ABSTRACT

Title of Dissertation: IMPLEMENTATION OF JANANI SURAKSHA YOJANA AND OTHER MATERNAL HEALTH POLICIES IN TWO INDIAN STATES: PREDICTORS OF MATERNAL HEALTH SERVICE UTILIZATION AMONG POOR RURAL WOMEN

Kranti Suresh Vora, Doctor of Philosophy, 2012

Dissertation directed by: Professor Sally Koblinsky
Department of Family Science

Poor, rural women in India contribute disproportionately to the nation's high maternal mortality ratio. In response to this problem, the Indian government launched a conditional cash transfer scheme, "Janani Suraksha Yojana (JSY)," in 2005 to increase poor women's access to maternal health care. The state of Tamil Nadu reorganized public health system resources and the state of Gujarat contracted with private providers to implement the scheme in rural areas. This study investigated the role of JSY/government assistance, and other health care sector and household factors in predicting poor, rural women's utilization of maternal health services in the two states. Health care sector factors included receipt of JSY payment, availability of a primary health center with round-the-clock services, and connection to a health facility by an all-weather road. Household factors included maternal education, paternal education, age at first birth and parity. Use of four maternal health care services was examined: adequate antenatal care, institutional delivery, private facility delivery and Cesarean section. State

findings were compared and contextualized by examining health polices/practices and health infrastructure within each state.

The study employed secondary data analyses using District Level Household Survey (DLHS)-3 data, with a sample of 2,267 rural women from the lowest two wealth quintiles. Multivariate logistic regression analyses examined associations between identified factors and maternal health care utilization in the two target states. Overall, Tamil women had better access to maternal health care services than Gujarati women. JSY payment predicted use of private facility deliveries in Gujarat, which incentivized use of private providers, but not institutional deliveries in Tamil Nadu where women also received cash regardless of the place of delivery. JSY payment did not predict adequate antenatal care, which was not incentivized. Access to an all-weather road predicted institutional deliveries in both states and adequate antenatal care by Tamil women. Maternal education was a significant predictor of maternal health services utilization in Tamil Nadu, while paternal education predicted such usage in Gujarat. Parity significantly predicted poor, rural women's use of all services. Implications of the findings for strengthening conditional cash transfer schemes and improving maternal health care services are discussed.

IMPLEMENTATION OF JANANI SURAKSHA YOJANA AND OTHER MATERNAL HEALTH POLICIES IN TWO INDIAN STATES: PREDICTORS OF MATERNAL HEALTH SERVICE UTILIZATION AMONG POOR RURAL WOMEN

by

Kranti Suresh Vora

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2012

Advisory Committee:

Professor Sally Koblinsky, Chair
Professor Elaine A. Anderson
Assistant Professor Xin He
Dr. Woodie Kessel
Professor Dushanka Kleinman
Dr. Marjorie Koblinsky

Table of Contents

List of Tables

List of Figures and Graphs

List of Abbreviations

ANM	Auxiliary Nurse Midwife
ASHA	Accredited Social Health Activist
BPL	Below Poverty Line
CHC	Community Health Center
CY	Chiranjeevi Yojana
DH	District Hospital
DHS	Demographic Health Survey
DLHS	District Level Household Survey
GDP	Gross Domestic Product
HH	Households
HPS	High Performing States
IFA	Iron Folic Acid
IIPS	International Institute for Population Sciences
INR	Indian Rupee
JSY	Janani Suraksha Yojana
LPS	Low Performing States
MBBS	Bachelor of Medicine Bachelor of Surgery
MCHIP	Maternal and Child Health Integrated Program
MNCH	Maternal, Neonatal and Child Health
NFHS	National Family Health Survey
NGO	Non-government Organization
NMBS	National Maternity Benefit Scheme
NRHM	National Rural Health Mission
NSS	National Sample Survey
OR	Odds Ratio
PHC	Primary Health Center
PPS	Probability Proportional to Size
PSIS	Perform System Indicators Survey
PSU	Primary Sampling Unit
RCH	Reproductive Child Health
SC	Sub-Center
TNMSC	Tamil Nadu Medical Services Corporation
TT	Tetanus Toxoid
UHC	Urban Health Center
UNICEF	United Nations Children’s Emergency Funds
UNFPA	United Nations Population Funds
USAID	United States Agency for International Development
WHO	World Health Organization

Chapter 1: Introduction

India has one of the fastest growing economies in the world, registering a growth of 9% in its gross domestic product (GDP) in 2007-08. The estimated GDP growth for the nation in 2010-11 was about 8% despite the present global recession.[1, 2] Maternal health indicators have also improved significantly in the more than 60 years since India's independence in 1947. However, there is a gap between the country's economic achievements and its progress in improving maternal health.

Maternal health indicators are often considered a reflection of the efficiency of a nation's health system.[3] Strengthening maternal health services helps to improve both maternal health and infant health. In 2001 the United Nations developed the Millennium Development Goals to improve health, social and economic conditions in the world's poorest countries by 2015. One of the eight major goals is to improve maternal health with a target of reducing maternal mortality by 75%.[3] Estimates by international development agencies show significant improvement in India's maternal mortality ratio from 570 per 100,000 live births in 1990 to 230 in 2008, a 59% reduction.[4]

Over the past decades, India has proposed and implemented many strategies at the national and state levels to improve the country's maternal health. Beginning in the early 1980s, India introduced large national programs such as Child Survival and Safe Motherhood (CSSM), Reproductive Child Health I (RCH I) and Reproductive Child Health II (RCH II) under the umbrella of the National Rural Health Mission (NRHM).[5] Additionally, Indian states such as Gujarat and Tamil Nadu have developed their own initiatives to improve access to maternal health care.[6, 7] These programs have enhanced the health infrastructure, availability of skilled manpower, maternal access to

blood transfusion during childbirth and referral linkages, contributing to improvements in maternal health indicators.[5] Yet, out of an estimated 358,000 maternal deaths worldwide, about 63,000 are Indian women. India has the distinction of being the highest contributor to maternal deaths in the world.[4]

In 2005, the Indian government launched the Janani Suraksha Yojana (JSY) scheme aimed at reducing maternal and infant mortality rates and increasing institutional deliveries among women below the poverty line (BPL). The meaning of the Hindi phrase, "Janani Suraksha Yojana," is a "scheme to protect mothers." This conditional cash transfer scheme/program provides cash payments to poor families who meet specific behavioral requirements, such as delivering their baby at a health facility.[8] JSY was implemented in 2006 in a majority of Indian states after the national government created implementation guidelines and released funds to support the program.[8, 9] JSY is the largest conditional cash transfer program of its kind in the world and thus has the potential to influence global maternal health policies in a major way. The program is targeted toward assisting poor women across India, but each state may modify the central JSY guidelines and implement the policy differently.

JSY is targeted to increase access to antenatal care, institutional delivery care, postnatal care and neonatal care for poor women.[9] The program is a modified version of the national maternity benefit scheme (NMBS). Between 2001 and 2005, the NMBS offered poor pregnant women a onetime payment of Indian Rupees (INR) 500 per pregnancy for up to two pregnancies. JSY was officially merged with the NMBS in 2005. This conditional cash transfer scheme requires that women document their below poverty line/level (BPL) status in order to receive benefits.[9, 10] Key features of JSY

are: early pregnancy registration, adequate antenatal care, a micro-birth plan, institutional delivery, referral and transport if needed and postpartum care for poor mothers and underserved populations, such as schedule caste and tribes.[9]

Although the principal element of JSY is providing poor women with money for institutional deliveries, there are likely to be multiple factors that affect women's decision-making about their antenatal care and deliveries. To date, there has been a dearth of research examining these factors, including health care sector/system factors (e.g. receipt of financial assistance, availability of a facility providing health services, transportation/access to facility), household/demographic characteristics of pregnant women and their families (e.g., maternal education, paternal education) and individual characteristics (e.g. age at first birth, parity). Additionally, there are differences in the way state governments elect to distribute cash incentives for delivery care. For example, some state policies generally limit cash payments to deliveries in public facilities, whereas others have policies that incentivize deliveries in private facilities. Health infrastructure for antenatal and delivery care may also influence maternal health behaviors. Given the scope, cost and potential influence of JSY, it is important to examine how factors that extend beyond the cash payment affect poor women's use of maternal health care.

The current study addresses these complex issues by examining the implementation of JSY and maternal health care utilization in two Indian States, Gujarat and Tamil Nadu. These states were selected because they are similar in economic development and socio-demographic factors but have elected to implement JSY policy differently, with Gujarat incentivizing deliveries in private facilities and Tamil Nadu

providing benefits to women who deliver in government facilities. The study investigates the role of a number of salient health system and demographic factors in predicting poor, rural women's utilization of antenatal care and institutional deliveries in each state. Additionally, it attempts to place these findings in context by examining state government policies and existing health infrastructure factors that may influence maternal health service utilization. This study adds significantly to existing maternal and child health literature by examining the impact of JSY and multiple factors beyond cash payments that may affect maternal health behavior in India, the world's leading contributor to maternal deaths.

Chapter 2: Review of Literature

Theory: Health Systems Framework for Maternal, Neonatal and Child Health

Many frameworks have been proposed to examine predictors of utilization of maternal health services among the poor and to explore how government policies influence their utilization. Poverty has been defined by the World Bank as "deprivation in well-being and comprises many dimensions. It includes low incomes and the inability to acquire the basic goods and services necessary for survival with dignity."[11] Poverty also often includes low levels of health and education, poor access to clean water and sanitation, inadequate physical security, lack of voice and insufficient capacity and opportunity to better one's life.[11]

Poverty is both a consequence and contributor to ill health and excessive mortality. Loss of income due to illness and out-of-pocket payments for health services can further impoverish the poor. Lack of utilization of preventive and curative health services due to an absence of financial resources, lack of access to health facilities, inadequately equipped facilities and poorly trained, often rude and unavailable staff, all contribute to ill health for poor.[11] Health is viewed as a dimension of poverty and improvement in the health of the poor is considered a key goal of development. Government can alleviate the effects of poverty on health outcomes by implementing appropriate policies to improve access to preventive and curative health care for the poor.[12]

Various frameworks have been adopted to explore poor women's use of health services. Some of these frameworks focus solely on the health care system while others

adopt a wider perspective and include contextual factors such as economics and politics. The Health Systems Framework for Maternal, Neonatal and Child health (MNCH) proposed by Ergo et al. can be used to examine demographic and health system/health care sector predictors that influence poor women's utilization of antenatal care and institutional deliveries.[13] The framework also enables researchers to place these findings within the context of state government policies and existing health infrastructure.

The MNCH framework was proposed in 2011 for the Maternal and Child Health Integrated Program (MCHIP) funded by the United States Agency for International Development (USAID).[12, 13] This framework, shown in Figure 1, draws from other frequently used health system frameworks, such as one developed by Cleason for the World Bank.[13] The framework has been used by its authors to analyze the health systems of Malawi.[14] It positions MNCH interventions within the broader health system and presents a tool to assess how health systems strengthening initiatives operate within a health system and impact MNCH. All of the factors in the framework operate to improve maternal and child health indicators ultimately by improving access and quality of health care.[13] Figure 1 shows that the three boxes in the central part of the framework represent the main component of the health system.

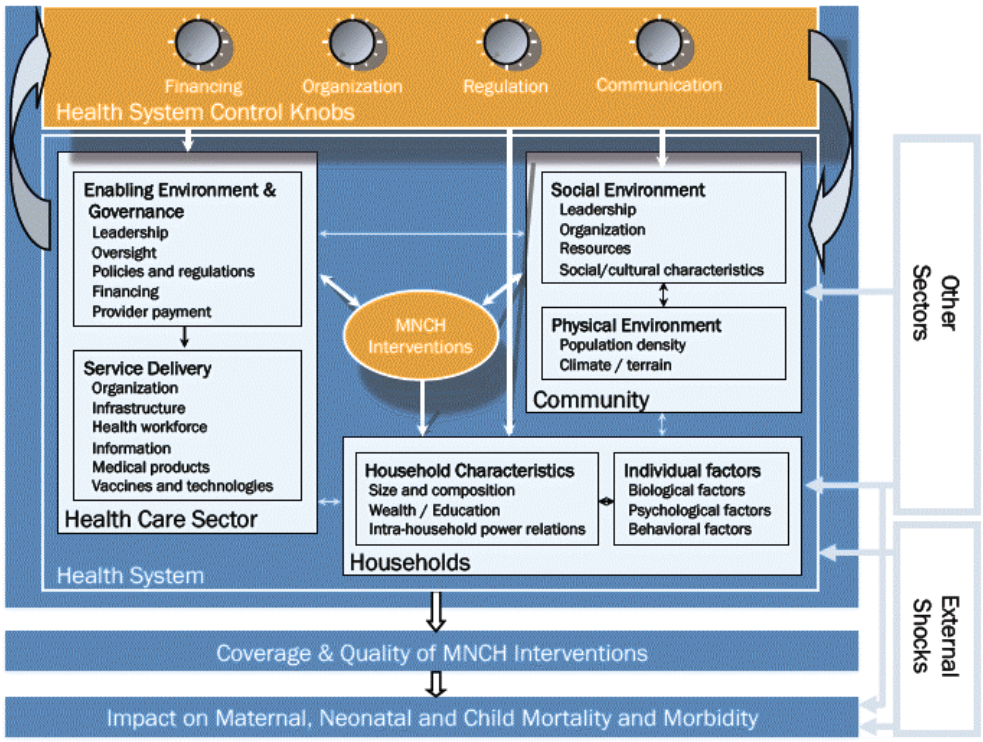
1. **Health care sector:** Comprised of two subcomponents: (a) Enabling environment and governance and (b) Service delivery.

2. **Community:** Comprised of two subcomponents: (a) Physical environment and (b) Social environment.

3. **Household:** Comprised of household characteristics and individual factors.

All components and subcomponents are interconnected and contain various elements of the health system. For example, enabling environment and governance also includes leadership, financing and provider payment. The bottom portion of the framework shows that coverage and quality of MNCH interventions are determined by a combination of different components of the health system and have a direct impact on maternal and child health outcomes irrespective of the level of intervention.

Figure 1: Health Systems Framework for Maternal, Neonatal and Child Health[13]



The top of the Health Systems Framework has four control knobs, allowing for analysis of how initiatives trigger changes that affect the coverage and quality of MNCH services and their impact on outcomes. The control knobs represent tools for addressing weaknesses in the system. These knobs are: financing, organization, regulation and communication. The framework also recognizes the important role that other sectors

such as sanitation, food security, education and potential effects of external shocks, such as global recession and earthquakes, have on the MNCH outcomes.

This dissertation focuses on implementation of a national maternal health care policy, which is based on the government's financing of institutional delivery care for poor, rural women. However, the focal point is the health system component of the Health Systems framework. Specifically, the dissertation examines the role of health care sector and household factors as predictors of poor, rural women's use of maternal health services in two Indian States. It also explores the linkages between state health system strengthening initiatives and utilization of maternal health services.

Health Care Sector

Enabling Environment and Governance. The governance and stewardship of the health care sector is the responsibility of the state level ministry of health in India. The national level ministry provides funds and guidelines for implementation of maternal health programs but states can act independently to determine the best possible way to implement them based on local conditions. For example, the states of Gujarat and Tamil Nadu have implemented JSY differently based on local needs.

Good leadership ensures that regulations and policies are in place for effective service delivery and monitoring mechanisms are in place for accountability. Operational aspects of financial management are part of the enabling environment and governance that influence the service delivery and use of maternal health services. The proportion of the target population that receives financial benefits is a good indicator of how well a program such as JSY is implemented. In addition to this variable, government documents, literature and personal communication with stakeholders can be used to

understand and compare the implementation and impact of JSY in the Indian states of Gujarat and Tamil Nadu. Details of JSY and its implementation are described later in this chapter.

Service Delivery. Availability of a functioning health facility and transportation are two key components of a health service delivery system. Specifically, women's access to a health facility providing round-the-clock care and availability of reliable transportation to a health facility have been found to predict women's use of maternal health services.[15, 16] In India, the primary health care center (PHC) is an important public health facility providing care at the community level in rural areas. Public health facility guidelines in India are population based. A PHC is a primary level health facility that provides antenatal care, delivery care and postpartum care for a population of 20,000 to 30,000, among other preventive and curative services. The PHC is usually staffed by a general doctor, a nurse-midwife and ancillary health workers such as a laboratory assistant, female health worker and pharmacist. Shortages of skilled health care providers for antenatal care and emergency obstetric care are common in Indian facilities, including PHCs serving poor women in rural areas.[17] A PHC has a labor room, facility to admit patients and basic laboratory facilities. Some PHCs are upgraded to include x-rays and basic operating theaters.[18]

Infrastructure and especially lack of roads, also influences utilization of maternal health care services. Poor roads directly influence the time cost for households to seek health care assistance because of the increase in travel time.[12] Availability of transportation, including all-weather roads to the nearest health facility, play an important role in use of maternal health services.[15] Poor road infrastructure can make access to

delivery care difficult for poor women, in particular, causing them to seek care from less qualified but locally available providers such as traditional birth attendants.[12]

The private sector is an important service provider, especially for maternal health care in India and southeast Asia.[19, 20] A significant increase in institutional deliveries in the private sector has occurred during the last decade in India. For example, the National Family Health Survey (NFHS)-3(2005-06) data shows that institutional deliveries increased in the private sector from 11% in NFHS-1(1992-93) to 20% in NFHS-3(2005-06).[21] Private sector deliveries accounted for more than two thirds of the increase in use of any facility during this period in India.[20] There are few studies examining the quality and scope of private sector services in maternal health care, but one study from Asia, sub-Saharan Africa and Latin America found excess use of Cesarean section in the private sector.[20] The private sector is less regulated than the public sector in developing countries, including India. Private facilities range from large corporate hospitals in urban areas to small, 10 bed nursing homes in rural areas.[20, 22] Hence, it is difficult to find data comparing quality of care among private sector facilities. International experts agree that to achieve Millennium Development Goals for maternal health care, it is critical to engage the private sector in low and middle income countries such as India.[23]

Community

The Health Systems Framework emphasizes the importance of both the physical and social community environment and their interaction. The double arrows connecting the community with the health care sector and households indicate the strong

relationships between these components. The majority of maternal health service delivery takes place within the community and is influenced by community involvement.

