This general lack of statistical significance may be partly due to the fact that the analysis is based on a fairly small number of children who suffered from ARI during the two weeks before the survey.

The multivariate analysis results for the other two curative child-health services, treatment of diarrhoea and treatment of fever (Tables 22 and 23), are quite similar to the results for ARI. None of the community-access variables has a major adjusted effect on either treatment of diarrhoea or treatment of fever. For India as a whole, Figure 20 shows that the adjusted effects of distance to a health facility are small and not statistically significant for treatment of ARI, diarrhoea, or fever. The adjusted effects of each of the community-access variables are also generally small and nonsignificant in the four northern states. As with ARI, mother's education and sex of child are the only socioeconomic or demographic variables that consistently show a positive relationship with treatment seeking for diarrhoea or fever.

Table 22 Adjusted effects of community access and other predictor variables on the likelihood that a child age 0–47 months received advice or treatment from a health facility or provider when sick with diarrhoea during the two weeks before the survey, rural areas of four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage receiving advice of treatment for diarrhoea				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km†	66	72	61	42	60
2–5 km	68	71	46*	67*	59
≥ 6 km	57	53	37	44	55
Family welfare/health worker visit					
Yes	67	65	48	56	61*
No†	61	55	55	43	54
Village has all-weather road					
Yes	58	69	62*	36	59
No†	68	61	44	65	57
Village media/educational activity					
Yes	60	68	53	57	58
No†	65	60	54	48	58
Household-level variables					
Religion					
Hindu†	63	63	51	51	58
Muslim	77	30	62	30	60
Other	88	NE	NE	NE	58
Caste/tribe					
Scheduled caste/scheduled tribe	72	69	49	49	59
Other†	61	58	54	51	58
Crowding					
< 3 persons per room†	62	56	51	54	57
≥ 3 persons per room	66	67	56	48	59
Electricity					
Yes	73	69	62	52	62*
No†	62	54	53	48	56
House type					
Kachcha†	66	60	50	42	57
Pucca or semi-*pucca*	60	82	63*	58	60
Individual woman-level variables					
Woman's education					
Illiterate†	64	63	49	54	57
Literate, < middle complete	61	59	74*	40	60
Middle complete or higher	66	77	63	18	65*
Woman's work status					
Not working†	65	67	52	55	61
Working	58	56	58	42	53*
Woman's media exposure					
Yes	64	66	58	60	60
No†	64	61	52	47	57
Individual child-level variables					
Child's age (in months)					
0–11†	63	64	50	44	54
12–23	65	59	61	53	62*
24–35	63	64	57	52	59
36–47	65	70	41	62	57

Table 22, cont. Adjusted effects of community access and other predictor variables on the likelihood that a child age 0–47 months received advice or treatment from a health facility or provider when sick with diarrhoea during the two weeks before the survey, rural areas of four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage receiving advice of treatment for diarrhoea				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Individual child-level variables, cont.					
Child's sex					
Male†	64	66	57	49	60
Female	65	59	50	51	56
Child's birth order					
1†	67	70	55	51	59
2	75	60	48	47	60
3	64	55	46	54	56
4+	58	62	59	49	57
Number of children	514	210	385	127	3,441

†Reference category

*p< .05

NE = Not estimated due to small number of cases

Notes: The units of analysis are rural children age 0–47 months at the time of the survey who suffered from diarrhoea during the two weeks before the survey. For definition of variables, see Table 1. Adjusted effects are estimated by logistic regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.

Mother's education tends to have a smaller effect on treatment seeking for these three childhood diseases than it does on utilization of the five maternal-health services or the two preventive child-health services (Figure 21). Child's sex has a considerable effect, with boys more likely than girls to receive advice or treatment for each of the three childhood diseases (Figure 22).

In sum, this analysis shows that community access to health and family-welfare services has little or no effect on the use of any of the preventive or curative child-health services considered. Availability of electricity in the household, mother's education, mother's media exposure, and sex of child have significant adjusted effects on the two preventive services—immunization and vitamin A supplementation. Mother's education is the strongest predictor of both immunization status and vitamin A supplementation. Only child's sex and mother's education have any noticeable effect on the three curative child-health services. This suggests that when children are sick, most parents seek treatment irrespective of the availability of services and irrespective of their own socioeconomic characteristics.