Physical environment. Physical environmental factors such as sanitation, access to healthy foods and population density affect maternal health outcomes. Infrastructure influences the utilization of maternal health care.[12] Physical distance from the nearest health facility, plays a role in maternal health service use.[15] Lack of affordable transport can make access to safe childbirth difficult for rural women.[12]

Social Environment. The social environment includes social units such as schools, worksites, families, friends and organizations. These units influence maternal health by affecting access to maternal health care. The social environment also includes cultural characteristics. The level of poverty and degree of social inequity, gender inequality, social cohesion, religion, caste and other cultural and social norms are important social characteristics of a community. Access to knowledge and available health care is dependent on cultural norms and beliefs. For example, the preference for sons in some cultures affects health seeking behavior and fertility choices.[24]

Household

Household actions, assets and risk factors are important determinants of utilization of maternal health services, especially antenatal care and institutional deliveries. In this framework, the household level includes both household and individual characteristics.

Household characteristics. A household is defined as a group of persons who make common provision for food, shelter and other essentials for living.[13] A woman's low status within the household is a great barrier to her access to maternal health care.

Lack of education and socioeconomic dependency makes women more vulnerable to physical and sexual abuse, as well as adverse pregnancy outcomes. Maternal and paternal education are powerful determinants of health status, and particularly maternal and child health. Less educated women are more likely than their more educated peers to get married early.[25] They have less access to health care information, placing them at greater risk for pregnancy-related complications.[25] Less educated women generally have more children than more educated women because they are less likely to adopt family planning methods for child spacing and for limiting family size.[26] Healthy practices such as exclusive breastfeeding, adequate antenatal care and use of skilled birth attendants are not common among less educated households.[13]

There is a strong relationship between a mother's education level and her use of maternal health services in India.[25, 27] Educated women are more likely than their less educated peers to use antenatal care and have institutional deliveries.[5] Paternal education may also influence women's greater utilization of maternal health care because more educated men typically understand the benefits of antenatal care and institutional delivery better than those who have limited schooling.[28]

Individual characteristics. As indicated earlier, individual characteristics are part of the household level in the Health Systems Framework for MNCH. Individual characteristics include biological, behavioral and psychological factors that contribute to maternal use of health services within this category.[13] This dissertation focuses on a small number of biological factors. Specifically, age of mother at first birth and parity (number of live births) are individual factors that may influence maternal health services utilization. Women giving birth for the first time at a very young age (less than 20 years)

are less likely than those whose first birth is at a later age (30 or more years) to use maternal health care services.[29] Teen pregnancy and advanced maternal age are associated with increased chances of pregnancy complications. It has been observed that first time mothers (primipara) are more likely to use maternal health care services than mothers who have a previous live birth (multipara).[30, 31] Hence, age at first birth and parity of mother are important individual characteristics to consider in examining use of maternal health services**.**

Adapting this framework, a study examined determinants or predictors of maternal use of health services in Malawi, comparing different time periods in the analysis. This country-level study focused mainly on governance and health system-related issues.[13, 14] To date, there have been no studies that adopted this framework to examine regional level differences in maternal health service utilization within the subcontinent of India. The current study is unique in examining health care sector and household factors that predict use of maternal health services in two Indian states and in analyzing how different state-level government policies influence maternal health service utilization.

Maternal Mortality in India

India is the second most populous country in the world after China. It has a high birth rate of 22.5 births per 1,000 population compared to China's birth rate of 14 per 1,000 population.[32] India's high birth rate, coupled with its large population, results in about 27 million births every year.[33] The maternal mortality ratio in India is 230 maternal deaths per 100,000 live births, resulting in the death of 63,000 mothers annually as a result of childbirth-related complications.[4, 5] An Indian woman has a 1 in 70

chance of dying in childbirth at some point during her lifetime; in the U.S. the lifetime risk of death in childbirth is only 1 in 4,800.[34]

India's Cesarean section (C-section) rate is about 9%, suggesting that some mothers may still be dying due to lack of access to this procedure.[5, 21] The major causes of maternal deaths in India are hemorrhage (38%), sepsis (11%), abortion-related complications (8%), hypertensive disorders (5%), obstructed labor (5%) and other related medical conditions (34%).[5, 35] The majority of these maternal deaths are preventable through primary prevention, such as family planning, antenatal care, sanitation and adequate nutrition, as well as early diagnosis and timely treatment when a complication occurs.

A number of factors are believed to be responsible for the high maternal mortality ratio in India, as well as the slowed progress in improving maternal health indicators. These factors include programmatic issues at the national and local levels, India's geographical and cultural diversity and other socio-cultural factors. Programmatic reasons include problems in the planning and implementation of federal, state and local interventions, ineffective implementation of evidence-based programs and emphasis on supply-side interventions.[5, 36] Most of the national level programs, including RCH I, focus on supply-side interventions such as improvements in infrastructure and training of personnel, while generally ignoring demand-side issues. As a result, health facilities and equipment are often underutilized, newly acquired skills of providers are lost and program goals are not achieved despite their efficient implementation.[31] In some Indian states, geographical and cultural issues prevent

elements of the programs from being executed successfully. Monitoring and evaluation components of the programs are often weak at both the national and state levels.[5]

India is a diverse country with huge regional disparities in maternal health indicators. Some regions of the country have maternal child health profiles comparable to those of developed nations, while others lag far behind. Figure 2 presents an administrative map of India and its 28 states and 7 union territories. In some states, such as Kerala, Tamil Nadu and Punjab, the maternal mortality ratio is low at around 100 maternal deaths per 100,000 live births, a ratio comparable to some of the developed nations. In contrast, the states of Assam, Madhya Pradesh and Uttar Pradesh have maternal mortality ratios as high as 700 or more maternal deaths per 100,000 live births, comparable to those in sub-Saharan African countries.[35, 37]

The geography of India is quite varied. Northeast states such as Assam have hilly terrains with heavy rainfalls that make physical access to health facilities especially challenging. Other states such as Uttar Pradesh and Bihar are geographically large with populations of 180 million and 89 million, respectively. Such expansive state boundaries and large populations make it difficult for state governments to manage health programs in general, including maternal health care programs.[38]

Socio-cultural determinants of maternal, newborn and child health also play a role and have cumulative effects over a lifetime. For example, social status is positively related to maternal and child health, with women of lower status experiencing greater difficulty in accessing maternal health care and especially delivery care services.[39] Hence, interventions to improve maternal health status must be adapted to the unique features of the state or local region.

Figure 2: Administrative Map of India[40]

Maternal Health Indicators

Given that India is the largest contributor of maternal deaths in the world, it is critical that the nation make progress in improving maternal health indicators to achieve

Millennium Development Goal 5. At the national level, India's maternal health programs have had only a modest impact on key maternal health indicators such as access to antenatal care, proportion of skilled birth attendance, institutional deliveries and postnatal care. For example, the proportion of women receiving at least three antenatal visits over a 13-year period increased from 44% in the NFHS-1 in 1992-93 to 51% in NFHS-3 in 2005-06. Thus, five years ago only half of Indian mothers were receiving at least three antenatal care visits. The percentage of women receiving care in the first trimester was even lower at 43% in NFHS-3.[21]

Unskilled birth attendants conduct more than half of the infant deliveries in India despite some improvements in skilled birth attendance, which has increased from 33% in NFHS-1 (1992-93) to 48% in NFHS-3 (2005-06).[5, 21] Similarly, the proportion of institutional deliveries increased from 26% in NFHS-1 to 39% in NFHS-3. Notably, the increase in institutional deliveries over this 13-year period was greater in the private sector than in the public sector. More recently published data from the District Level Household Survey (DLHS)-3(2007-08) reveals that the proportion of institutional deliveries in India has increased to 47%.[41]

India's C-section delivery rate increased from 3% in NFHS-1 to 9% in NFHS-3. The majority of this increase in C-section was in the private sector.[21] The United Nations (UN) has adopted the proportion of C-sections as a process indicator for a population's access to maternal health care. This indicator is based on the fact that, to prevent maternal deaths, both surgery and other types of obstetric services must be available and used; C-section is a proxy for emergency obstetric care. The UN process indicators provide evidence of whether programs are saving the lives of women who

really need them, especially poor women with complications.[42] NFHS-3 data show that rural Indian women have limited access to C-section, with the proportion of C-section among rural women at only 6% compared to 17% among urban women.[21] Thus, the proportion of C-section deliveries among poor, rural women is an important indicator of access to maternal health services in India and its individual states.

In 2009, UNICEF (United Nations Children's Fund) conducted a coverage evaluation survey to examine the coverage of maternal health care services in India, including adequate antenatal care. UNICEF defined adequate antenatal care as having at least three antenatal visits, receiving one tetanus toxoid (TT) injection and consuming more than 100 iron folic acid (IFA) tablets. Despite more than three decades of ambitious, national-level maternal and child health programs, the rate of adequate antenatal care was a dismal 26.5%.[43] This percentage is much lower than estimates from NFHS and DLHS data collected earlier. On the other hand, the same survey shows that the national proportion of institutional deliveries is 72.9% and of skilled birth attendance is 76.2%, percentages much higher than those reported in the NFHS or DLHS data.[43] The sudden increases in institutional deliveries and skilled birth attendance reported by UNICEF were attributed, in part, to implementation of JSY under NRHM in 2005.[44] It should be noted that the sample size of the UNICEF survey was much smaller than those for the NFHS or DLHS and the methods of sample selection and data collection were different.[21, 41, 43]

Access to Maternal Health Care for Poor Rural Women

India spends less than 3% of its government funds on health care, one of the lowest percentages in the world.[45, 46] In contrast, Indians' out-of-pocket health

expenses represent about 78% of total health care expenditures, one of the highest percentages in the world.[46] Financing of health care has an important bearing on an individual's access to health care and the threat of financial ruin because of high health-related expenses.

The Partnership for Maternal, Newborn and Child Health unites developing and donor countries, United Nations (UN) agencies, professional associations, academic and research institutions, foundations and NGOs to intensify and coordinate national, regional and global progress towards the UN Millennium Development Goals 4 and 5 (maternal and child health goals). The Partnership focuses on 68 priority countries, which represent 97% of all global maternal and child deaths. The Partnership's Countdown to 2015 Initiative measures coverage of basic health services proven to reduce maternal and child mortality, the strength of health systems and how equitably health services are distributed.[47]

The Countdown working group asserts that government expenditures on health as a proportion of total government expenditures and out-of-pocket expenditures are important indicators of the extent to which a country's health care system is accessible and equitable.[46] Using these measures, India's health care system is rated low in both access and equity. The poor in India have the least access to health care and are at highest risk for financial ruin due to health-related expenses despite a decline in the coverage gap (percentage point differences) between the richest and the poorest quintiles from 49% in 1990-94 to 36.3% in 2004-06.[45, 46]

About 28% of the Indian population lives below the poverty line. Research reveals that poor mothers have benefitted the least from improvements in the country's

maternal health care services.[48, 49] Although Indian health policy is guided by principles of equity in health care and is committed to providing for the poor and underprivileged, a 2006 data found that women in the richest quintile were 6 times more likely to deliver in an institution than women in the poorest quintile.[50] The absolute difference in the proportion of institutional delivery in NFHS-1 in 1992-93 between the poorest and richest quintiles was 65%, which increased to 70% in NFHS-3 in 2005-06.[21, 51] Thus, while the equity gap for general health care diminished during this period, the gap between rich and poor women for maternal health care use increased. Adequate antenatal care utilization (at least 3 visits, first visit in the first trimester, at least 100 IFA tablets and two tetanus toxoids as measured in NFHS-3) was even lower among poor mothers as they recognized the dangers of a home delivery and spent their limited financial resources on an institutional delivery rather than preventive antenatal care.[49]

The majority of the Indian population lives in rural areas where access to health care and infrastructure differs from access in urban areas. Rural areas have higher maternal and infant mortality rates and lower maternal health care utilization than urban areas in India.[21] Some of the reasons for better access to health care in urban areas are the higher concentration of health facilities, the greater availability of skilled health providers and the easier geographic access than in rural areas.[52]

Janani Suraksha Yojana (JSY)

India's small government investment in health care is perceived to be slowing its progress in maternal health, especially among the poor. In response to this problem, in 2005 the Indian government launched "Janani Suraksha Yojana" (JSY) as part of the National Rural Health Mission. JSY is a conditional cash transfer scheme aimed at

reducing maternal and infant mortality rates in families below the poverty line by increasing institutional deliveries. Conditional cash transfer programs provide cash payments to poor households that meet specific behavioral requirements, generally related to children's health care and education.[8]

India's official poverty measure is based upon the ability to purchase a minimum recommended daily diet of 2,400 kilocalories (kcal) per individual in rural areas where about 70% of people live and 2,100 kcal in urban areas. Rural areas usually have higher caloric requirements because of the greater physical activity among rural residents. The national Planning Commission, which is responsible for the estimate, currently estimates that a monthly income of about Indian Rupees (INR) 356 per person (INR 4,272 per year) is needed to provide the required diet in rural areas and INR 539 monthly (INR 6,468 per year) is needed in urban areas. Individuals with lower incomes are considered below the poverty line. Factors such as housing, health care and transportation are not taken into account in the poverty estimates. The national sample survey (NSS), which measures monthly per capita consumer expense (MPCE) every five years, is used for the estimates. The latest estimates are based on the 2004-05 survey.[53]

Accredited social health activists (ASHAs) are village-based women who are selected and trained to effectively implement JSY for a population of 1,000. The ASHA is charged with identifying beneficiaries, helping them to complete required paperwork and accessing the maternal health care services listed above, including accompanying mothers to the delivery facility. ASHAs are compensated for their work based on the number of institutional deliveries and do not receive a salary.[9, 10, 54] Although ASHAs are essentially recruited to implement JSY, certain states such as Tamil Nadu

have used existing health workers to implement JSY successfully.[44] Hence, availability of ASHAs is often not an optimal indicator of how well JSY is being implemented.

State JSY implementation committees have been established to implement and monitor JSY using guidelines from the national government.[10] According to these guidelines, registered pregnant women should receive payments in one installment at the time of discharge from the institution where the delivery took place. The Auxiliary Nurse Midwife (ANM) is provided with an account of INR 10,000 to ensure timely payment to women delivering at a public facility, and it is a responsibility of the ANM or ASHA to ensure timely disbursement. Some of the states require that all beneficiaries should be paid by check. Checks provide an additional written record of the disbursement and have helped to reduce fraud. Some states issue a mix of cash and checks to beneficiaries, while others continue paying exclusively in cash. If state policy requires payment in the form of checks, beneficiaries must have bank accounts to cash the checks, which is a challenge for some beneficiaries.[10]

The JSY scheme is centrally funded by the Indian government and implemented in all of the states. The states are divided into Low Performing States (LPS) and High Performing States (HPS) based on maternal health indicators such as maternal mortality ratio, total fertility rate, proportion of institutional deliveries and per capita income. Low Performing States include Assam, Bihar, Chhattisgarh, Jammu and Kashmir, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttaranchal and Uttar Pradesh. High Performing States include Andhra Pradesh, Arunachal Pradesh, Goa, Gujarat, Haryana, Himachal

Pradesh, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Punjab, Sikkim, Tamil Nadu, Tripura and West Bengal.

JSY eligibility criteria are different for LPS and HPS residents, with states determining the beneficiaries of the scheme. For example, all pregnant women who are BPL are eligible for JSY in LPS, while for some HPS only women who are both from schedule caste/tribe and are BPL are eligible for JSY. The cash amount paid to the beneficiary also differs by LPS and HPS. In LPS, national guidelines award beneficiaries residing in the rural areas INR 1,400 (US $36) and women from urban areas INR 1,000 (US $26). In HPS, national guidelines recommend that beneficiaries residing in the rural areas receive INR 700 (US $18) and women from urban areas receive INR 600 (US $16). National guidelines further recommend that if the beneficiary has a C-section, she will receive additional INR 1,400 (US $36) to cover the hospital expenses. Additional monies are also paid for transportation if a referral is required.[9, 10, 54]

Although the initial emphasis of JSY was to increase institutional deliveries in the public health system, today the scheme includes home deliveries and deliveries in accredited private institutions in some states. Private institutions are accredited in areas where a public health center is not available for institutional deliveries. Government hospitals can also hire the services of a private obstetrician for INR 1,000 (US $26) to perform a C-section.[9, 10, 54] Nearly 8.4 million Indian women have benefited from JSY as of 2008-09.[9, 10]

The national (federal) government provides monies for JSY. However, since health is a state level mandate in India, states may differ in the way in which national health policies and schemes are implemented, depending upon maternal health indicators

and local needs. For example, Gujarat uses JSY funds to implement "Chiranjeevi Yojana." The Indian translation for this initiative is "Scheme for Long Life." This public-private partnership engages private institutions for fixed fees to provide services to JSY beneficiaries.[6, 55]

Table 1 provides an overview of the implementation of JSY and CY in the two target states, Gujarat and Tamil Nadu. Eligibility criteria differ, with Gujarat extending the benefit to all women below the poverty line for up to two live births in 2007.[56] In this same time period, Tamil Nadu provided benefits not only to women below the poverty line, but also to any women in the schedule caste or schedule tribe. Benefits were provided regardless of the number of live births.[7] Both states provided a beneficiary payment of INR 700, which includes an incentive for institutional delivery of INR 500 and a transportation stipend of INR 200. CY guidelines in Gujarat provide a fixed payment of INR 1,790 per delivery to private providers, whereas in Tamil Nadu private sector providers are not incentivized. Tamil Nadu's JSY scheme also did not incentivize public health care providers who were salaried by the government. At the time of the study, Gujarat's CY scheme paid ASHAs INR 50 per delivery but there was no equivalent payment in Tamil Nadu.[7, 56] Researchers in Gujarat have calculated that if a poor pregnant woman had to cover the cost of an institutional delivery in the state without CY benefits, the average total cost would be INR 4,000, including provider fees, medicines, and transportation.[55] The equivalent cost for Tamil Nadu was not available from government health documents.

Table 1: Implementation of JSY/CY in Rural Areas of Gujarat and Tamil Nadu, 2007[7, 55]

	Gujarat (CY)	Tamil Nadu (JSY)
Eligibility criteria	Below poverty line Up to two live births	Below poverty line Schedule caste and schedule tribe No limit on births
Payment to beneficiary	INR 500	INR 500
Transportation cost	INR 200	INR 200
Private provider payment per delivery	INR 1,790	Not applicable
Payment to ASHA	INR 50	Not applicable

This dissertation focuses on poor, rural women in the states of Gujarat and Tamil Nadu, comparing use of maternal health services as a function of differential state JSY policies and other contextual factors. No current publication on JSY has employed this type of analysis to compare two Indian states. The study adds to the maternal and child health literature by evaluating the role of JSY/CY and other health care sector and household factors in predicting use of maternal health services and by examining how Indian maternal health care policies are implemented in two states. Conditional cash transfer schemes are now in vogue in many developing countries to improve maternal and child health outcomes, and JSY is the largest such scheme in the world. Analyses of differential contextual and policy factors that predict the outcomes of conditional cash transfer schemes in two Indian states can play a valuable role in improving India's existing schemes and informing the design of such programs in other developing nations.