Table 23 Adjusted effects of community access and other predictor variables on the likelihood that a child age 0–47 months received advice or treatment from a health facility or provider when sick with fever during the two weeks before the survey, rural areas of four northern states and India, NFHS-1, 1992–93

Characteristic	Adjusted percentage receiving advice of treatment for fever				
	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Community-access variables					
Distance to health facility					
< 2 km†	68	73	60	63	65
2–5 km	70	57*	54	64	64
≥ 6 km	64	59	66	60	63
Family welfare/health worker visit					
Yes	67	64	65	68	67*
No†	68	57	57	54	59
Village has all-weather road					
Yes	68	63	64	62	66*
No†	67	62	53	63	62
Village media/educational activity					
Yes	71	62	62	59	66
No†	67	62	58	64	63
Household-level variables					
Religion					
Hindu†	68	61	59	64	65
Muslim	69	91	58	47	59*
Other	57	60	43	47	68
Caste/tribe					
Scheduled caste/scheduled tribe	68	59	61	58	61*
Other†	68	64	58	66	65
Crowding					
< 3 persons per room†	68	59	54	69	62
≥ 3 persons per room	67	65	62	59	66*
Electricity					
Yes	71	66	69	58	69*
No†	67	56	57	67	62
House type					
Kachcha†	67	63	56	61	61
Pucca or semi-*pucca*	68	59	67	63	69*
Individual woman-level variables					
Woman's education					
Illiterate†	66	60	55	65	63
Literate, < middle complete	67	69	58	51	65
Middle complete or higher	82*	71	89*	53	69*
Woman's work status					
Not working†	70	63	57	63	65
Working	52*	61	61	62	61*
Woman's media exposure					
Yes	62	61	56	70	64
No†	70	63	59	59	64
Individual child-level variables					
Child's age (in months)					
0–11†	62	61	59	70	62
12–23	71*	63	58	63	67*
24–35	67	67	59	64	64
36–47	68	55	57	46*	62
Child's sex					
Male†	71	68	63	72	68
Female	64*	54	53*	51*	59*

Table 23, cont. Adjusted effects of community access and other predictor variables on the likelihood that a child age 0–47 months received advice or treatment from a health facility or provider when sick with fever during the two weeks before the survey, rural areas of four northern states and India, NFHS-1, 1992–93

	Adjusted percentage receiving advice of treatment for fever				
Characteristic	Uttar Pradesh	Madhya Pradesh	Bihar	Rajasthan	India
Individual child-level variables, cont.					
Child's birth order					
1†	71	69	64	71	69
2	71	63	64	62	65
3	68	58	62	64	62*
4+	64	57	52	53*	61*
Number of children	1,064	400	559	240	6,848

†Reference category

*p< .05

Notes: The units of analysis are rural children age 0–47 months at the time of the survey who suffered from fever during the two week before the survey. For definition of variables, see Table 1. Adjusted effects are estimated by logistic regression. Significance levels take design effects due to clustering into account. For any given predictor variable, the set of control variables consists of all the other predictor variables in the table. When calculating adjusted percentages for categories of a given predictor variable, other variables are held constant at their mean values. Models are based on the weighted sample.
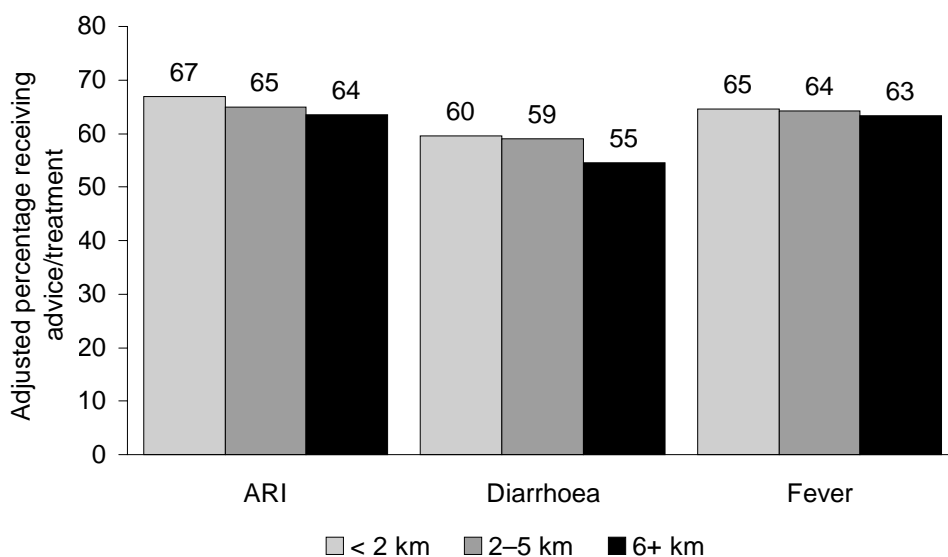