Selected States for Study: Gujarat and Tamil Nadu

Gujarat and Tamil Nadu are selected for study because they are similar in terms of socio-demographic indicators; yet differ in JSY policy implementation and other contextual areas. Gujarat is a western state bordered by Pakistan and the Arabian Sea. Tamil Nadu is a state on the southernmost part of the Indian peninsula, bordered by the Bay of Bengal on the east and the Indian Ocean on the south. Both Gujarat and Tamil Nadu are considered urban states, with Gujarat having an urban population of about 37% and Tamil Nadu an urban population of approximately 44%.[38]

Table 2 presents selected socio-demographic indicators for India and reveals that both states are faring better than the national average on almost all indicators. Gujarat and Tamil Nadu have a higher female literacy rate, a higher life expectancy for females, a lower maternal mortality ratio and a lower infant mortality rate than the national averages.[6, 7, 38] Additionally, the proportion of residents living below the poverty line (BPL) is lower in both the states than the national average.[38]

The two states are different in some socio-demographic aspects. Gujarat has a higher birth rate, total fertility rate, infant mortality rate and maternal mortality ratio than Tamil Nadu. The status of women is lower in Gujarat than Tamil Nadu, as indicated by a lower female literacy rate, life expectancy for females and female: male sex ratio. On the other hand, Gujarat has a lower proportion of people living below the poverty line than Tamil Nadu and less population density.[38] Gujarat has made slow but significant progress in increasing access to maternal health care. The state has had a long-term shortage of obstetricians to provide maternal health services in government hospitals. Only 37% of government health care facilities are staffed with obstetricians.

Table 2: Socio-demographic Indicators for Gujarat and Tamil Nadu [38, 57]

Indicator	India	Gujarat	Tamil Nadu
Population in Millions (2001)	1,028	51	62
Proportion of Urban Population (2001)	27.8	37.3	44.4
Female Literacy Rate (2001)	53.7	57.8	64.4
Life Expectancy-Female (2002-06)	64.2	65.2	67.4
Maternal Mortality Ratio (2004-06)	254	160	111
Infant Mortality Rate (2009)	50	48	28
Proportion of People Living Below Poverty Line (2004-05)	27.5	16.8	22.5
Birth Rate (2009)	22.5	22.3	16.3
Total Fertility Rate (2008)	2.6	2.5	1.7
Female: Male Sex Ratio (2001)	933	920	987
Population Density per Square Kilometer	325	258	480

This shortage of obstetricians in government facilities affects primarily the weaker segments of society, whose members generally seek government health services. On the other hand, about 2,000 obstetricians are available in the private sector in Gujarat.[56] Understanding the limitations of public health facilities, the state government analyzed various options available. Private sector involvement was deemed the most acceptable option. [56]

In 2005, Gujarat implemented a unique public-private partnership, "Chiranjeevi Yojana (CY)," to expand maternal health services for poor women in the state. Using JSY funds, CY addresses the shortage of public maternal health care providers in underserved areas by contracting with non-governmental private practitioners.[56] CY enables accredited private practitioners and hospitals to collect fixed fees from the

government for providing free maternal health services to JSY beneficiaries. Hence, in Gujarat, BPL mothers can access either public or private facilities participating in CY and collect their JSY funds.

CY provides cash assistance to poor mothers for institutional deliveries, offers a transportation stipend, and provides a financial incentive to the health worker (e.g., ASHA) who accompanies the pregnant woman to a health facility.[56] CY has been hailed as successful by Indian and international experts and is cited as an excellent example of a public-private partnership. It has won international and national awards for innovations that improve access to maternal health care.[6, 55, 56]

Other Gujarat maternal health initiatives in the past decade include a program that trains general practitioners (Bachelor of Medicine, Bachelor of Surgery-MBBS doctors) for emergency obstetric care, including C-section and anesthesia. Gujarat has also trained skilled birth attendants and completed verbal autopsies for maternal death audits. Trained doctors are placed in areas where obstetricians are not available. Human resource innovations are also aimed at increasing poor, rural families' access to basic and comprehensive emergency obstetric care. Physicians and nurses are recruited on the spot and receive posting orders within hours of recruitment using a computer-based system. The training of general practitioners and improved nurse/physician recruitment and posting policies has increased the availability of skilled health care providers for PHCs providing care in rural areas within the public health system. [6, 56, 58]

The government of Gujarat has involved multiple local and international partners in its efforts to improve maternal health care. Partners include Jhpiego (Johns Hopkins Program for Increasing Education of Gynecology and Obstetrics), AMDD (Averting

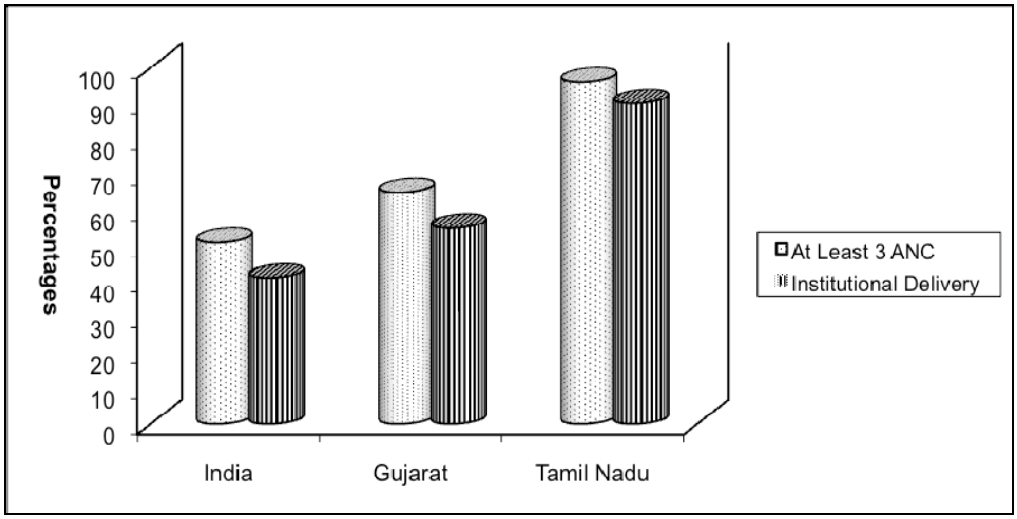
Maternal Deaths and Disabilities), professional associations (e.g., Federation of Obstetrics and Gynecological Societies of India/ FOGSI) and private practitioners. It has also improved emergency transportation by collaborating with the Emergency Medical Research Institute (EMRI) to provide access to fully equipped ambulances with trained personnel and the best telecommunication facilities available.[58, 59]

The crude birth rate (annual number of births in a year per 1,000 persons in the population) in Gujarat decreased over a period of more than 3 decades from 44.2 in 1971 to 22.3 in 2009. Similarly, the total fertility rate fell to 2.5 in 2008 from 2.9 in 2001. According to NFHS-3 data, institutional deliveries increased significantly from 36% in 2001 to 55% in 2006.[60] Infant mortality rates have decreased from 60 in 2001 to 48 per 1,000 live births in 2009 and the maternal mortality ratio declined from 202 in 1999-2001 to 160 per 100,000 births in 2004-06.[6, 61]

Tamil Nadu has also made impressive progress in the past decades in improving maternal health indicators and access to quality maternal health care.[7, 62, 63] Tamil Nadu is the only state in India where institutional deliveries have shifted from the private sector to the public sector. The proportion of deliveries in the public sector increased from 38% to 48% from NFHS-2 (2001) to NFHS-3 (2006), while overall institutional deliveries increased from 67% to 87% in the same time period.[7, 64] Graph 1 shows utilization of antenatal care and institutional deliveries in the target states and India based on NFHS-3 findings.

Tamil Nadu is using a three-pronged strategy to improve maternal and neonatal health and increase access to maternal health services within the public sector. This strategy includes: 1) prevention and termination of unwanted pregnancies, 2) high quality

Graph 1: Proportions of Antenatal Care and Institutional Deliveries in Gujarat and Tamil Nadu[60, 64]



antenatal care and incentivization of institutional delivery and 3) routine essential obstetric care and emergency obstetric first aid at the primary level and accessible high quality emergency obstetric care at the first referral level in the public sector.[7, 62] Tamil Nadu has posted three contractual nurses to guarantee 24-7 delivery care and at least one female doctor at the PHC level. To ensure availability of comprehensive emergency obstetric care at the first referral unit level, private specialists are contracted and the government accredits fully equipped public health facilities. The aim is to ensure access to at least one comprehensive facility within less than two hours travel time from any lower-level facility. Tamil Nadu Medical Services Corporation (TNMSC) is a logistics management system and government owned company. It manages purchase, storage and distribution of medicines, medical and surgical supplies and surgical and diagnostic equipment. Surveillance of maternal deaths, community and facility-based

maternal death reviews and near-miss audits help Tamil Nadu to monitor and identify gaps in maternal health care services.[7, 62]

Notably, in addition to implementing JSY, Tamil Nadu has continued its National Maternity Benefit Scheme (NMBS). This scheme provided financial assistance to women who deliver at home as well as in facilities.[7] In the years of this study (2007-08), women who delivered at home received INR 6,000 while women who delivered in a health facility received INR 6,500 (with INR 500 representing the JSY payment). The government considered the INR 6,000 as compensation for higher nutritional expenditures and lost wages of the pregnant woman.

As a result of its maternal health policies and infrastructure improvements, the maternal mortality ratio in Tamil Nadu decreased in three and a half decades from 380 in 1971 to 111 per 100,000 live births in 2006.[7, 62] The total fertility rate declined from 3.9 in 1971 to 1.7 in 2008 and the crude birth rate was down from 31.4 in 1971 to 16.3 in 2009. The infant mortality rate has fallen significantly from 113 in 1971 to 28 per 1,000 live births in 2009. All of these indicators are similar to those in many developed nations.[7, 62, 65, 66] However, it should be recognized that poor mothers have lower access to maternal health care services and have worse maternal health outcomes than more affluent mothers.[5]

Both Gujarat and Tamil Nadu have made significant gains in the past to improve maternal health care. Yet despite similarities in certain economic and demographic indicators, there are major differences in the social and health systems of both states. In Gujarat, most of the initiatives involve the private sector and although there has been an increase in access to maternal health care, improvements have been primarily at the

district level facilities and in the urban population.[10] In contrast, Tamil Nadu has strengthened the public health system and increased access to maternal care services at the grass roots level in the rural areas.[7]

The review of literature reveals that there are differences in maternal health policies; health services utilization and health outcomes in these two Indian states. It is likely that health care sector and household factors predict differential utilization of these health services. Although there is extensive literature on individual predictors of maternal health services utilization among the poor in India and other developing nations, a majority of these studies do not address variables at different levels of the health care framework. This study adds to the maternal and child health literature by examining the relationship between a selected group of health care sector and household factors and maternal health services utilization in Gujarat and Tamil Nadu. Moreover, this study appears to be the first to compare predictors of maternal health services utilization in two Indian states, as well as the ways in which differential implementation of a national health policy influences use of these services within the states.

Predictors of Maternal Health Services Utilization among Poor Rural Women

Current literature indicates that many health care sector and household factors are predictors of maternal health services utilization in developing countries such as India.[30, 31, 67] The following section summarizes previous research on important predictors of maternal health services utilization, organized according to the conceptual framework.

Health Care Sector Level Factors

Receipt of financial assistance from a government scheme. The cost of health care, including transportation, is a major factor affecting poor women's use of maternal health care. One literature review found that cost of care was the major deterrent to accessing maternal health care services among poor women.[68] Another literature review concluded that interventions for demand-side barriers, including cost of care, have not been well evaluated, although there was evidence that financial assistance to poor families improved women's access to maternal care.[69] For example, a study examining financial incentives for maternal health services in Nepal found that such incentives increased maternal health care utilization.[70]

India accounts for more than a quarter of maternal deaths across the globe. Poor, rural women account for the majority of these deaths.[4] To tackle this problem, the Indian government introduced JSY in 2005. One of the largest cash incentive schemes ever launched, JSY has attracted the attention of researchers who have examined the scheme's impact on maternal health. Reported results are mixed. Some studies indicate a major positive impact of JSY on maternal health indicators while others show no impact.[10, 44, 71] Most studies of JSY report increases in institutional deliveries, but some note that the scheme alone cannot be credited for the increase. Overall, the existing literature suggests that receiving financial assistance from the government increases women's use of maternal health services.

Availability of a PHC providing services round-the-clock. Another health care sector factor that has been found to be a significant predictor of utilization of maternal health services is availability of a health facility that provides round-the-clock

services.[26, 30, 31, 72-74] For example, one study of maternal mortality in Gambia found that non-availability of a health facility was an important predictor of high maternal mortality ratio.[75] Research conducted in the Matlab area of Bangladesh shows that greater access to a health facility improves use of maternal health care services, especially emergency obstetric care, as well as reduces maternal mortality.[16] A functional health facility requires the availability of both a physical infrastructure and skilled health care providers to provide services round-the-clock. One 1995 study of a northern Indian state that used the Perform System of Indicators Survey (PSIS) data revealed that access to a health facility and skilled health care providers increased institutional deliveries.[26]

Research using NFHS-2 data from northeastern Indian states also found that the presence of any health facility increased utilization of maternal health services; moreover, the odds increased if the facility was located in a rural area and was a government facility.[72] A study examining non-utilization of public facilities using NFHS-3 national data found that lack of health facilities was linked to non-use of antenatal care and delivery care.[52] Primary household surveys conducted in the Indian state of West Bengal by the Future Health System in 2008 found that physical access to a health facility had an impact on institutional deliveries, but not on antenatal care.[76] Overall, the research suggests that availability of a functioning health facility plays an important role in increasing use of maternal health services and in improving maternal health outcomes.

Connection to a health facility by an all-weather road. Connection to a health facility by an all-weather road is another health care sector factor found to predict rural

women's utilization of maternal health care.[68] The absence of all-weather roads provides a disincentive for women to travel to health care facilities for their deliveries. About 40% of Indian villages lack all-weather roads and 2.7 million kilometers of rural road network are in poor condition because of neglect and underfunding.[77] Indian roads often have potholes and insufficient pavement thickness. During the monsoon about 33% of Indian villages are cut off from the rest of the country as a result of flooding.[77-79] Availability of an all-weather road to a health facility helps to ensure access to maternal care and institutional delivery.[80] One study examining access to obstetric care in Gambia found that poor road conditions was an important cause of delay in obtaining maternal health care, contributing to a high maternal mortality ratio.[75] In the three-delay model proposed by Thaddeus and Maine, absence of roads acts as a deterrent to seeking health care and leads to a delay in decision-making and reaching a health facility.[68]

Another study of the relationship between road infrastructure and maternal health service utilization in India found that regions with higher road density had higher proportions of women utilizing maternal health care services.[78] Other studies also report that greater length of time to reach a health facility reduces the likelihood of using maternal health services.[52, 76, 81] Overall, better quality of roads, and particularly access to all-weather roads, appears likely to increase pregnant women's utilization of maternal health services.

Household Level Factors

Household

Maternal education. Maternal education is an important household level predictor of utilization of maternal health services in developing and developed countries.[25] Higher education helps women to understand the importance of early and adequate antenatal care and institutional delivery. A number of Indian studies have examined the role of maternal education in maternal use of health services. For example, a study using NFHS-2 data from the southern states found that educated women were more likely to have adequate antenatal care and institutional delivery compared to uneducated women.[31] A similar study in the northeastern states also found that higher education among women increased their utilization of antenatal care and institutional delivery in government facilities.[72] The study did not find education to be a significant predictor of use of a private facility. In contrast, research using the Demographic Health Survey (DHS) in sub-Saharan Africa, Asia and Latin America found that maternal education was an important determinant of use of a private facility for delivery care.[20]

In India, a 1995 study using the Perform System of Indicators Survey (PSIS) data from a northern state found that more educated women had increased use of antenatal care and institutional delivery.[26] A national Indian study using NFHS-2 data revealed that uneducated women have lower use of maternal health services, including institutional deliveries and antenatal care, than their educated peers. There was a positive relationship between maternal education and utilization of maternal health care services, although the influence of education was not as great in the southern states as in the northern states.[25] A similar study focusing only on the northern states found a

significant positive association between maternal education and utilization of maternal health services, including antenatal care.[73] Still another study in the western state of Maharashtra using NFHS-2 data indicated that maternal education was significantly associated with use of a private facility for delivery care.[22] Overall, both the Indian and international studies reveal that maternal education is an important predictor of use of maternal health services, with more educated mothers utilizing more services.

Paternal education. Paternal education is another household factor thought to predict maternal utilization of health services, largely because of its association with household income and occupation. One study using NFHS-2 data from the northern Indian states found a significant positive association between a husband's education and his wife's utilization of maternal health services, including antenatal care and institutional deliveries.[73] Findings from a similar study in the southern states indicated that husband's education was positively associated with utilization of maternal health services (including antenatal care) in some, but not all, of the states.[31] Research in the western state of Maharashtra using NFHS-2 data revealed higher paternal education was significantly associated with maternal use of a private facility for delivery care.[22] However, a study using NFHS-2 data from the northeastern states found no significant relationship between paternal education and women's utilization of maternal health services.[72] Another international study from sub-Saharan Africa, Asia and Latin America using DHS data also found that a husband's education was not significantly associated with his wife's use of a private facility for delivery care.[20] Thus, although the findings are mixed, the literature suggests that husband's education may be an important predictor of maternal health care service utilization in some Indian states.

Individual

Age at first birth. Age at first birth is a household factor referring to the age at which a woman gives birth to her first child. A number of variables influence a woman's age at first birth, including place of residence, socio-cultural environment and female autonomy. Numerous studies have found age at first birth to be a predictor of maternal health care utilization. For example, research in Ethiopia found that mothers whose first birth was before 20 years of age were less likely to use safe delivery services compared to women who first gave birth at age 30 years or older.[29] In contrast, other Ethiopian studies found that having the first birth at 20 years or younger increases maternal utilization of antenatal services and institutional deliveries compared to first births at more than 20 years of age.[82, 83] A study from Uganda comparing adolescent, first-time mothers with adult, first-time mothers revealed that adolescent mothers were less likely to use maternal health services, although skilled birth assistance was higher among the adolescent mothers.[84]

Still another study examining maternal health care utilization among adolescent mothers in developing countries found that maternal health care utilization, including antenatal care and skilled delivery care, was lower among adolescent (18 years or less) compared to adult (more than 18 years) mothers in a majority of countries studied.[85] A research study in Pakistan found that younger first time mothers were less likely to receive antenatal care compared to older mothers.[86] Thus, the association of age at first birth with maternal health care utilization is somewhat mixed in the literature. Use of different cut-off ages for younger and older age at first birth (e.g., younger age at first birth defined as 18 years or less, less than 20 years, 20 years or less) is one factor that

may have contributed to differential findings. The majority of literature suggests that mothers who give birth for the first time at 19 years or older are more likely to use maternal health care services than those whose first birth is at a younger age.

Parity. Another household factor, parity, refers to the number of a woman's live births. Numerous studies have linked parity with maternal health service utilization. Most of the research concludes that primipara or first time mothers have higher utilization of maternal health care services, including institutional deliveries, compared to multipara women who have had more than one live birth.[30, 31, 72, 73] Among the reasons suggested for this finding are that health providers and society consider primipara women at higher risk; as women have more children, their reliance on prior birth experiences and their larger families translate into lower use of resources for health care.[31] A study using DHS data from sub-Saharan Africa, Asia and Latin America also found that primipara women are more likely than multipara women or grand multipara women to use private facilities for delivery care.[20]

In India, a study using NFHS-2 data from the southern states found that primipara women had a higher incidence of antenatal care and were more likely to deliver in a health facility than multipara women.[31] In studies with NFHS-2 data from northeastern states and a western state of India, primipara women were more likely to utilize antenatal care, have an institutional delivery and use a private facility than multipara women or grand multipara women.[22, 72] A 1995 study using the Perform System of Indicators Survey (PSIS) data from a northern Indian state found that primipara women have better access to antenatal care and institutional delivery compared to multipara women.[26] Overall, the majority of studies have found parity to be an

important predictor of maternal health service utilization, with primipara women utilizing more services.

Purpose of Study and Operational Definition of Variables

Purpose of Study

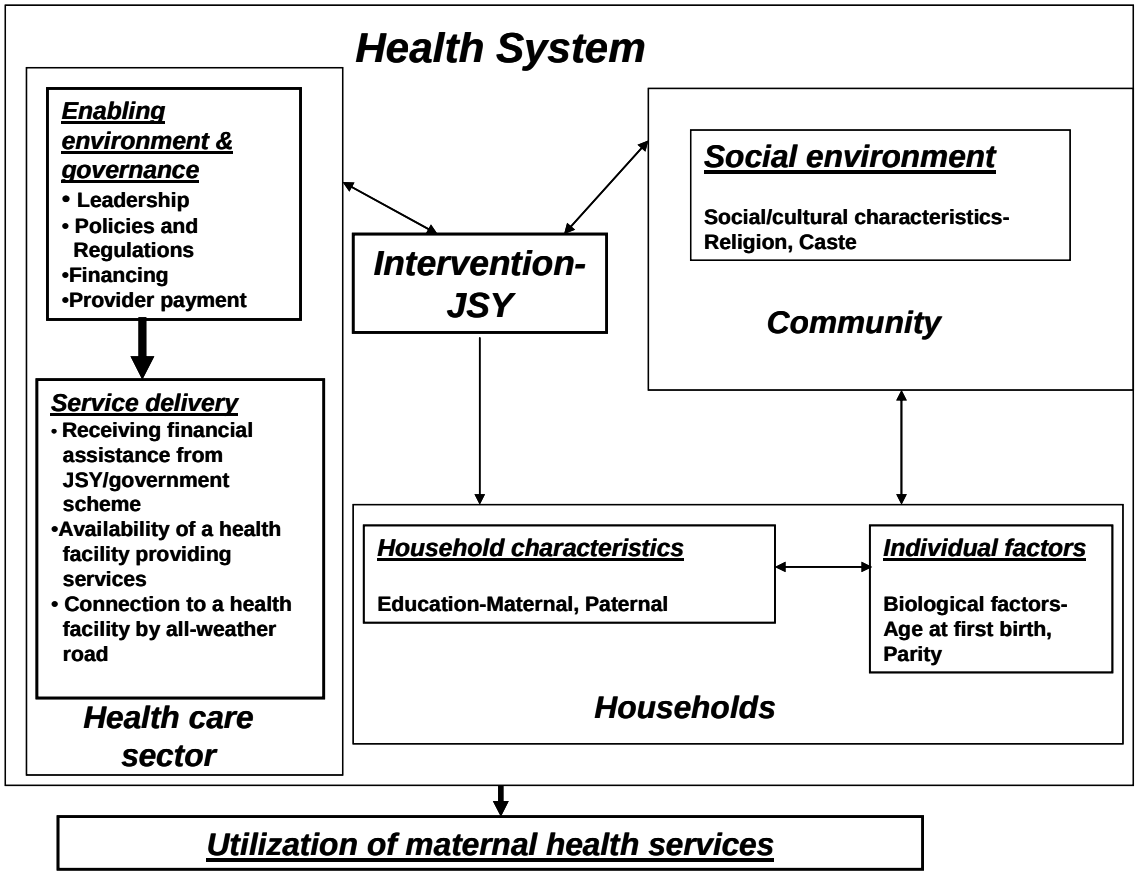
This study examines selected predictors of maternal health services utilization in the Indian states of Gujarat and Tamil Nadu after implementation of Janani Suraksha Yojana**.** The study adds to the literature by identifying contextual factors beyond cash payments that may influence use of maternal health services among poor, rural women. Women in this study resided in rural areas and were members of the lowest two wealth quintiles in India. The International Institute for Population Sciences (IIPS) defined five wealth quintiles in the Household questionnaire based on household assets such as land, livestock, vehicles, housing type, and household appliances (e.g., television, radio) in DLHS-3. The first quintile is the poorest and the fifth is the richest.

The conceptual model for the study is presented in Figure 3. Specific objectives of the dissertation were to:

1) Conduct a comparative analysis of predictors of the utilization of antenatal care, institutional delivery care, private sector care and Cesarean section among rural, poor women (lowest two wealth quintiles) in two Indian states, Gujarat and Tamil Nadu.

2) Explore the role of differential JSY policy implementation and selected maternal health infrastructure factors in explaining the use of maternal health services in the two Indian states.

Figure 3: Conceptual Model for the Study



Operational Definition of Variables

Independent variables

1. **Receipt of financial assistance from JSY or a government scheme:** Receiving financial assistance from JSY or any government scheme.
2. **Availability of a primary health center (PHC) providing services round-the-clock:** Availability of a PHC providing 24-7 services.
3. **Connection to a health facility by an all-weather road:** Connection by an all-weather road to any health facility.
4. **Maternal education:** Mother's total years of schooling as reported by the respondent.

5. **Paternal education**: Father's total years of schooling as reported by the respondent.
6. **Age at first birth:** Age at first birth in years as reported by the respondent.
7. **Parity:** Total number of live births as reported by the respondent.

Control variables

1. **Religion:** Religion of the head of the household as reported by the respondent**.** Religion is divided into two categories: Hindu and non-Hindu.
2. **Caste:** Caste of the head of the household as reported by the respondent. Caste is divided into two categories: schedule caste and non-schedule caste.

Dependent variables

1. **Adequate antenatal care:** Receiving a first antenatal visit in the first trimester, at least three antenatal care visits and at least 100 iron folic acid (IFA) tablets taken during the last pregnancy.
2. **Institutional delivery:** Child birth/delivery in a health facility, private or public including sub center (SC), primary health center (PHC), community health center (CHC), district hospital (DH), or ayush clinic.
3. **Use of a private facility for maternal health care:** Childbirth/delivery in a private facility.
4. **Use of Cesarean section:** Child birth/delivery by a C-section or any operative procedure.

Research Questions and Hypotheses

This study asks four major research questions. Following each question are hypotheses based on theory and existing research. Hypotheses are tested separately for poor, rural women in each of the states, Gujarat and Tamil Nadu.

Question 1: Are receiving financial assistance from JSY or a government scheme, availability of a PHC providing services round-the-clock, connection to a health facility by an all-weather road, maternal education, paternal education, age at first birth and parity significant predictors of utilization of adequate antenatal care?

Hypotheses:

1A. Mothers who have received financial assistance from JSY or a government scheme are more likely to receive adequate antenatal care than mothers who do not receive such financial assistance.

1B. Mothers who have access to a PHC providing services round-the-clock are more likely to receive adequate antenatal care than mothers who lack such access.

1C. Mothers who have connection to a health facility by an all-weather road are more likely to receive adequate antenatal care than mothers who lack such access.

1D. Mothers with more education are more likely to receive adequate antenatal care than mothers with less education.

1E. Mothers with more educated husbands are more likely to receive adequate antenatal care than mothers with less educated husbands.

1F. Mothers who are older at the time of first birth are more likely to receive adequate antenatal care than mothers who are younger at the time of first birth.

1G. Mothers who are primipara are more likely to receive adequate antenatal care than mothers who are multipara or grand multipara.

Question 2: Are receiving financial assistance from JSY or a government scheme, availability of a PHC providing services round-the-clock, connection to a health facility by an all-weather road, maternal education, paternal education, age at first birth and parity significant predictors of utilization of an institutional delivery?

Hypotheses:

2A. Mothers who have received financial assistance from JSY or a government scheme are more likely to have an institutional delivery than mothers who did not receive such financial assistance.

2B. Mothers who have access to a PHC providing services round-the-clock are more likely to have an institutional delivery than mothers who lack such access.

2C. Mothers who have connection to a health facility by an all-weather road are more likely to have an institutional delivery than mothers who lack such access.

2D. Mothers with more education are more likely to have an institutional delivery than mothers with less education.

2E. Mothers with more educated husbands are more likely to have an institutional delivery than mothers with less educated husbands.

2F. Mothers who are older at the time of first birth are more likely to have an institutional delivery than mothers who are younger at the time of first birth.

2G. Mothers who are primipara are more likely to have an institutional delivery than mothers who are multipara or grand multipara.

Question 3: Are receiving financial assistance from JSY or a government scheme, availability of a PHC providing services round-the-clock, connection to a health facility by an all-weather road, maternal education, paternal education, age at first birth and parity significant predictors of utilization of a private facility for a delivery?

Hypotheses:

3A. In Gujarat, mothers who have received financial assistance from JSY or a government scheme are more likely to have a delivery in a private facility than mothers who did not receive such financial assistance.

3B. In Gujarat, mothers who have access to a PHC providing services round-the-clock are more likely to have a delivery in a private facility than mothers who lack such access.

3C. In Gujarat, mothers who have connection to a health facility by an all-weather road are likely to have a delivery in a private facility than mothers who lack such access.

3D. In Gujarat, mothers with more education are more likely to have a delivery in a private facility than mothers with less education.

3E. In Gujarat, mothers with more educated husbands are more likely to have a delivery in a private facility than mothers with less educated husbands.

3F. In Gujarat, mothers who are older at the time of first birth are more likely to have a delivery in a private facility than mothers who are younger at the time of first birth.

3G. Mothers who are primipara are more likely to give birth in a private facility than mothers who are multipara or grand multipara.

Question 4: Are receiving financial assistance from JSY or a government scheme, availability of a PHC providing services round-the-clock, connection to a health facility

by an all-weather road, maternal education, paternal education, age at first birth and parity significant predictors of utilization of Cesarean section?

Hypotheses:

4A. Mothers who have received financial assistance from JSY or a government scheme are more likely to have a Cesarean section than mothers who did not receive such financial assistance.

4B. Mothers who have access to a PHC providing services round-the-clock are more likely to have a Cesarean section than mothers who lack such access.

4C. Mothers who have connection to a health facility by an all-weather road are more likely to have a Cesarean section than mothers whose lack such access.

4D. Mothers with more education are more likely to have a Cesarean section than mothers with less education.

4E. Mothers with more educated husbands are more likely to have a Cesarean section than mothers with less educated husbands.

4F. Mothers who are older at the time of first birth are more likely to have a Cesarean section than mothers who are younger at the time of first birth.

4G. Mothers who are primipara are more likely to have a Cesarean section than mothers who are multipara or grand multipara.

Chapter 3: Methodology

Sample

The present study utilizes the District Level Household Survey (DLHS)-3 data for secondary data analyses. The DLHS was initiated in 1997 to assess individuals' utilization of services provided by government health care facilities and their perceptions about the quality of these services. The DLHS-3 in 2007-08 is the third in the series of district surveys, preceded by DLHS-1 in 1998-99 and DLHS-2 in 2002-04. The International Institute for Population Sciences (IIPS) conducted all three surveys. DLHS-3, like the two previous surveys, was designed to provide estimates of important indicators of maternal and child health, family planning and other reproductive health services. In addition, DLHS-3 also provides information about important interventions of the National Rural Health Mission (NRHM).

DLHS-3 data provide information on maternal health services utilization for ever-married women between the ages of 15 and 49 years who were pregnant after January 2004 and had delivered by December 2007. For multipara women and grand multipara women, the data used are from the most recent birth. The sample size among the districts in the two target states depended on their use of maternal and child health care services, including antenatal care, institutional delivery, child immunization and other factors reported in DLHS-2. For low performing districts, the sample size was 1,500 households (HHs); for medium performing districts, 1,200 HHs; and for good performing districts, 1,000 HHs.

Data were collected from 720,320 households from 28 Indian states and 6 Union territories during 2007-08. From these households, 643,944 ever-married women ages

15-49 years were interviewed. In the state of Gujarat, 26,145 households and 24,513 ever-married women were surveyed. The response rates are 90.8% and 89.7% for households and ever-married women, respectively. In Tamil Nadu, 32,623 households and 26,685 ever-married women ages 15-49 years were surveyed. The response rates are 98.1% and 96.5% for households and ever-married women, respectively.

The sample for this study is comprised of all ever-married women belonging to the lowest two wealth quintiles (1^{st} and 2^{nd}) and residing in rural areas in the states of Gujarat and Tamil Nadu. All women in the sample gave birth between January 2006 and December 2007. The final combined analytic sample for both states was 2,267 women, which included 1,608 women from Gujarat and 659 women from Tamil Nadu.

Measures

Five uniform bilingual questionnaires, both in English and in the local language, were used in DLHS-3: Household, Ever-married Women (ages 15-49), Unmarried Women (ages 15-24), Village and Health Facility questionnaires. The Household questionnaire collected information on all members of the household, religion of the head of household, caste of the head of household, the socioeconomic characteristics of the household, assets possessed, number of marriages to members of the household since January 2004 and deaths in the household since January 2004. In the case of female deaths, attempts were made to determine if they were maternal deaths.

The Ever-married Women questionnaire collected data on women's demographic characteristics, maternal care, immunization and childcare, contraception and fertility preferences and reproductive health including knowledge about HIV/AIDS. The Village questionnaire contained information on availability of health facilities in the village and if

the health facilities were accessible throughout the year by an all-weather road. For the first time, a population-linked Health Facility questionnaire was used in DLHS-3. This questionnaire collected data on all community health centers (CHCs) and district hospitals (DH) in a district. Further, all sub-centers (SC) and primary health centers (PHC) expected to serve the population of the selected primary sampling unit were covered. There were separate questionnaires for SC, PHC, CHC and DH. They included questions on infrastructure, human resources, supply of drugs and instruments, and performance.

Study Variables. DLHS-3 questions used in the present study are presented in Appendix A. The Village questionnaire provided data on availability of a PHC providing services round-the-clock and connection to a health facility by an all-weather road. The Ever-married Women questionnaire provided information on receipt of financial assistance from JSY or a government scheme, maternal education, paternal education, age at first birth and parity. Data for the control variables (religion and caste) came from the Household questionnaire and information about women's use of maternal health services came from the Ever-Married Women questionnaire. The Ever-married Women dataset included the control variables from the Household questionnaire. Thus, the final dataset used in this study merged data from the DLHS-3 Ever-married Women dataset and the Village dataset.

Following is a summary of study variables and how they were measured to test the hypotheses.

Independent Variables

1. **Receipt of financial assistance from JSY or a government scheme:** Receipt of any financial assistance from JSY or any government schemes (such as CY) during the last childbirth. It is a binary variable.
2. **Availability of a PHC providing services round-the-clock:** Presence of a primary health center (PHC) providing 24-7 services. It is a binary variable.
3. **Connection to a health facility by an all-weather road:** Village of residence connected throughout the year by a road to a sub-center, primary health center, community health center, district hospital or block primary health center. It is a binary variable.
4. **Maternal education:** Mother's total years of schooling was obtained and placed in one of four categories: Uneducated, less than five years of education, five to nine years of education and ten or more years of education.
5. **Paternal education:** Husband's total years of schooling was obtained and placed in one of four categories: Uneducated, less than five years of education, five to nine years of education and ten or more years of education.
6. **Age at first birth:** Age at which the respondent gave birth to her first child. It is a continuous variable.
7. **Parity:** Total number of live birth**s** reported by the mother. Parity is divided into three categories: primipara, or one live birth; multipara, or more than one but less than four live births; and grand multipara, or four or more live births**.**

Control Variables

1. **Religion:** Mother's religion is treated as being the same religion as the head of household, as is the custom in India. For the present study, religion is divided into two categories, Hindu and non- Hindu.
2. **Caste:** Mother's caste is treated as being the same caste as the head of household, as is the custom in India. It is divided into two categories: schedule caste (SC) and non-schedule caste (non-SC). Non-schedule caste includes schedule tribe, other backward castes and other castes.

Dependent variables

1. **Adequate antenatal care:** Mother having an antenatal visit in the first trimester, at least three antenatal visits and 100 or more iron folic acid (IFA) tablets. It is a binary variable. All of the conditions need to be satisfied for a "yes."
2. **Institutional delivery:** Mother having a delivery in a government facility, private facility or NGO hospital. Government facilities include sub center (SC), primary health center (PHC), community health center (CHC), district hospital (DH), urban Health centers (UHC) or ayush Clinic. Institutional delivery is a binary variable.
3. **Private facility delivery:** Mother using a private facility for an institutional delivery. Use of a private facility is a binary variable.
4. **Cesarean section:** Any delivery other than normal (vaginal delivery without use of instruments) is considered as a C-section delivery because the number

of other operative deliveries is very low for the analytic sample. Use of Cesarean section is a binary variable.