Figure 20 Adjusted effects of distance to a health facility on the likelihood that a child age 0–47 months received advice or treatment from a health facility or provider when sick with ARI, diarrhoea, or fever during the two weeks before the survey, rural areas of India, NFHS-1, 1992–93
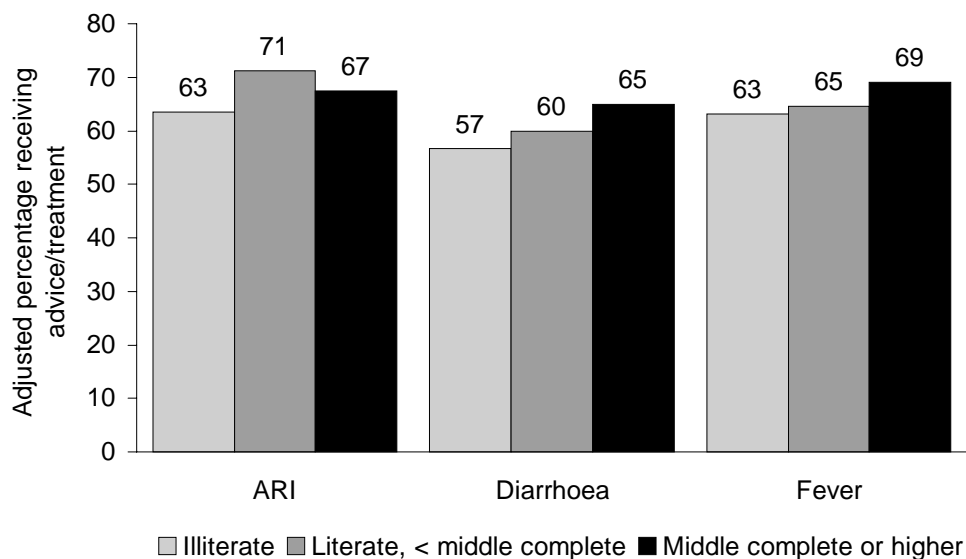
Figure 21 Adjusted effects of mother's education on the likelihood that a child age 0–47 months received advice or treatment from a health facility or provider when sick with ARI, diarrhoea, or fever during the two weeks before the survey, rural areas of India, NFHS-1, 1992–93
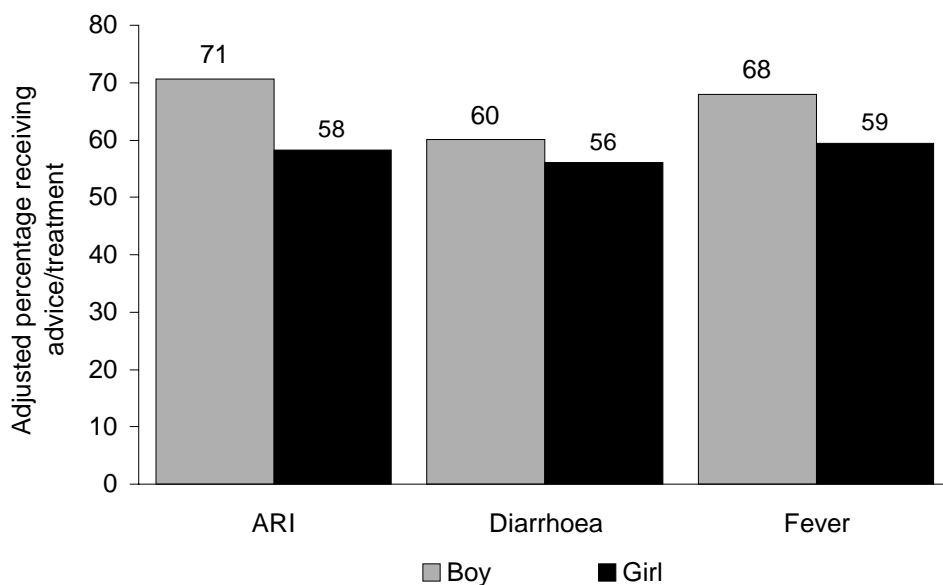