Procedure

The present study uses DLHS-3 data from Ever-married Women and Village dataset in the states of Gujarat and Tamil Nadu. The DLHS-3 used two-stage stratified random sampling in rural areas and three-stage stratified sampling in urban areas of each district. The information from the 2001 Census was used as a sampling frame for selecting primary sampling units (PSUs). In rural areas, all of the villages in the district were stratified based on population/HH size, percentage of schedule caste population, female literacy (years of schooling) and other factors. The required number of villages from each stratum was selected with probability proportional to size (PPS). In selected primary sampling units (villages), households were listed and the required number of households was selected using systematic random sampling. For larger villages (more than 300 HHs) segmentation was carried out. In cases of 300 to 600 HHs, two segments of equal size were created and one was selected using PPS. For PSUs having more than 600 HHs, segments of 150 HHs were created depending on size and then two segments were selected using PPS.

Participation in the survey was voluntary. The IIPS took steps to minimize the likelihood that an individual participating in the study could be identified. The DLHS data are available for public use and every case has an identification number. It is not possible to connect the data to individual participants.

The policy analysis uses government documents, reports, data from national and state government websites and reports and documents from international agencies such as

the United Nations Population Fund (UNFPA) and World Health Organization (WHO). Relevant publications from peer-reviewed journals and government and non-government agencies also provide information on policies related to maternal health services. Selected stakeholders at the district, state and national level in India were interviewed to obtain pertinent information or confirm findings and insights that needed verification. The policy analysis examines implementation of JSY, CY, human resource policies, infrastructure, logistics management and budgeting policies for both Gujarat and Tamil Nadu.

Data Analyses

Descriptive statistics for all independent control and dependent variables were generated to summarize the sample's demographics and maternal services utilization data for each of the two Indian states. Bivariate analyses using binary logistic regression were conducted to examine the relationships among all independent and dependent variables. To test the hypotheses, multiple logistic regression analyses were used to determine the degree to which the independent variables are predictors of the four dependent maternal health service utilization variables. Religion and caste were control variables. Logistic regression was selected as the appropriate statistical model to apply to this study because all of the dependent variables are binary. Four separate regression analyses were carried out for each of the two states, one for each of the dependent variables. Statistical software IBM SPSS 19 was used in the statistical data analyses.

All analyses were carried out using state level ever-married women weights. Sampling weights for household, ever-married women and unmarried women were

generated by DLHS-3 for each district. These design weights were used for computations of district level demographic and reproductive child health indicators.

The policy analysis includes descriptions of financial, human resource and infrastructure policies and practices in the two selected states. The opportunity to examine how study results may be linked to differential state policies and practices enhanced understanding of the similarities and differences in women's use of maternal health services in the two Indian states.

Chapter 4: Results

Descriptive Statistics

The analytic sample consisted of 2,267 women between the ages of 15 and 49 who were residing in the Indian states of Gujarat and Tamil Nadu. Women belonging to the lowest two wealth quintiles who gave birth between January 2006 and December 2007 were included in the analyses. Table 2 presents characteristics of the analytic sample by state. There were few missing cases in this dataset; use of a private facility had 0.54% missing data for the state of Gujarat and 3.24% for the state of Tamil Nadu.

Table 3 illustrates differences between the two states with respect to health care sector and household variables, as well as maternal health care utilization outcomes. Chi-square statistics were used to examine differences between the two states on all variables except for age at first birth, where a *t* test was used. Results revealed significant differences for all variables except religion and use of a private facility for delivery. With respect to health care sector variables, women in Tamil Nadu (28.3%) were more than three times more likely than those in Gujarat (8.8%) to receive payment from JSY or another government scheme for their most recent birth. Women in Tamil Nadu (73.8%) had greater access to a primary health center (PHC) than those in Gujarat (58.5%); those in Tamil Nadu (97%) also had greater access to a health facility by an all-weather road than women in Gujarat (80.7%).

There were also significant differences in the household variables of maternal education, paternal education, age at first birth, and parity in the two states.

Table 3: Descriptive Statistics for Gujarat and Tamil Nadu

Variable	Gujarat	Tamil Nadu	*p* value
Receipt of financial assistance from JSY/govt. scheme			
Received financial assistance	08.8%	28.3%	0.00**
Did not receive financial assistance	91.2%	71.7%	
Availability of PHC providing services round-the-clock			
PHC available	58.5%	73.8%	0.00**
PHC not available	41.5%	26.2%	
Connected to a health facility by an all-weather road			
Connection available	80.7%	97.0%	0.00**
Connection not available	19.3%	03.0%	
Maternal education			
Uneducated	71.1%	31.3%	0.00**
Less than 5 years	10.0%	09.7%	
5-9 years	16.5%	45.7%	
10 or more years	02.4%	13.3%	
Paternal education			
Uneducated	40.2%	26.7%	0.00**
Less than 5 years	12.7%	11.0%	
5-9 years	32.9%	46.3%	
10 or more years	14.2%	16.0%	
Age at first birth (in yrs)			
Mean	19.5 yrs	21.0 yrs	0.00**
Minimum	10.0 yrs	14.0 yrs	
Maximum	35.0 yrs	37.0 yrs	
Parity			
Primipara	22.3%	36.6%	0.00**
Multipara	41.5%	51.9%	
Grand Multipara	36.2%	11.4%	
Religion			
Hindu	95.8%	96.4%	0.51
Non-Hindu	04.2%	03.6%	
Caste			
Schedule caste	53.8%	95.4%	0.00**
Non-Schedule caste	46.2%	04.6%	
Adequate antenatal care			
Yes	12.3%	28.7%	0.00**
No	87.7%	71.3%	
Institutional delivery			
Yes	30.9%	85.3%	0.00**
No	69.1%	14.7%	
Use of a private facility			
Yes	16.2%	16.0%	0.89
No	83.8%	84.0%	
Use of C-section			
Yes	03.6%	14.8%	0.00**
No	96.4%	85.3%	

** $p<0.01$

With respect to household factors, poor women in Gujarat (71.1%) were more than twice as likely to be uneducated as women in Tamil Nadu (31.3%). Approximately 10% of women in both states had less than 5 years of education. Tamil women (45.7%) were almost 3 times more likely than Gujarati women (16.5%) to have 5-9 years of education. Similarly, Tamil women (13.3%) were more than 5 times more likely than Gujarati women (2.4%) to have the highest level of education, 10 or more years.

Table 3 also reveals that husbands in both states were more educated than their wives. However, when comparing husbands in the two states, those in Gujarat (40.2%) were more likely to be uneducated than those in Tamil Nadu (26.7%). Approximately equal numbers of Gujarati (12.7%) and Tamil (11.0%) husbands had less than 5 years of education. Tamil husbands (46.3%) were more likely to have 5-9 years of education than Gujarati husbands (32.9%). Similarly, Tamil husbands (16.0%) were slightly more likely than those in Gujarat (14.2%) to have the highest level of education, 10 or more years.

Women in Tamil Nadu had a significantly higher mean age of first birth (21.0 years) than women in Gujarat (19.5 years). There were also significant differences in parity of mothers in the two states. In the state of Gujarat, 22.3% of women were primipara, 41.5% were multipara and 36.2% were grand multipara. In Tamil Nadu, 36.6% of women were primipara, 51.9% were multipara and 11.5% were grand multipara. With respect to religion, the vast majority of women in both Tamil Nadu (96.4%) and Gujarat (95.8%) were Hindu, with no significant difference between the states on this variable. However, there was a significant difference in caste, with substantially more Tamil women (95.4%) than Gujarati women (53.8%) in the schedule caste.

Examination of maternal health services utilization in Gujarat and Tamil Nadu revealed significant differences between the states for three of the four variables. Women in Tamil Nadu (28.7%) were more than twice as likely to receive adequate antenatal care than women in Gujarat (12.3%). Similarly, Tamil women (85.3%) were almost three times more likely to have an institutional delivery than Gujarati women (30.9%). However, no significant differences were found in the use of private facilities between the two states, with Gujarati women (16.2%) only slightly more likely to deliver in a private facility than Tamil women (16.0%). With respect to C-section, women in Tamil Nadu (14.8%) were significantly more likely to have a C-section than those in Gujarat (3.6%).

Bivariate Analyses

Bivariate analyses were used to examine relationships between the independent variables and the four dependent variables and to select variables to use as predictors in the multivariate analyses. All variables that have a moderately significant relationship ($p < 0.10$) with at least one of the four dependent measures of health services utilization in Gujarat or Tamil Nadu were included in the regression model for multivariate analyses. Findings reveal that all of the independent variables, including receiving financial assistance from JSY or a government scheme, access to a PHC providing round-the-clock services, connection by an all-weather road, maternal education, paternal education, age at first birth and parity were significantly related to at least one health service utilization variable in Gujarat or Tamil Nadu. Table 4 presents results of the bivariate analyses for Gujarat and Table 5 presents results from Tamil Nadu.

Table 4: Bivariate Analyses for Gujarat

	Adequate antenatal care		Institutional delivery		Use of a private facility		Use of C-section	
Independent variables	**Unadj. OR**	***p* value**	**Unadj. OR**	***p* value**	**Unadj. OR**	***p* value**	**Unadj. OR**	***p* value**
Receipt of financial assistance from JSY/govt. scheme	0.86	0.66	4.23	0.00**	2.25	0.00**	1.46	0.36
Access to a PHC providing services round-the-clock	1.48	0.09^{+}	1.10	0.40	0.99	0.92	1.14	0.63
Connection by an all-weather road to a health facility	0.99	0.97	1.40	0.02*	1.24	0.23	0.71	0.28
Maternal education								
Uneducated	Ref.							
Less than 5 years	1.33	0.42	0.97	0.88	0.74	0.23	0.94	0.90
5-9 years	1.30	0.33	1.26	0.11	1.02	0.92	1.38	0.34
10 or more years	2.86	0.02*	1.52	0.21	1.14	0.76	1.63	0.51
Paternal education								
Uneducated	Ref.							
Less than 5 years	2.07	0.03*	0.76	0.15	0.78	0.32	0.66	0.46
5-9 years	0.92	0.78	1.12	0.36	1.18	0.30	1.40	0.29
10 or more years	1.67	0.09^{+}	1.57	0.00**	1.80	0.00**	1.82	0.11
Age at first birth	1.07	0.06^{+}	1.06	0.00**	1.06	0.02*	0.98	0.74
Parity								
Primipara	Ref.							
Multipara	1.03	0.90	0.51	0.00**	0.54	0.00**	0.46	0.00**
Grand multipara	0.56	0.06^{+}	0.45	0.00**	0.51	0.00**	0.23	0.00**
Unadj. OR-Unadjusted Odds Ratio							+p<0.10	*p<0.05 **p<0.01

Table 5: Bivariate Analyses for Tamil Nadu

	Adequate antenatal care		Institutional delivery		Use of a private facility		Use of C-section	
Independent variables	**Unadj. OR**	***p* value**	**Unadj. OR**	***p* value**	**Unadj. OR**	***p* value**	**Unadj. OR**	***p* value**
Receipt of financial assistance from JSY/govt. scheme	1.12	0.58	1.95	0.02*	1.55	0.06+	2.03	0.00**
Access to a PHC providing services round-the-clock	1.09	0.70	1.07	0.79	0.83	0.44	1.41	0.22
Connection by an all-weather road to a health facility	1.09	0.88	3.68	0.00**	1.53	0.57	0.58	0.34
Maternal education								
Uneducated	Ref.							
Less than 5 years	0.85	0.64	1.35	0.42	1.10	0.81	2.25	0.05+
5-9 years	1.10	0.64	2.60	0.00**	1.22	0.46	1.66	0.08+
10 or more years	1.10	0.75	3.68	0.00**	1.99	0.04*	2.28	0.03*
Paternal education								
Uneducated	Ref.							
Less than 5 years	1.18	0.60	1.41	0.38	1.34	0.44	0.91	0.83
5-9 years	1.00	0.98	1.90	0.00**	1.05	0.84	1.29	0.38
10 or more years	1.03	0.91	2.16	0.04*	1.32	0.43	2.24	0.02*
Age at first birth	1.04	0.14	1.10	0.00**	1.06	0.04*	1.10	0.00**
Parity								
Primipara	Ref.							
Multipara	0.75	0.14	0.49	0.00**	0.60	0.03*	0.51	0.00**
Grand multipara	0.69	0.26	0.24	0.00**	0.29	0.00**	0.11	0.00**
Unadj. OR-Unadjusted Odds Ratio						+p<0.10 *p<0.05 **p<0.01		

Tables 4 and 5 reveal that in Gujarat, adequate antenatal care was significantly associated with access to a PHC ($p<0.10$), maternal education ($p<0.05$), paternal education ($p<0.05$), age at first birth ($p<0.10$) and parity ($p<0.10$). However, none of the independent variables were significantly associated with antenatal care in Tamil Nadu. In Gujarat, institutional delivery was significantly associated with receiving financial assistance from JSY or a government scheme ($p<0.01$), connection to a health facility by an all-weather road ($p<0.05$), paternal education ($p<0.01$), age at first birth ($p<0.01$) and parity ($p<0.01$). In Tamil Nadu, there were significant associations between institutional delivery and receiving financial assistance from JSY or a government scheme ($p<0.05$), connection by an all-weather road ($p<0.01$), maternal education ($p<0.01$), paternal education ($p<0.01$), age at first birth ($p<0.01$) and parity ($p<0.01$).

In Gujarat, use of a private facility was significantly associated with receiving financial assistance from JSY or a government scheme ($p<0.01$), paternal education ($p<0.01$), age at first birth ($p<0.05$) and parity ($p<0.01$). In Tamil Nadu, there were significant associations between use of a private facility and receiving financial assistance from JSY or a government scheme ($p<0.10$), maternal education ($p<0.05$), age at first birth ($p<0.05$) and parity ($p<0.01$). Use of a C-section was significantly associated with parity in Gujarat ($p<0.01$). In Tamil Nadu, use of a C-section was significantly associated with receiving financial assistance from JSY or a government scheme ($p<0.01$), maternal education ($p<0.05$), paternal education ($p<0.05$), age at first birth ($p<0.01$) and parity ($p<0.01$).

Multivariate Analyses

The major purpose of this study was to examine predictors of maternal health services utilization among poor, rural women in Gujarat and Tamil Nadu. Based on the literature review and results of the bivariate analyses, all of the independent variables in the bivariate analyses were used in the multivariate analyses for the two states. Logistic regression was used for multivariate analyses. The logistic regression model examined the associations between a set of independent variables and a binary dependent variable. The independent variables in the logistic regression model included receiving financial assistance from JSY or a government scheme, access to a PHC providing round-the-clock care, connection to a health facility by an all-weather road, maternal education, paternal education, age at first birth and parity. The four binary dependent variables were adequate antenatal care, institutional delivery, use of a private facility for delivery and use of Cesarean section. All of the associations with *p* values of less than 0.05 are considered significant. Hosmer-Lemeshow goodness of fit tests revealed that models for all outcomes variables were a good fit for the data in both Gujarat and Tamil Nadu ($p>0.05$).

Multivariate Analyses for Receiving Adequate Antenatal Care

Table 6 presents results of the multivariate analyses for receiving adequate antenatal care; adjusted odds ratios and 95% confidence intervals are shown for independent variables in the model. With respect to the health care sector variables, receipt of financial assistance from JSY or a government scheme and availability of a PHC providing services round-the-clock failed to significantly predict receipt of adequate antenatal care in Gujarat or Tamil Nadu.

Table 6: Multivariate Analyses for Receipt of Adequate Antenatal Care

Independent Variable	Gujarat			Tamil Nadu		
	Adjusted odds ratio	**95% CI**	***p* value**	**Adjusted odds ratio**	**95% CI**	***p* value**
Receipt of financial assistance from JSY/govt. scheme	0.74	0.36-1.54	0.43	1.60	0.87-2.93	0.13
Availability of PHC providing services round-the-clock	1.51	0.95-2.42	0.08	1.04	0.62-1.75	0.89
Connected to a health facility by an all-weather road	1.03	0.56-1.89	0.91	3.42	1.24-9.47	0.02*
Maternal Education						
Uneducated	Ref.					
Less than 5 years	1.24	0.61- 2.53	0.55	1.18	0.54-2.59	0.67
5-9 years	1.05	0.59-1.90	0.86	2.34	1.32-4.15	0.00**
10 or more years	2.10	0.74-6.00	0.16	2.97	1.08-8.21	0.04*
Paternal Education						
Uneducated	Ref.					
Less than 5 years	2.00	1.04-4.02	0.04*	1.15	0.50-2.59	0.74
5-9 years	0.84	0.46-1.53	0.57	1.17	0.64-2.13	0.61
10 or more years	1.41	0.74-2.72	0.30	1.07	0.45-2.55	0.87
Age at first birth	1.05	0.97-1.13	0.24	1.08	1.00-1.19	0.06
Parity						
Primipara	Ref.					
Multipara	1.07	0.62-1.86	0.81	0.65	0.36-1.17	0.15
Grand Multipara	0.60	0.30-1.19	0.14	0.43	0.19-0.97	0.04*
						*p<0.05 **p<0.01

Connection to a health facility by an all-weather road was a significant predictor of antenatal care in Tamil Nadu; women with an all-weather road connection were 3.4 times more likely to receive adequate antenatal care than women without such a connection. In Gujarat, such access was not a significant predictor of receiving adequate antenatal care.

With respect to household variables, maternal education was found to be a significant predictor of receiving adequate antenatal care in Tamil Nadu. Women with 5-9 years of education were 2.3 times more likely and women with 10 or more years of education were almost 3 times more likely to have received adequate antenatal care when compared to uneducated women. However, in Gujarat, maternal education was not significantly associated with receiving adequate antenatal care.

In Gujarat, there was a positive association between paternal education and women's receipt of adequate antenatal care. Specifically, women whose husbands had less than 5 years of education were twice as likely to have received adequate antenatal care compared to those with uneducated husbands. The association was not significant for women whose husbands had higher levels of education. In Tamil Nadu, paternal education was not a significant predictor of women receiving adequate antenatal care. Age at first birth was not a significant predictor for receiving adequate antenatal care in Gujarat and Tamil Nadu. In Tamil Nadu, parity was a significant predictor of receiving antenatal care; a grand multipara woman was 57% less likely to receive adequate antenatal care compared to a primipara woman. In Gujarat, parity was not a significant predictor of receiving adequate antenatal care.

Multivariate Analyses for Use of Institutional Delivery

Table 7 presents results of the multivariate analyses for use of institutional delivery; adjusted odds ratios and 95% confidence intervals are shown for independent variables in the model. With respect to the health care sector variables, receiving financial assistance from JSY or a government scheme was a significant predictor of institutional delivery in Gujarat; women who received payment were 3.9 times more likely to have an institutional delivery than those who did not receive payment. However, there was no association between JSY or a government scheme payment and having an institutional delivery in Tamil Nadu. Availability of a PHC providing services round-the-clock was not a significant predictor of having an institutional delivery in either Gujarat or Tamil Nadu. However, connection to a health facility by an all-weather road significantly predicted women's use of institutional delivery in both states. Access to such a road increases the odds of women having an institutional delivery 1.4 times in Gujarat and 3.4 times in Tamil Nadu compared to women who do not have such access.

With respect to household variables, maternal education was not a significant predictor of institutional delivery in Gujarat. However, in Tamil Nadu, maternal education was found to have a significant positive association with institutional delivery. Women having 5-9 years of education were 2.3 times more likely and women having 10 or more years of education were 3.0 times more likely to have an institutional delivery than uneducated women. In Gujarat, paternal education was significantly related to institutional delivery for women whose husbands had 10 more years of education; these women were 1.4 times more likely to have an institutional delivery compared to women with uneducated husbands.

Table 7: Multivariate Analyses for Use of Institutional Delivery

Independent Variable	Gujarat			Tamil Nadu		
	Adjusted odds ratio	**95% CI**	***p* value**	**Adjusted odds ratio**	**95% CI**	***p* value**
Receipt of financial assistance from JSY/ govt. scheme	3.93	2.68-5.77	0.00**	1.60	0.87-2.93	0.13
Availability of PHC providing services round-the-clock	1.04	0.83-1.31	0.72	1.04	0.62-1.75	0.89
Connected to health facility by all-weather road	1.42	1.06-1.90	0.02*	3.42	1.24-9.47	0.02*
Maternal education						
Uneducated	Ref.					
Less than 5 years	0.85	0.58-1.25	0.42	1.18	0.43-1.67	0.67
5-9 years	1.01	0.74-1.38	0.95	2.34	1.32-4.15	0.00**
10 or more years	0.85	0.43-1.69	0.65	2.97	1.08-8.21	0.04*
Paternal education						
Uneducated	Ref.					
Less than 5 years	0.72	0.50-1.06	0.10	1.15	0.49-2.72	0.74
5-9 years	0.99	0.76-1.30	0.96	1.17	0.64-2.13	0.61
10 or more years	1.44	1.03-2.02	0.03*	1.07	0.45-2.55	0.87
Age at first birth	1.05	1.01-1.09	0.02*	1.08	1.00-1.17	0.06
Parity						
Primipara	Ref.					
Multipara	0.54	0.41-0.72	0.00**	0.65	0.51-1.10	0.15
Grand Multipara	0.54	0.40-0.72	0.00**	0.43	0.19-0.97	0.04*

*$p<0.05$ **$p<0.01$

Paternal education was not a significant predictor of institutional delivery in Tamil Nadu. Age at first birth was found to be a significant predictor of institutional delivery in Gujarat. With each one-year increase in a woman's age at first birth, the odds of her having an institutional delivery increased by 5%. Age at first birth was not significantly associated with institutional delivery in Tamil Nadu. In both states, parity was a significant predictor of having an institutional delivery. In Gujarat, both multipara and grand multipara women were 46% less likely to have an institutional delivery compared to a primipara woman. In Tamil Nadu, a grand multipara woman was 57% less likely to have an institutional delivery compared to a primipara woman.

Multivariate Analyses for Use of a Private Facility

Table 8 presents results of the multivariate analyses for use of a private facility; adjusted odds ratios and 95% confidence intervals are shown for independent variables in the model. With respect to the health care sector variables, receiving financial assistance from JSY or a government scheme was a significant predictor of use of a private facility in Gujarat; women receiving such a payment were twice as likely to use a private facility as those who did not receive financial assistance. There was no association between JSY/government scheme payment and women's delivery in a private facility in Tamil Nadu. Availability of a PHC providing services round-the-clock was not a significant predictor of women's use of a private facility for delivery in Gujarat or Tamil Nadu. Connection to a health facility by an all-weather road also failed to predict women's use of a private facility in either state. With respect to household variables, maternal education was not significantly associated with use of a private facility in either state.

Table 8: Multivariate Analyses for Use of a Private Facility

Independent Variable	Gujarat			Tamil Nadu		
	Adjusted odds ratio	**95% CI**	***p* value**	**Adjusted odds ratio**	**95% CI**	***p* value**
Receipt of financial assistance from JSY/govt. scheme	2.06	1.36-3.12	0.00**	1.35	0.84-2.18	0.21
Availability of PHC providing services round-the-clock	0.94	0.72-1.25	0.69	0.80	0.49-1.31	0.38
Connected to health facility by all-weather road	1.26	0.87-1.81	0.22	1.43	0.33-6.17	0.63
Maternal Education						
Uneducated	Ref.					
Less than 5 years	0.64	0.39-1.06	0.09	1.03	0.43-1.67	0.94
5-9 years	0.81	0.56-1.19	0.28	1.19	0.67-2.11	0.56
10 or more years	0.61	0.25-1.46	0.27	2.04	0.97-4.32	0.06
Paternal Education						
Uneducated	Ref.					
Less than 5 years	0.81	0.49-1.33	0.41	1.29	0.59-2.84	0.52
5-9 years	1.16	0.84-1.61	0.37	0.82	0.46-1.48	0.52
10 or more years	1.84	1.23-2.73	0.00**	0.94	0.44-1.99	0.87
Age at first birth	1.04	0.99-1.10	0.08	1.05	0.98-1.12	0.15
Parity						
Primipara	Ref.					
Multipara	0.57	0.41-0.79	0.00**	0.69	0.43-1.07	0.10
Grand Multipara	0.57	0.40-0.82	0.00**	0.37	0.14-0.99	0.04*
						*p<0.05 **p<0.01

In Gujarat, paternal education was a significant predictor of women's use of a private facility. Women whose husbands had 10 or more years of education were 1.8 times more likely than women with uneducated husbands to use a private facility. Paternal education did not significantly predict women's use of a private facility in Tamil Nadu. Age at first birth was not significantly associated with use of a private facility in either state. Parity was a significant predictor of women's use of a private facility in both states. In Gujarat, multipara and grand multipara women had 43% less odds of using a private facility compared to primipara women. In Tamil Nadu, grand multipara women were 63% less likely to use a private facility than primipara women.

Multivariate Analyses for Use of Cesarean Section

Table 9 presents results of the multivariate analyses for use of Cesarean section; adjusted odds ratios and 95% confidence intervals are shown for independent variables. With respect to the health care sector variables, women in Tamil Nadu who received financial assistance from JSY or a government scheme were 1.7 times more likely to have a C-section than those who did not receive such payment. There was no significant association between receipt of a JSY/government scheme payment and a C-section delivery in Gujarat. Neither availability of a PHC providing services round-the-clock nor connection to a health facility by an all-weather road was a significant predictor of a C-section delivery in Gujarat or Tamil Nadu. With respect to household variables, maternal education was not a significant predictor of C-section delivery in Gujarat. However, there was a significant association between these variables in Tamil Nadu; specifically, the odds of having a C-section were 2.4 times higher for women having less than 5 years of education compared to uneducated women in this state.

Table 9: Multivariate Analyses for Use of Cesarean Section

Independent Variable	Gujarat			Tamil Nadu		
	Adjusted odds ratio	**95% CI**	***p* value**	**Adjusted odds ratio**	**95% CI**	***p* value**
Receipt of financial assistance from JSY/govt. scheme	1.11	0.48-2.54	0.80	1.66	1.01-2.70	0.04*
Availability of PHC providing services round-the-clock	1.16	0.93-2.34	0.60	1.59	0.90-2.81	0.11
Connected to health facility by all-weather road	0.71	0.38-1.34	0.30	0.44	0.14-1.31	0.14
Maternal Education						
Uneducated	Ref.					
Less than 5 years	0.80	0.30-2.11	0.65	2.44	1.05-5.66	0.04*
5-9 years	0.99	0.48-2.02	0.98	1.57	0.78-3.18	0.21
10 or more years	0.86	0.17-4.45	0.86	1.99	0.83-4.79	0.12
Paternal Education						
Uneducated	Ref.					
Less than 5 years	0.67	0.22-2.01	0.47	0.83	0.31-2.22	0.71
5-9 years	1.20	0.62-2.32	0.58	0.93	0.49-1.79	0.84
10 or more years	1.69	0.77-3.71	0.19	1.85	0.84-4.10	0.13
Age at first birth	0.94	0.83-1.06	0.30	1.08	1.01-1.16	0.02*
Parity						
Primipara	Ref.					
Multipara	0.44	0.24-0.81	0.00**	0.58	0.36-0.96	0.03*
Grand Multipara	0.23	0.10-0.51	0.00**	0.18	0.04-0.80	0.02*

*p<0.05 **p<0.01

Paternal education was not a significant predictor of a woman's C-section delivery in either Gujarat or Tamil Nadu. Age at first birth was not a predictor of C-section delivery in Gujarat, but was a significant predictor in Tamil Nadu. With each one-year increase in a woman's age at first birth, the odds of her having a C-section increased by 8%. Parity was a significant predictor of use of C-section in both states. In Gujarat, a multipara woman was 56% less likely and a grand multipara woman was 77% less likely to have a C-section compared to a primipara. In Tamil Nadu, a multipara woman was 42% less likely and a grand multipara woman was 82% less likely to have a C-section than a primipara woman.

Summary of Hypotheses and Results

Table 10 presents a summary of all hypotheses and results of the multivariate analyses, organized by the four dependent variables measuring use of maternal health services.

Table 10: Summary of Hypotheses and Findings

No.	Hypothesis	Results for Gujarat	Results for Tamil Nadu
1A	Mothers who have received financial assistance from JSY or a government scheme are more likely to obtain adequate antenatal care than mothers who do not receive such financial assistance.	Not supported	Not supported
1B	Mothers who have access to a PHC providing services round-the-clock are more likely to obtain adequate antenatal care than mothers who lack such access.	Not supported	Not supported
1C	Mothers who have connection to a health facility by an all-weather road are more likely to obtain adequate antenatal care than mothers who lack such access.	Not supported	Supported

1D	Mothers with more education are more likely to obtain adequate antenatal care than mothers with less education.	Not supported	Supported
1E	Mothers with more educated husbands are more likely to obtain adequate antenatal care than mothers with less educated husbands.	Supported for less than 5 years of paternal education	Not supported
1F	Mothers who are older at the time of first birth are more likely to obtain adequate antenatal care than mothers who are younger at the time of first birth.	Not supported	Not supported
1G	Mothers who are primipara are more likely to obtain adequate antenatal care than mothers who are multipara or grand multipara.	Not supported	Supported for grand multipara
2A	Mothers who have received financial assistance from JSY or government scheme are more likely to obtain have institutional delivery than mothers who did not receive such financial assistance.	Supported	Not supported
2B	Mothers who have access to a PHC providing services round-the-clock are more likely to have institutional delivery than mothers who lack such access.	Not supported	Not supported
2C	Mothers who have connection to a health facility by an all-weather road are more likely to have institutional delivery than mothers who lack such access.	Supported	Supported
2D	Mothers with more education are likely to have institutional delivery than mothers with less education.	Not supported	Supported
2E	Mothers with more educated husbands are more likely to have institutional delivery than mothers with less educated husbands.	Supported for 10 or more years of paternal education	Not supported
2F	Mothers who are older at the time of first birth are more likely to have institutional delivery than mothers who are younger at the time of first birth.	Supported	Not supported
2G	Mothers who are primipara are likely to have institutional delivery than mothers who are multipara or grand multipara.	Supported	Supported

3A	In Gujarat, mothers who have received financial assistance from JSY or government scheme are more likely to have delivery in a private facility than mothers who did not receive such financial assistance.	Supported	Not Applicable
3B	In Gujarat, mothers who have access to a PHC providing services round-the-clock will be more likely to have a delivery in a private facility than mothers who lack such access.	Not supported	Not Applicable
3C	In Gujarat, mothers who have connection to a health facility by an all-weather road are likely to have a delivery in a private facility than mothers who lack such access.	Not supported	Not Applicable
3D	In Gujarat, mothers with more education are more likely to have a delivery in a private facility than mothers with less education.	Not supported	Not Applicable
3E	In Gujarat, mothers with more educated husbands are more likely to have a delivery in a private facility than mothers with less educated husbands.	Supported for 10+ years of paternal education	Not Applicable
3F	In Gujarat, mothers who are older at the time of first birth are likely to have a delivery in a private facility than mothers who are younger at the time of first birth.	Not supported	Not Applicable
3G	Mothers who are primipara are more likely to give birth in a private facility than mothers who are multipara or grand multipara.	Supported	Supported
4A	Mothers who have received financial assistance from JSY or government scheme are more likely to have a Cesarean section than mothers who did not receive such financial assistance.	Not supported	Supported
4B	Mothers who have access to a PHC providing services round-the-clock are more likely to have a Cesarean section than mothers who lack such access.	Not supported	Not supported

4C	Mothers who have connection to a health facility by an all-weather road are more likely to have a Cesarean section than mothers whose lack such access.	Not supported	Not supported
4D	Mothers with more education are more likely to have a Cesarean section than mothers with less education.	Not supported	Supported for less than 5 years of education
4E	Mothers with more educated husbands are more likely to have a Cesarean section than mothers with less educated husbands.	Not supported	Not supported
4F	Mothers who are older at the time of first birth are more likely to have a Cesarean section than mothers who are younger at the time of first birth.	Not supported	Supported
4G	Mothers who are primipara are more likely to have a Cesarean section than mothers who are multipara or grand multipara.	Supported	Supported

Chapter 5: Discussion

This study utilized the Health Systems Framework for Maternal, Neonatal and Child Health to examine how Janani Suraksha Yojana (JSY) and other health care sector and household factors predict poor, rural women's utilization of maternal health services in Gujarat and Tamil Nadu. The study focused on rural women in India's lowest two wealth quintiles because these women contribute disproportionately to the country's high maternal mortality ratio.[4, 5] Specifically, the study examined the role of three health care sector factors and four household factors in predicting women's use of maternal health services. Health care sector factors included maternal receipt of financial assistance from JSY or a similar government scheme, availability of a primary health center providing round-the-clock services and presence of an all-weather road connected to a health facility. Household factors included maternal education, paternal education, mother's age at first birth and parity. There were four measures of poor, rural women's utilization of maternal health services: adequate antenatal care, institutional delivery, private facility delivery and Cesarean section delivery.

Conditional cash transfer programs are promising tools for enhancing access to maternal health. JSY has had great success in increasing access to delivery care in India.[10] About 8.4 million Indian women had benefited from JSY as of 2008-09. However, national evaluation data have found that women in the middle wealth quintiles benefit from the scheme more than poor women.[44]

The current study is unique in examining predictors of maternal health services utilization by poor, rural women in two Indian states that have adopted different policies for incentivizing use of maternal health care. The two states, Gujarat and Tamil Nadu,

have similar economic indicators and both are performing relatively well on maternal health indicators compared to the majority of other Indian states.[38, 43] However, they have implemented different policies to promote maternal use of health services, with Tamil Nadu focusing on incentivizing births in government health facilities and Gujarat providing financial assistance to promote deliveries in private facilities.

Maternal Health Care Factors in Gujarat and Tamil Nadu

It is important to consider health care sector and household characteristics of poor, rural women in the target states. Of key interest in this study was the implementation of JSY schemes. Findings reveal that 28% of Tamil women reported receiving financial assistance from JSY, a proportion more than three times higher than the 9% of women reporting such assistance in Gujarat. This outcome was somewhat surprising given the high visibility of the JSY scheme and the reported success of Chiranjeevi Yojana (CY) in Gujarat.[6, 55, 56] Another study also using the DLHS-3 data found that 26% of all Tamil women and about 9% of all Gujarati women reported financial assistance from JSY.[44] The differential findings in use of JSY/CY benefits in the two states likely stems from the fact that Tamil Nadu had implemented the national maternity benefit scheme (NMBS), a precursor of JSY, in 1989.[7, 62] Gujarat did not begin implementing its maternity benefit scheme until 2005.[44] Previous research suggests that many poor, rural Gujarati women have not been properly informed about the CY scheme.[87] To obtain CY benefits, women need to be informed during the antenatal period so they can prepare adequately.

With respect to other health care sector factors, findings indicated that almost three quarters (74%) of Tamil women had access to a primary health center providing

round-the-clock services compared to slightly less than 60% of Gujarati women. Moreover, in Tamil Nadu, almost all (97%) poor, rural women were connected to a health facility by an all-weather road versus 81% of their peers in Gujarat. These findings are consistent with National Family Health Survey (NFHS) data and other studies revealing that Tamil Nadu has a higher proportion of functional health facilities and better road infrastructure in its rural areas than Gujarat.[5, 57, 60, 64, 78] This difference likely reflects the greater historical focus on medical education and health services in Tamil Nadu as compared to Gujarat.[88]

An examination of household factors revealed that poor, rural women in Tamil Nadu were more educated and had better-educated husbands than their peers in Gujarat. More than 70% of the women in Gujarat who participated in this study had no education, compared to 31% of study participants in Tamil Nadu. Almost 60% of the women in Tamil Nadu had five or more years of education, while only 19% of Gujarati women had attained this level of formal schooling. Education levels of husbands in the two states were also significantly different, especially at the lowest level. Approximately 40% of husbands Gujarat had no education, compared to 27% of husbands in Tamil Nadu. Approximately 62% of Tamil husbands and 47% of Gujarati husbands had five or more years of education. Government data likewise indicate that female literacy and overall literacy rates are higher in Tamil Nadu than in Gujarat.[5, 31]

Current findings also revealed a wide range in mother's age at first birth, from 10 years to 37 years of age. The mean age of first birth for Gujarati mothers was 19.5 years and for Tamil mothers was 21 years. These ages are higher than those for the nation of India, where the mean age at first birth is 18.8 years.[21] In the current study, 22% of

Gujarati mothers were primipara compared to 37% of Tamil mothers. In contrast, 36% of mothers in Gujarat had four or more births (grand multipara) compared to 11% in Tamil Nadu. These findings are consistent with Tamil women's higher mean ages of marriage and first birth, as well as their lower fertility rate, compared to Gujarati women.[38, 60, 64]

The study also revealed differences in maternal health services utilization in the two Indian states. Approximately 28% of Tamil women obtained adequate antenatal care, a rate more than twice that of the 12% of Gujarati women who obtained such care. Notably, the average percentage of women in all wealth quintiles receiving adequate antenatal care in India is about 19%, so poor, rural Tamil women are above average and their Gujarati peers are below average in receiving adequate antenatal services.[89] Given that India's average rate of institutional delivery is 41%, Tamil women in this study had a higher institutional delivery rate (85%) and Gujarati women a lower rate (31%) than the national average.[21] Use of private facilities for delivery was similar among women in the two states; approximately 16% of both Tamil and Gujarati women delivered their last child in a private facility. This rate is below the average private delivery rate of 20% for all Indian women, but again, this percentage includes urban women. [21] Finally, findings reveal that almost 15% of Tamil women and 4% of Gujarati women reported having a C-section for their last birth. Poor, rural Tamil women have a higher C-section rate and Gujarati women have a lower rate than India's C-section rate of 9%.[21]

Predictors of Maternal Health Care Utilization Among Poor Rural Women

The major goal of this study was to use the Health Systems Framework for Maternal, Neonatal and Child Health to examine factors that might predict poor, rural women's use of maternal health services in two Indian states. Consistent with the framework, the study focused on the extent to which three health care sector factors and four household factors were significant predictors of women's use of four maternal health services. Comparisons were made of similarities and differences in predictors in Gujarat and Tamil Nadu, drawing on previous research, government policies, and interviews with stakeholders in these states.