Figure 22 Adjusted effects of sex of child on the likelihood that a child age 0–47 months received advice or treatment from a health facility or provider when sick with ARI, diarrhoea, or fever during the two weeks before the survey, rural areas of India, NFHS-1, 1992–93

CONCLUSION

It has been argued that physical access to health services is key to their utilization, particularly in regions that are characterized by low levels of economic and social development. The logistic regression analysis in this report estimates the effects of community-access variables on each of several measures of utilization of family planning and maternal and child health services, with statistical controls for a number of potentially confounding socioeconomic and demographic variables. The analysis, which is based on data from India's first National Family Health Survey (NFHS-1), conducted in 1992–93, focuses on the rural population of four large northern states—Uttar Pradesh, Madhya Pradesh, Bihar, and Rajasthan—which are among the least-developed states of India and which together account for two-fifths of India's population. Results for these four states are compared with results for the country as a whole. Five sets of utilization variables are considered related to contraception, antenatal care, delivery care, preventive child-health care, and curative child-health care.

The findings indicate that community access has little influence on the use of family planning and maternal and child health services when the potentially confounding effects of selected socioeconomic and demographic variables are statistically controlled by holding them constant. By contrast, household living standard (as measured by availability of electricity in the household and type of house), woman's education, woman's exposure to mass media, and son preference have considerable influence on the use of these services. Woman's education emerges as the predictor variable with the strongest influence on knowledge and use of contraception and on use of antenatal care, delivery care, and preventive child-health care (immunization status and vitamin A supplementation), but not on use of curative child-health care (treatment of ARI, diarrhoea, or fever). The effects of woman's exposure to mass media are rather similar to the effects of woman's education. A woman's knowledge of the five main modern contraceptive methods and the number and sex composition of her children have strong effects on contraceptive use. Neither community-access variables nor socioeconomic variables have much effect on the use of the three curative child-health services, but boys are consistently more likely than girls to receive medical advice or treatment.

Service utilization is also affected by the quality of services, such as limited choice of family planning methods, gaps in counseling and information provided, inferior clinical standards and procedures, and lack of follow-up and continuity of care. Unfortunately, NFHS-1 did not include questions on quality of care. It was possible, however, to include one indirect indicator of quality in the analysis of utilization of family planning services, namely knowledge of all five main modern family planning methods. The large and statistically significant effect of this method-choice indicator on current use of contraception suggests that provision of more information about a

range of contraceptive methods might substantially improve utilization of family planning services. This conclusion must be viewed as tentative, however, because of the likelihood of some reverse causation, inasmuch as some current users may have educated themselves about the various methods after deciding to use contraception rather than before.

Overall, at current levels of development in the four northern states and the country as a whole, the findings suggest that utilization of family planning and maternal and child health services is driven primarily by household- and individual-level socioeconomic and demographic factors, not by community access to services. It appears that health and family-welfare services are sufficiently accessible in rural India so that further improvements in physical accessibility alone (e.g., decreasing the distance to a health facility) will not make much difference in the propensity to utilize services. The main factors affecting service utilization appear to be demand factors, such as woman's education, woman's exposure to mass media, and son preference. Quality of services is also likely to be important, but this factor was not assessed in NFHS-1.

ACKNOWLEDGEMENTS

REFERENCES

Abdalla, G. M. 1993. Determinants of maternal and child health services utilization in Egypt. In Cairo Demographic Centre. *Twenty-third Annual Seminar on Population and Development Issues in the Middle East, Africa and Asia.* Cairo: Cairo Demographic Centre.

Ahmed, Saifuddin, and W. Henry Mosley. 1997. *Simultaneity in maternal-child health care utilization and contraceptive use: Evidence from developing countries.* Hopkins Population Center Papers on Population, WP 97-03. Baltimore, Maryland: Department of Population Dynamics, School of Public Health, Johns Hopkins University.

Anonymous. 1987. Gross under-utilization of family welfare services. *Focus on Population* 1(1): 3–4.

Barlow, R., and F. Diop. 1995. Increasing the utilization of cost-effective health services through changes in demand. *Health Policy and Planning* 10(3): 284–95.

Bertrand, Jane T., Karen Hardee, Robert J. Magnani, and Marcia A. Angle. 1995. Access, quality of care and medical barriers in family planning programs. *International Family Planning Perspectives* 21(2): 64–69.

Bhatia, P. S. 1988. Factors contributing to low performance of health and family welfare program in Rajasthan—a situational analysis. In M. E. Khan, R. B. Gupta, C. V. S. Prasad, and S. K. Ghosh Dastidar, eds. *Performance of Health and Family Welfare Program in India,* pp. 210–57. Bombay: Himalaya Publishing House.

Chatterjee, M. 1990. *Indian women: Their health and economic productivity.* World Bank Discussion Papers, Report No. 109. Washington, D.C.: World Bank.

Das, N. P., and Saroj Bhavsar. 1991. Population growth in India: Emerging trends in the light of 1991 Census results. *Demography India* 20(2): 227–41.

Dennis, L. I., B. C. Flynn, and J. B. Martin. 1995. Characteristics of pregnant women, utilization, and satisfaction with prenatal services in St. Petersburg, Russia. *Public Health Nursing* 12(6): 374–77.

Elo, Irma T. 1992. Utilization of maternal health-care services in Peru: The role of women's education. *Health Transition Review* 2(1): 49–69.

Fosu, G. B. 1994. Childhood morbidity and health services utilization: Cross-national comparisons of user-related factors from DHS data. *Social Science and Medicine* 38(9): 1209–20.

Govindasamy, P. 1994. Poverty, women's education and utilization of health services in Egypt. In *Women, poverty and demographic change.* Liege, Belgium: International Union for the Scientific Study of Population (IUSSP).

Govindasamy, P., and B. M. Ramesh. 1997. *Maternal education and the utilization of maternal and child health services in India.* National Family Health Survey Subject Reports, No. 5. Mumbai: International Institute for Population Sciences; Calverton, Maryland: Macro International, Demographic and Health Surveys (DHS).

Gupta, R. N. 1988. Health and family welfare program in Rajasthan—an appraisal. In M. E. Khan, R. B. Gupta, C. V. S. Prasad, and S. K. Ghosh Dastidar, eds. *Performance of Health and Family Welfare Program in India*, pp. 188–209. Bombay: Himalaya Publishing House.

Gupte, Manisha, Sunita Bandewar, and Hemlata Pisal. 1999. Women's perspectives on the quality of general and reproductive health care: Evidence from rural Maharashtra. In Michael A. Koenig and M. E. Khan, eds. *Improving quality of care in India's Family Welfare Programme: The challenge ahead*, pp. 117–39. New York: The Population Council.

IIPS (International Institute for Population Sciences). 1995. *National Family Health Survey (MCH and family planning), India 1992–93.* Bombay: IIPS.

Jain, A., L. Visaria, P. Visaria, and V. P. Shah. 1992. *Impact of family planning program inputs on use of contraceptives in Gujarat State, India.* Working Paper, No. 43. Ahmedabad: Gujarat Institute of Development Research.

Kanitkar, Tara, and S. Mukherji. 1988. Demographic, health and family planning situation in Bihar. In M. E. Khan, R. B. Gupta, C. V. S. Prasad, and S. K. Ghosh Dastidar, eds. *Performance of Health and Family Welfare Program in India*, pp. 39–71. Bombay: Himalaya Publishing House.

Kanitkar, T., and R. K. Sinha. 1989. Antenatal care services in five states of India. In S. N. Singh, M. K. Premi, P. S. Bhatia, and Ashish Bose, eds. *Population transition in India*, vol. 2, pp. 201–11. Delhi: B. R. Publishing.

Khan, M. E., and R. B. Gupta. 1985. *Determinants of high family planning practices: A case study of Nilgiris*. Bombay: Himalaya Publishing House.

Khan, M. E., and R. B. Gupta. 1988. Familial values, contraception and utilization of MCH services in rural Uttar Pradesh. In M. E. Khan, R. B. Gupta, C. V. S. Prasad, and S. K. Ghosh Dastidar, eds. *Performance of Health and Family Welfare Program in India,* pp. 84–121. Bombay: Himalaya Publishing House.

Khan, M. E., and C. V. S. Prasad. 1988. Functioning of health and family welfare program—a comparative study of Bihar and Kerala. In M. E. Khan, R. B. Gupta, C. V. S. Prasad, and S. K. Ghosh Dastidar, eds. *Performance of Health and Family Welfare Program in India*, pp. 1–38. Bombay: Himalaya Publishing House.