Adequate Antenatal care

One important preventive maternal health service is antenatal care.[5] Obtaining a sufficient number of antenatal care visits and receiving appropriate antenatal care facilitates women's preparation for a safe childbirth.[90] It was hypothesized that all three health care sector factors and four household factors would be significant predictors of poor, rural women's receipt of adequate antenatal care in Gujarat. Contrary to expectations, paternal education was the only significant predictor of receiving adequate antenatal care in Gujarat. Specifically, Gujarati women whose husbands had less than five years of education were twice as likely to have received adequate antenatal care as those with uneducated husbands. However, levels of paternal education higher than five years did not predict wives' receipt of adequate antenatal care relative to uneducated husbands.

The latter finding is somewhat surprising given the expectation that women with more highly educated husbands would also be more likely than those with uneducated

husbands to obtain adequate antenatal care. One possible reason for this finding could be that men with some elementary education are more receptive to the health messaging about the importance of antenatal care than uneducated or more highly educated men. Notably, the literacy level of these messages is relatively low (e.g., "A pregnant woman should get calcium by consuming milk, green vegetables and take Iron Folic Acid tablets given by government health providers," "A pregnant woman should be checked by a doctor or an ANM at least 3 times during pregnancy and should receive two tetanus toxoid injections"). These messages are usually displayed in public places that are frequented by manual laborers with an elementary level of education, such as on billboards and the backs of government buses. Uneducated men are unable to read these messages, and possibly the more educated men (who generally hold factory and office jobs) are less observant or influenced by their content.

Contrary to expectations, there were no other significant predictors of antenatal care in Gujarat. One likely explanation of this outcome is that at the time of the study, the state's CY scheme was focused on delivery care versus more comprehensive maternal health care, including antenatal care.[6, 56] A USAID review of performance based financing, including conditional cash transfer schemes, found that healthcare services that are not linked to financial assistance were underutilized compared to incentivized services.[91] Provision of antenatal care was not incentivized for poor, rural women in Gujarat at the time DLHS-3 data were collected [19, 54-56] and only 12% of study women in the state met the conditions for adequate antenatal care. Other studies of Indian states using all wealth quintiles have also found lower utilization of antenatal care in Gujarat compared to Tamil Nadu. For example, the proportion of women at all income

levels in Gujarat who received at least 3 antenatal care visits in NFHS-3 was only 65% compared to 96% in Tamil Nadu.[60, 64] Notably, the latter study adopted a lower standard for antenatal care than the one in the current study, which required a prenatal visit in the first trimester, at least three antenatal visits and consumption of at least 100 Iron Folic Acid tablets.

In contrast to findings in Gujarat, results revealed a number of significant predictors of adequate antenatal care among poor, rural women in Tamil Nadu. As hypothesized, one health care sector factor, connection to a health facility by an all-weather road, significantly predicted women's receipt of adequate antenatal care. Women with access to an all-weather road were almost three and a half times more likely to obtain adequate antenatal care than women with no such access. Notably, 97% of the study participants in Tamil Nadu were connected to a health facility by an all-weather road, ensuring easy access to a health facility for maternal care. Another study found that Tamil Nadu was among Indian states with the highest road density (more than 50 kilometer per 100 square kilometers).[78] This study also found that regions with a higher road density had a higher proportion of mothers receiving adequate antenatal care than those with a lower road density.[78]

In Tamil Nadu, there was also no support for the hypothesis that receipt of JSY financial assistance would predict poor, rural women's use of antenatal care. As in Gujarat, the failure of the Tamil Nadu government to incentivize antenatal care likely contributed to this finding. Availability of a PHC providing 24-7 services also failed to predict use of antenatal care. One possible reason is that PHCs often provide a limited range of maternal health services, which may not include round-the-clock obstetric care.

Women may choose to obtain antenatal services from a "one stop" facility, such as a Community Health Center, that provides more comprehensive services. Alternatively, they may seek antenatal care from outreach workers (e.g. Auxiliary Nurse Midwives) at a sub-center, which is a lower level health facility and may be closer to their homes than a PHC.

As predicted, the household factors of maternal education and parity were significant predictors of Tamil women's use of antenatal care. Poor women with 5-9 years of education were 2.3 times more likely and women with 10 or more years of education were 3 times more likely to have obtained adequate antenatal care than their uneducated peers. Previous studies in India and other developing nations have also found a strong association between maternal education and women's receipt of adequate antenatal care.[5, 20, 25, 31, 73, 82, 86] The failure of paternal education to predict antenatal care may reflect the relatively high level of education and autonomy of Tamil women, and their tendency to have a substantial role in decision-making about their reproductive care.

As hypothesized, parity also emerged as a significant predictor of utilization of antenatal care by poor, rural Tamil women. Grand multipara women were 57% less likely than their primipara peers to have received adequate antenatal care. Previous research in India and other developing countries has also found a relationship between parity and antenatal care, with most studies suggesting that primipara women have higher utilization of antenatal care than women who have more than one child.[31, 73, 82, 92] Interestingly, the association was not significant for Tamil women who had two to three births (multipara), indicating that primipara and multipara women did not differ

significantly in their utilization of antenatal care. Contrary to predictions, age at first birth was not a significant predictor of women's receipt of adequate antenatal care in Tamil Nadu. The relatively high age of first birth among Tamil women, which averaged 21 years, may have played a role in this finding.

Institutional Delivery

The principal goal of the JSY scheme is to incentivize institutional delivery.[9, 10] Historically, increasing women's access to health facilities that have the capability to provide emergency obstetric care has contributed substantially to the reduction in maternal mortality.[93] Current findings indicate that institutional delivery was the most utilized maternal health care service in this study. A variety of health care sector and household factors were found to be significant predictors of institutional delivery among poor, rural women in both Gujarat and Tamil Nadu.

As hypothesized, receiving financial assistance from JSY or a government scheme and connection to a health facility by an all-weather road were both significant predictors of institutional delivery among poor, rural women in Gujarat. CY payment was a significant predictor of institutional delivery; women who received financial assistance from the CY scheme were almost 4 times more likely to deliver their children in a health facility than those who did receive such assistance. This finding is consistent with the reported success of CY in motivating poor, rural women to seek institutional delivery since its introduction in 2005.[10, 44, 55, 56] Financial assistance for delivery care in the state has covered transportation and payment of private providers in rural areas, addressing both demand-side and supply-side barriers to institutional delivery.[55, 94]

Another significant predictor of institutional delivery was connection to a health facility by an all-weather road in Gujarat. Gujarati women who were connected to a health facility by an all-weather road were 1.4 times more likely to have an institutional delivery than those who lacked such a connection. Gujarat has high road density (35-50 kilometers per 100 square kilometers) and in recent years the government has collaborated with various organizations to improve referral transport.[6, 59, 78] Moreover, CY has incentivized transport to health facilities for delivery, providing pregnant women with INR 200.[6, 55, 56] Hence, it is not surprising that Gujarati women who had access to an all-weather road were more likely to travel to a health facility for childbirth. Other studies in India and developing nations have also found significant associations between physical accessibility of a health facility (road quality and physical distance) and institutional delivery.[59, 68, 75, 76, 80, 95]

Contrary to expectations, access to a PHC providing round-the-clock services did not predict institutional delivery among poor, rural Gujarati women. This finding is inconsistent with a majority of Indian studies that found availability of a PHC with 24-7 services increased institutional deliveries.[22, 26, 52, 76] One explanation of this outcome is that Gujarat has a relatively low percentage (12%) of female medical officers staffing the PHCs.[96] Women may prefer female birth assistance, choosing traditional birth attendants over PHCs that lack female medical officers.

Contrary to expectations, the household factor of maternal education was not a significant predictor of institutional deliveries in Gujarat. This finding may be due, in part, to the fact that Gujarat is a patriarchal society where women are less autonomous, regardless of their education, than women in the southern Indian states.[97] As

hypothesized, paternal education significantly predicted Gujarati women's use of institutional delivery. Mothers whose husbands had 10 or more years of education were 1.4 times more likely to deliver in a health facility than those with uneducated husbands. Notably, only rural women whose husbands had the highest level of education in this study (10 years or the equivalent of a high school education) were more likely to deliver in a health facility than women with uneducated husbands. This finding likely reflects poor, rural Gujarati men's strong influence in family decision-making, with only the more educated men perceiving the benefits of institutional delivery.

As hypothesized, the household factor, age at first birth, was also a significant predictor of institutional delivery in Gujarat. With each one-year increase in a woman's age at first birth, the odds of her having a delivery in a health facility increased by 5%. Age at first birth is tied to the age of marriage, which reflects local social customs in India. Generally, women who marry at an early age have children earlier. Studies in both India and Africa have found that women who bear children at a later age (20 or older) are more likely to deliver in an institution than women who begin childbearing in their adolescent years.[30, 31, 73, 83]

Current findings also supported the hypothesis that parity would be a significant predictor of institutional delivery among poor, rural Gujarati women. Both multipara and grand multipara women were 46% less likely to deliver in a health facility than primipara women. Numerous studies in India and other nations have found that primipara women have higher use of maternal health services than multipara and grand multipara women, including institutional delivery.[21, 31, 73, 83] In India, families consider the first pregnancy to be high risk and are more likely to support institutional delivery for a

woman's first birth.[30, 31] As women have more children, families have fewer resources for health care and are less likely to view institutional delivery as necessary for women who are experienced mothers.[30, 31] It should also be noted that at the time of the study, JSY limited its financial assistance to poor mothers to two live births.[9]

In Tamil Nadu, there were three significant predictors of poor, rural women's institutional delivery. Consistent with one hypothesis, Tamil women who were connected to a health facility by an all-weather road were 3.4 times more likely to deliver in a health facility than those who lacked such a connection. As noted earlier, Tamil Nadu has an extensive all-weather road system providing better access to health facilities than in many other Indian states.[78] Poor, rural women's access to an all-weather road greatly increased the likelihood that they would deliver in a health facility.

Contrary to predictions, receipt of JSY payment did not predict institutional delivery among poor, rural Tamil women. It appears likely that Tamil Nadu's practice of providing financial assistance to pregnant women for nutrition and lost wages, regardless of whether they deliver at home or in a facility [7, 62], contributed to this finding. The difference in payment for home and institutional deliveries was only INR 500[7], suggesting a weak incentive for women to deliver in a health facility.

In contrast to another hypothesis, availability of a PHC with round-the-clock services failed to predict institutional deliveries in Tamil Nadu. Unlike Gujarat, approximately 62% of the health officers at PHCs in Tamil Nadu are women.[98] However, there are also shortcomings in the services of Tamil Nadu PHCs, most notably their relative lack of telephones to handle referrals and lack of residential quarters enabling medical officers to be available overnight.[98] These factors may have

contributed to the failure of accessible PHCs to significantly predict poor, rural women's institutional deliveries.

As hypothesized, maternal education significantly predicted poor, rural women's use of institutional delivery in Tamil Nadu. Mothers who had 5-9 years of education were 2.3 times more likely and mothers with 10 or more years of education were 3 times more likely to deliver in a health facility than uneducated mothers. These findings are consistent with a wealth of literature in India and other nations showing a positive association between maternal education and institutional delivery.[25, 73, 83] Education has been found to increase women's knowledge of optimal maternal health care and to empower them to seek health services, including institutional delivery.[25, 31]

As expected, parity was also a significant predictor of institutional delivery among poor, rural women in Tamil Nadu. Grand multipara women were 57% less likely to deliver in a health facility than primipara women. This finding is consistent with research showing greater maternal health services utilization among primipara women in India.[21, 31, 73] As in the case of antenatal care, only grand multipara women were less likely to use this maternal health service than primipara women. It is interesting that multipara women in Tamil Nadu did not differ from their primipara peers in their likelihood of delivering in a health facility. This finding may stem, in part, from the greater education and autonomy of women in Tamil Nadu. Grand multipara women who have more than 3 children, a rate much higher than the overall Tamil Nadu total fertility rate of 1.7 children [38], may be less likely to use any reproductive health services, including an institutional delivery.

Contrary to expectations, neither paternal education nor age at first birth was significant predictors of Tamil women's institutional deliveries. As in the case of antenatal care, Tamil women's relatively high level of education, autonomy and personal role in family decision-making may have diminished the importance of paternal education as a predictor of women's institutional delivery. The relatively high age of first birth among poor, rural Tamil women may likewise have contributed to the failure of age at first birth to predict institutional delivery in this state.

Use of a Private Facility

The private sector has played an increasingly important role in the provision of maternal health care in India. The NFHS-3 found that institutional deliveries in the private sector grew from 11% in NFHS-1 (1992-93) to 20% in NFHS-3 (2005-06).[20] Moreover, the Gujarat government has introduced a JSY scheme to incentivize delivery care in private sector facilities. The present study selected Gujarat as a target state because of its implementation of CY.

As hypothesized, receipt of financial assistance from CY was a significant predictor of private facility deliveries among poor, rural women in Gujarat. Women who received financial assistance from JSY/CY were twice as likely to use a private facility for delivery as women who did not have such assistance. Gujarat's implementation of CY involved contracting with private health care providers to perform deliveries because there was a dearth of obstetricians in the rural public health system.[55, 56, 94, 99] Current findings are consistent with previous studies showing that CY has improved access to delivery care for poor, rural women.[10, 19, 56]

Contrary to study hypotheses, access to a PHC with 24-7 services and connection to a health facility by an all-weather road did not predict women's use of private facilities for delivery. A likely explanation for these findings is that the PHC is a government health facility. Gujarat's incentivization of private sector maternal health services decreases the likelihood that availability of a government PHC would affect women's delivery in a private facility. Connection to a government health facility by an all-weather road also failed to predict use of private facilities for childbirth; in this case, an all-weather road connection to a private facility likely had greater relevance.

Contrary to expectations, maternal education was not a significant predictor of poor, rural women's use of private facilities for childbirth in Gujarat. This finding is consistent with previous findings that maternal education failed to predict adequate antenatal care and institutional delivery in the state. However, paternal education was a significant predictor of private sector deliveries. Women whose husbands had 10 or more years of education were 1.8 times more likely than women with uneducated husbands to use a private facility for childbirth, suggesting that the most educated Gujarati husbands understood the benefits of a hospital delivery, including timely treatment for labor complications.

As expected, parity was also a significant predictor of use of private facilities by poor, rural women in Gujarat. Multipara and grand multipara women were 43% less likely to use a private facility for childbirth compared to primipara women. Previous literature examining maternal health care utilization in India has also found that primipara women are more likely to use a private facility for delivery care compared to multipara or grand multipara women.[20, 29] Unlike the finding for institutional deliveries, age at

first birth was not a significant predictor of private facility deliveries. This finding suggests that age at first birth may be a more important predictor of deliveries in public versus private facilities among poor, rural women in Gujarat. Women who give birth at earlier ages may choose not to use private facilities because they are less comfortable than older women with the predominantly male obstetricians who staff these private facilities.

Unlike Gujarat, Tamil Nadu does not incentivize use of private facilities for childbirth. Consequently, only one hypothesis addressed use of private facilities in Tamil Nadu. Specifically, it was expected that parity would be significant predictor of use of private facilities for childbirth by poor, rural women in the state. As hypothesized, parity significantly predicted women's use of a private facility for delivery. Grand multipara women were 63% less likely to have used a private facility for their last childbirth than primipara women. This finding is consistent with previous research finding lower use of private facilities for childbirth among multipara and grand multipara Indian women.[65, 72] As in the case of antenatal care and institutional delivery, multipara women in Tamil Nadu did not differ from their primipara peers in use of private facilities for delivery care. Only grand multipara women differed from primipara women, possibly reflecting the fact that grand multipara women are less likely than other Tamil women to use any reproductive health services.

Use of Cesarean Section

Use of Cesarean section is a United Nations indicator of access to maternal health care. A higher percentage of C-sections indicates better availability of obstetric care, offered primarily in institutional facilities.[42] WHO has proposed an optimal range of

C-sections of 5-15% of all births in a country; rates above or below the optimal range are often considered dangerous.[100] In this study of two Indian states, the proportion of C-section deliveries was almost four times higher among poor, rural women in Tamil Nadu (15%) as compared to their peers in Gujarat (4%). Notably, the Gujarat rate is below optimal and lower than India's rural C-section rate of 6%.[21]

Contrary to the study hypotheses, none of the health care sector factors significantly predicted poor, rural women's use of C-sections in Gujarat. It was especially surprising that JSY/CY financial assistance was not a significant predictor because CY policy supports private sector obstetricians to provide C-sections in the rural areas. Moreover, a study of Asia, Africa and Latin America revealed an over provision of C-sections in the private sector.[20] Private providers in Gujarat may not be performing a large number of C-sections to keep their profits up since the provider payment is fixed, irrespective of the type of delivery, and C-sections are more expensive than vaginal births.[55, 56] In one study, some poor, rural CY beneficiaries in Gujarat reported that their private provider referred them to a public health facility for a C-section; however for the most part, beneficiaries were satisfied with services provided.[55, 56]

Availability of a PHC with round-the-clock services also failed to predict poor, rural women's use of C-section in Gujarat. This finding may be attributed to the fact that PHCs in the state have weak referral linkages with higher level health facilities that provide C-sections.[6, 59] The failure of connection to a health facility by an all-weather road to predict C-sections may stem from the fact many of Gujarat health facilities do not provide C-sections. Additionally, Gujarat has few emergency vehicles to transport

women with labor complications to higher level health facilities and has limited funds to fuel existing vehicles.[6, 59, 101]

As hypothesized, parity was found to be a significant predictor of C-sections among poor, rural Gujarati women. Multipara women were 56% less likely and grand multipara were 77% less likely to have a C-section delivery compared to primipara women. Many Indian and international studies have also found that primipara women have a higher probability of delivering by C-section than multipara or grand multipara women.[26, 31, 49]

Contrary to expectations, maternal education did not predict use of C-section in Gujarat. Maternal education failed to predict utilization of any of the four maternal health care services examined in this state, a finding likely influenced by Gujarati women's low levels of education and lack of autonomy. Although paternal education significantly predicted antenatal care, institutional delivery, and use of private facilities in Gujarat, it was not a significant predictor of C-section. Age at first birth also failed to predict poor, rural women's use of a C-section. These findings may stem, in part, from the very low numbers of C-section deliveries among study participants in Gujarat.