Khan, M. E., C. V. S. Prasad, and Neshat Quaiser. 1987. Reasons for under-utilization of health services—a case study of a PHC in a tribal area of Bihar. *Demography India* 16(2): 177–95.

Khan, M. E., R. B. Gupta, and Bella C. Patel. 1999. The quality of coverage of family planning services in Uttar Pradesh: Client perspectives. In Michael A. Koenig and M. E. Khan, eds. *Improving quality of care in India's Family Welfare Programme: The challenge ahead*, pp. 49–69. New York: The Population Council.

Khan, Z., G. Y. Soomro, and S. Soomro. 1994. Mother's education and utilization of health care services in Pakistan. *Pakistan Development Review* 33(4, Pt 2): 1155–66.

Koenig, Michael A., Gillian H. C. Foo, and Ketan Joshi. 1999. Quality of care within the Indian family welfare program: A review of recent evidence. Hopkins Population Center Papers on Population, WP 99-01. Baltimore, Maryland: Department of Population and Family Health Sciences, Johns Hopkins University.

Koenig, Michael A., and M. E. Khan, eds. 1999. *Improving quality of care in India's Family Welfare Programme: The challenge ahead*. New York: The Population Council.

Kumar, R., M. M. Singh, and M. Kaur. 1997. Impact of health centre availability on utilization of maternity care and pregnancy outcome in a rural area of Haryana. *Journal of the Indian Medical Association* 95(8): 448–50.

Levine, Ruth E., Harry E. Cross, Sheena Chhabra, and Hema Viswanathan. 1992. Quality of health and family planning services in rural Uttar Pradesh: The client's views. *Demography India* 21(2): 247–65.

Ministry of Finance. 1998. *Economic survey, 1997–98*. New Delhi: Economic Division, Ministry of Finance, Government of India.

Ministry of Health and Family Welfare. 1996. *Health information of India, 1994*. New Delhi: Central Bureau of Health Intelligence, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India.

Mroz, Thomas A., Kenneth A. Bollen, Ilene S. Speizer, and Dominic J. Mancini. 1999. Quality, accessibility, and contraceptive use in rural Tanzania. *Demography* 36(1): 23–40.

Patel, Daxa, Anil Patel, and Ambrish Mehta. 1999. The effects of service quality on IUD continuation among women in rural Gujarat. In Michael A. Koenig and M. E. Khan, eds. *Improving quality of care in India's Family Welfare Programme: The challenge ahead*, pp. 333–45. New York: The Population Council.

Phommasack, B. 1995. Improving utilization of health care services by increasing community participation. In J. H. Roberts, J. Kitts and L. J. Arsenault, eds. *Gender, health, and sustainable development: Perspectives from Asia and the Caribbean*, pp. 122–25. Ottawa: International Development Research Centre (IDRC).

PRC (Population Research Centre), Bhopal, and IIPS (International institute for Population Sciences). 1995. *National Family Health Survey (MCH and family planning), Madhya Pradesh, 1992*. Bombay: IIPS.

PRC (Population Research Centre), Lucknow, and IIPS (International Institute for Population Sciences). 1995. *National Family Health Survey (MCH and Family Planning), Uttar Pradesh, 1992–93*. Bombay: IIPS.

PRC (Population Research Centre), Patna, and IIPS (International Institute for Population Sciences). 1995. *National Family Health Survey (MCH and family planning), Bihar, 1993*. Bombay: IIPS.

PRC (Population Research Centre), Udaipur, and IIPS (International Institute for Population Sciences). 1995. *National Family Health Survey (MCH and family planning), Rajasthan, 1992–93*. Bombay: IIPS.

Premi, M. K. 1993. Outreach and accessibility of family planning methods in rural Uttar Pradesh. In M. K. Premi, ed. *Family planning and MCH in Uttar Pradesh (a review of studies)*, pp. 75–88. New Delhi: Indian Association for the Study of Population.

Rao, P. S., and J. Richard. 1984. Socio-economic and demographic correlates of medical care and health practices. *Journal of Biosocial Science* 16(3): 343–55.

Ray, S. K., B. B. Mukhopodhyay, R. Das, M. M. Ganguly, A. Maidal, and S. C. Roy. 1984. Extent of utilization of maternal health care services of PHC by families of a rural area. *Indian Journal of Public Health* 28(3): 122–27.

Regmi, G. P., and M. Manandhar. 1997. Patterns and determinants of health care utilization. In *Insights on family health issues in Nepal*, pp. 27–48. Kathmandu: Family Health Division, Department of Health Services, Ministry of Health, Government of Nepal; and Calverton, Maryland: Macro International, Demographic and Health Surveys (DHS).

Retherford, R. D., and M. K. Choe. 1993. *Statistical models for causal analysis*. New York: John Wiley and Sons, Inc.

Roberto, E. L. 1993. Perceived factors of family planning clinic performance and service quality. *Philippine Population Journal* 9(1–4): 74–85.

Rosenzweig, M., and T. Paul Schultz. 1982. Child mortality and fertility in Colombia: Individual and community effects. *Health Policy and Education* 2:305–48.

Roy, T. K., and R. K. Verma. 1999. Women's perceptions of the quality of family welfare services in four Indian states. In Michael A. Koenig and M. E. Khan, eds. *Improving quality of care in India's Family Welfare Programme: The challenge ahead*, pp. 19–32. New York: The Population Council.

Sarita, P. T., and R. Tuominen. 1993. Use of health care services in two rural communities in Tanzania. *Community Dentistry and Oral Epidemiology* 21(3): 133–35.

Satia, J. K., and G. Giridhar. 1991. Supply aspects of meeting demand for family planning. In J. K. Satia and Shireen J. Jejeebhoy, eds. *The demographic challenge: A study of four large Indian states*, pp. 178–215. Bombay: Oxford University Press.

Satia, J. K., and Shireen J. Jejeebhoy. eds. 1991. *The demographic challenge: A study of four large Indian states*. Bombay: Oxford University Press.

Satia, Jay, and Sangeeta S. Sokhi. 1999. Developing an alternative system of monitoring indicators for the family welfare programme. In Michael A. Koenig and M.E. Khan, eds. *Improving quality of care in India's Family Welfare Programme: The challenge ahead*, pp. 346–67. New York: The Population Council.

Sawhney, N. 1993. Management of family welfare programme in Uttar Pradesh: Infrastructure utilization, quality of services, supervision and MIS. In M. K. Premi, ed. *Family planning and MCH in Uttar Pradesh (a review of studies)*, pp. 50–67. New Delhi: Indian Association for the Study of Population.

Shelton, J. D., and S. S. Davis. 1996. Some priorities in maximizing access to and quality of contraceptive services. *Advances in Contraception* 12(3): 233–37.

Shrestha, D. R., and A. Ittiravivongs. 1994. Factors affecting utilization of health centers in a rural area of Chon Buri Province, Thailand. *Southeast Asian Journal of Tropical Medicine and Public Health* 25(2): 361–67.

Swenson, I. E., N. M. Thang, V. Q. Nham, and P. X. Tieu. 1993. Factors related to the utilization of prenatal care in Vietnam. *Journal of Tropical Medicine and Hygiene* 96(2): 76–85.

Talwar, Prem P. 1988. Family welfare program in Madhya Pradesh: Status and strengthening measures. In M. E. Khan, R. B. Gupta, C. V. S. Prasad, and S. K. Ghosh Dastidar, eds. *Performance of Health and Family Welfare Program in India*, pp. 154–77. Bombay: Himalaya Publishing House.

Thomas, Duncan, and John Maluccio. 1996. Fertility, contraceptive choice, and public policy in Zimbabwe. *World Bank Economic Review* 10(1): 189–222.

Townsend, John W., M. E. Khan, and R. B. Gupta. 1999. The quality of care in the sterilization camps of Uttar Pradesh. In Michael A. Koenig and M. E. Khan, eds. *Improving quality of care in India's Family Welfare Programme: The challenge ahead*, pp. 314–30. New York: The Population Council.

UNECA (United Nations Economic Commission for Africa, Population Division). 1989. The impact of maternal and child health and family planning (MCH/FP) programmes on fertility, infant and child mortality and maternal health. In *Developments in family planning policies and programmes in Africa,* pp. 257–87. Legon, Ghana: Regional Institute for Population Studies, University of Ghana.

Visaria, Leela. 1999. The quality of reproductive health care in Gujarat: Perspectives of female health workers and their clients. In Michael A. Koenig and M. E. Khan, eds. *Improving quality of care in India's Family Welfare Programme: The challenge ahead*, pp. 143–68. New York: The Population Council.