In contrast to Gujarat, there were four significant predictors of C-section deliveries in Tamil Nadu. As hypothesized, receipt of financial assistance from JSY predicted greater use of C-section. Poor, rural Tamil women receiving payment from JSY or similar government schemes were 1.7 times more likely to have a C-section delivery than women not receiving such assistance. This finding may be influenced, in part, by the greater availability of public sector health facilities providing comprehensive obstetric care, including C-section, in Tamil Nadu as compared to Gujarat[6, 7, 62, 89]

There is also an additional payment for obstetricians and anesthesiologists to perform C-sections in public facilities in Tamil Nadu, incentivizing the practice.[7, 62]

Contrary to predictions, availability of a PHC with 24-7 services and connection to a health facility by an all-weather road did not significantly predict women's use of C-sections in Tamil Nadu. The high proportion of poor, rural women in the state who had C-sections (15%) suggests that most women with labor complications were able to obtain this obstetric care. As noted, Tamil Nadu's C-section rate for the women in this study is at the high end of the 5-15% optimal range proposed by WHO.[42]

As hypothesized, maternal education was a significant predictor of C-section delivery among poor, rural women in Tamil Nadu. Women with less than five years of education were 2.4 times more likely to have a C-section delivery than uneducated women in Tamil Nadu. However, the higher levels of maternal education were not significantly associated with use of C-section. As in the case of antenatal care, institutional delivery and private facility delivery, paternal education did not predict use of C-section in Tamil Nadu. Poor, rural women's high level of education in this state may have reduced the impact of their husband's influence in decision-making about reproductive care, including the decision to have a C-section. It appears likely that Tamil women and their physicians had a greater role than husbands in making this decision.

As hypothesized, mother's age at first birth significantly predicted use of C-section among Tamil women. With each one-year of increase in a woman's age at first birth, her odds of having a C-section increased by 8%. Previous research indicates that women who have children earlier are less likely to use maternal health services including C-section. [30, 31, 73, 83] Moreover, women having their first birth at later ages,

particularly after 30 years, are more likely to have pregnancy-related complications and thus require C-section deliveries.[102] As noted earlier, the average age of poor, rural Tamil women at the time of their first childbirth was 21 years, indicating that many had delayed childbearing in comparison to the larger population of Indian women (averaging 18.8 years at first birth).

Consistent with expectations, parity also significantly predicted C-section deliveries for poor, rural Tamil women. Multipara women were 42% less likely and grand multipara women were 82% less likely to have a C-section delivery than primipara women. As noted earlier, primipara women are more likely to utilize all types of maternal health care, including C-section, than women who have had more than one child.[26, 31, 49]

Policy and Context Informing Study Findings

Although a different set of factors predicted use of maternal health services in Gujarat and Tamil Nadu, there were a number of common patterns within the findings. To increase understanding of these findings and go beyond examination of articles in peer-reviewed journals, local policies, reports, and website data were reviewed in the two target states. Interviews were also conducted with government officials, maternal and child health specialists and residents of Gujarat and Tamil Nadu. In Gujarat, interviewees included a state-level government health officer, a district-level health officer, a maternal health specialist, two obstetricians and two mothers. In Tamil Nadu, interviews were conducted with a state-level government health officer, a district-level health officer and a maternal health expert to assist in interpreting and providing context for the findings.

Overall findings revealed that a higher proportion of poor, rural women in Tamil Nadu used maternal health services than their peers in Gujarat. Tamil women were more likely to obtain adequate antenatal care and to have an institutional delivery and C-section than Gujarati women. Although CY incentivized use of private facilities in Gujarat, a near equal percentage of Gujarati and Tamil women had their last child in a private health facility.

A number of factors have likely contributed to the higher use of maternal health services among poor, rural women in Tamil Nadu as compared to Gujarat. As noted earlier, Tamil Nadu implemented the national maternity benefit scheme (NMBS) in 1989, a precursor of JSY.[7, 62] Gujarat implemented its first maternity benefit scheme, CY, much later in 2005.[44]

Although Gujarat has public sector initiatives to promote use of maternal health services, execution of its policies and programs has been less efficient and effective than in Tamil Nadu.[5-7] Annual per capital health care expenditures are US $30 for Gujarat and US $23 for Tamil Nadu. However the Tamil Nadu government contributes more than US $6 to this health expenditure, while the Gujarat government spends less than US $5.[94] The government of Tamil Nadu spends 5.6% of its total revenue expenditures on health, a relatively high percentage for Indian states.[63] The equivalent Gujarat expenditure is only 3.7%.[103] Greater government spending decreases out-of-pocket health care spending for Indian citizens and increases the likelihood that health care services are accessible and equitable, especially to poor, rural populations.

Another likely contributor to the greater use of maternal health services among poor, rural Tamil women than their Gujarati peers is Tamil Nadu's better management of

its public health system. Tamil Nadu has personnel trained in public health and management at the state level, district level and sub-district level, including personnel with post graduate degrees in public health.[7, 62] Tamil Nadu is one of only two states in India with a state level officer charged with managing maternal and child health programs. In contrast, Gujarat has one maternal health consultant working on an ad hoc basis at the state level. The majority of state and district level health officers in Gujarat are medical doctors who have experience working in government, but they do not have public health training. Better management of the overall Tamil Nadu public health system seems likely to have contributed to the greater number of women taking advantage of the JSY scheme and their higher use of antenatal services, institutional deliveries, and C-sections, as compared to women in Gujarat.

One interesting finding was that a near equal percentage (16%) of poor, rural women in both Gujarat and Tamil Nadu reported having their last birth in a private facility. While one might expect a higher percentage in Gujarat given the CY scheme, it should be noted that approximately half (52%) of all institutional births in Gujarat were in private facilities compared to 19% in Tamil Nadu. This pattern of usage of private facilities in Gujarat provides evidence of the success of the CY scheme over a relatively short time period since its introduction. Interviews with state officers and maternal and child health experts revealed several factors that have contributed to the scheme's early success, including recruitment of ASHAs, shortened distances to reach private facilities, and targeting of the most underserved districts.

There has been significant global interest in determining how conditional cash transfer programs promote use of maternal health services. India has the largest such

program in the world. Thus, it was somewhat surprising that this study found only 28% of poor, rural women in Tamil Nadu and 9% of their peers in Gujarat reported receiving payment from JSY/CY. Interviews with health officials in Gujarat suggest that a number of factors played a role in poor, rural Gujarati women's low participation in the scheme, including poor government communication about eligibility requirements, frequent changes in CY rules and women's limited understanding of the benefits. Health officers also indicated that communication of the scheme must not only target women, but also their husbands and families because of their salient role in decision-making about women's reproductive care. ASHAs also need additional training to enroll pregnant women early in the CY scheme; failure to complete the appropriate paperwork often precludes women from receiving the CY benefits.

Conversations with health officers in both Gujarat and Tamil Nadu also revealed that even when women complete the necessary paperwork, there are often delays in their receiving the JSY/CY payment. This occurs despite the policy to disburse the funds at the time of delivery. Similar delays in payments to health care workers (ASHAs in Gujarat and village health nurses in Tamil Nadu) may reduce their motivation to recruit women into the scheme. In some cases, husbands collect the benefit without their wives' knowledge. Corruption is another potential problem. Anecdotal reports indicate that many women participating in JSY/CY do not receive the promised payment amount. Such weaknesses in implementation likely contributed to the relatively low percentage of women who reported receiving financial assistance from JSY/CY in Gujarat and Tamil Nadu.

An important goal of this study was to examine the role of JSY/CY payments in predicting poor, rural women's use of maternal health services. In both states, these payments failed to predict most services that were not directly tied to receipt of financial assistance. For example, JSY/CY payment failed to predict use of adequate antenatal care in both states, where there was no payment for antenatal care during the period of the study. CY payment predicted use of private facility deliveries in Gujarat, which provided financial assistance for private facility delivery care, but not in Tamil Nadu, which incentivized public facility births. Interviews with a state health officer in Gujarat revealed that the state's observation of the positive relationship between use of maternal services and cash payment resulted in a recent modification in its CY scheme. Specifically, Gujarat now incentivizes women's use of antenatal care services.

Surprisingly, availability of a PHC providing round-the-clock services was not a significant predictor of any maternal health care service in either of the targeted Indian states. The literature suggested a number of factors that may have reduced the effectiveness of PHCs in addressing the maternal health care needs of poor, rural women. Challenges in Gujarat included the small number of female medical officers, weak referral linkages with higher level health facilities that provide C-sections, and limited emergency vehicles and gasoline to fuel them.[6, 59] Reported shortcomings of PHCs in Tamil Nadu included limited telephones for communication and lack of residential quarters enabling medical officers to be available overnight.[98]

Confidential conversations with state level officers and maternal and child health specialists confirmed that the infrastructure and staffing of PHCs in Gujarat and Tamil Nadu was superior to that of most Indian states. However, these stakeholders also shared

that many PHCs were unable to deliver round-the-clock care because of chronic shortages of supplies, poorly maintained equipment, and low availability of health professionals at night. In Gujarat, implementation of CY without significant additional staffing often led to overcrowding in labor rooms and immediate discharges (as early as 3-6 hours post-delivery), resulting in a negative birth experience and possibly jeopardizing the mother's health. Knowledge of such problems among poor, rural women likely affected some women's perceptions of the quality of PHC care, as well as their intent to use these facilities. Such issues may have contributed to the failure of available PHCs to predict maternal health services utilization among poor, rural women in the target states.

A number of other interesting patterns were also found in the household predictors of poor, rural women's use of health services in the two Indian states. For example, maternal education predicted use of antenatal care, institutional deliveries, and C-section in Tamil Nadu, but not in Gujarat. Paternal education significantly predicted antenatal care, institutional delivery, and private facility delivery in Gujarat, but failed to predict use of any maternal health services in Tamil Nadu. Stakeholders in the two states supported speculation that these differences reflect the stronger patriarchal society in Gujarat, reducing women's role in family decision-making about reproductive care. Moreover, they reported that the higher education and greater autonomy of Tamil women gave women a stronger voice in decisions about use of maternal health services. Tamil women often marry close relatives (e.g., uncles), enhancing their informal household power, independence and sense of empowerment; such marriage practices are uncommon in Gujarat.

Parity was a consistent predictor of use of all four maternal health care services in the two states, with the exception of adequate antenatal care in Gujarat. State stakeholders confirmed that families in both Gujarat and Tamil Nadu promote use of maternal care services for primipara women because they consider them to be at higher risk than multipara and grand multipara women. After a normal vaginal birth, they have less concern about mothers receiving adequate antenatal care or institutional delivery.

Limitations

Although this study extends existing literature by examining factors that predict poor, rural Indian women's use of maternal health services, the research has several limitations. First, because the study asked women to report on their last childbirth, there is the issue of recall bias. For example, women were asked to remember details of their antenatal care visits and to recall whether they had used a public or private facility. Their memories of these events may not have been fully accurate, and women may have wished to portray themselves in a positive light (e.g., stating that they had obtained at least three antenatal care visits and consumed 100 Iron Folic Acid tablets).

The Village questionnaire used in this study may have also been subject to recall bias. Some village heads may have attempted to present a positive picture of their health care facilities and road infrastructure. Although DLHS attempts to construct user-friendly surveys, the resulting data are open to the possibility of self-reporting bias.

A second limitation is that DLHS-3 was carried out in 2007-08, just two to three years after implementation of JSY. In developing countries such as India, the time lag between the decision to implement a program and effective implementation at the grass

roots level requires several years. Hence, the survey might not have captured the full impact of the JSY/CY schemes.

A third limitation is related to the cross-sectional nature of this research. Although the study identifies significant predictors of maternal health care utilization, no causal directions can be concluded from the observed relationships. Future studies using longitudinal designs are required to explore causation.

Finally, it should be noted that the current study focused on poor, rural women in just two Indian states. Therefore, one cannot generalize the findings to all women in Gujarat and Tamil Nadu, or to all poor, rural women in India or developing nations. Future research will be necessary to examine predictors of maternal health services utilization in other populations that are receiving benefits from conditional cash transfer schemes.

Policy and Program Implications

Despite several limitations, results of the current study have important implications for policy makers and program planners interested in improving the accessibility and equity of maternal health services in India and other developing countries. These findings contribute to a very sparse literature on predictors of maternal health care utilization among poor, rural women. Moreover, they suggest ways in which health care sector and household level interventions may increase women's use of maternal health services, including antenatal care, institutional delivery, and appropriate use of C-section.

The current study indicates that Indian states should develop policies that leverage available resources to meet the maternal health care needs of underserved women. In

Tamil Nadu, the government reorganized public sector resources to increase poor, rural women's access to maternal health services, reaching a level where 85% of women in the current study had an institutional delivery. The Gujarat government capitalized on its well-developed private sector in rural areas, incentivizing births in private facilities to a level where they represented half of all institutional deliveries among poor, rural women just two years after implementation of CY. Other Indian states should follow their lead in selecting and prioritizing interventions based on their needs, fiscal resources and institutional capacities. Such efforts should enhance state efficiency, effectiveness and equity in the provision of maternal health care services.

A second set of policy implications addresses the impact of financial assistance in motivating women to use maternal health services. Despite implementation of JSY/CY throughout the target states, less than 30% of poor, rural Tamil women and less than 10% of poor, rural Gujarati women in the study reported being beneficiaries of the schemes. These findings suggest the need for additional communication programs, not dependent on literacy, to increase uneducated women's awareness of state health schemes. Comprehensive communication plans should also target husbands and families. ASHAs and community health workers should be trained to enroll women in JSY early in their pregnancies so that women can complete the appropriate paperwork and obtain the benefit. Moreover, JSY/CY payments should be made at the time of delivery and awarded directly to mothers.

Current findings revealed that JSY/CY payments were associated with an increase in utilization of institutional deliveries and private sector deliveries in Gujarat. There was no association between JSY/CY and adequate antenatal care, a service that was not

incentivized under these schemes at the time of the study. Such findings suggest that state governments should divide the cash payment in their JSY scheme to provide incentives for women to obtain adequate antenatal care. As noted earlier, Gujarat revised their CY scheme to incentivize antenatal care after the period of this study. The low C-section rate in Gujarat may also be tied to fixed CY payments made to private providers, regardless of type of delivery. Policy makers and program planners should explore the reasons for this very low C-section rate in Gujarat and consider modifications of the current scheme to ensure women's access to this life-saving procedure.

A third policy and programmatic implication addresses a health care sector factor, the availability of a PHC providing round-the-clock services. This factor failed to predict use of any maternal health care services in this study, presumably because of shortcomings in infrastructure and human resources in PHCs in the target states. Efforts to promote JSY schemes should be matched by state efforts to increase the quality of health facilities, establish reasonable workloads for health personnel, and improve the obstetric care available to poor, rural women. At the district level, program planners should work to ensure the availability of a female health care provider round the clock by providing them with residential quarters, ensuring their safety and providing competitive salaries. Program staff should also establish clear referral linkages between PHCs and higher-level health facilities providing C-section.

A fourth implication of current findings addresses transportation, another important health care sector factor in developing nations such as India. Availability of an all-weather road connected to a health facility predicted greater use of institutional delivery in Gujarat and Tamil Nadu, as well as increased number of Tamil women

obtaining adequate antenatal care. These results suggest that developing nations should invest in rural road infrastructure so that women will have confidence that they can travel to health facilities for antenatal care and deliveries, regardless of weather conditions.

Finally, study findings of associations between household factors and maternal health services utilization have implications for program planners and policymakers. Maternal education, paternal education, age at first birth and parity were all significant predictors of poor, rural women's use of some maternal health services. Investments in increasing the literacy and education levels of poor, rural women may enhance their autonomy and ability to make wise decisions about their reproductive care, as was evident in Tamil Nadu. Similarly, educational programs for poor, rural men may increase their understanding of the benefits of obtaining high quality maternal health care services for their wives. Findings also suggest that implementation of family planning programs that provide birth control methods to postpone first birth and limit family size may increase women's utilization of maternal health services.

Directions for future research

Although the present study adds to the literature examining the role of JSY and other health care sector and household factors in predicting maternal health care utilization, further research is needed. Conditional cash transfer schemes such as JSY are based on the behavioral economics approach where behavioral decisions are thought to be governed by financial considerations.[104] Providing cash payments, vouchers, and subsidies are believed to reduce economic burdens on families and motivate positive change in health behaviors. Future research should explore how different types of

financial incentives, and the timing of their delivery, influence patterns of maternal health care utilization.

The current study utilized secondary data analyses so it was not possible to examine all health care sector and household factors of interest. Future studies using new measures might examine health care sector factors such as health leadership, health workforce, and availability of emergency transportation. Researchers should also explore the role of household factors such as female autonomy, intra-household power relations, and social support, in predicting use of maternal health services.

Future studies might also conduct qualitative research to explore the reasons why women obtain or fail to obtain specific maternal health care services, including antenatal care, delivery in government or private health facilities, or use of C-section. Interviews with poor, rural women and their husbands should provide valuable data about the perceived quality of available maternal care services and salient factors contributing to their views about the quality of care. Qualitative studies of health care providers should also provide important insights about their role in implementing JSY/CY schemes and the status of service delivery in their districts/states, as well as ways in which services can be improved.

The current study focused on poor, rural Indian women. Additional research should explore predictors of maternal health services utilization among poor, urban women, another underserved population in India. Although it is assumed that poor, urban Indian women have access to health care facilities, financial and social factors may preclude their using them. Research involving poor, urban women will need to explore a number of variables not investigated in this study, including the time women have

available to visit clinics (which rarely offer evening hours), household power relations, and stereotypes/stigma associated with use of government facilities for reproductive care.

Future research should also examine the role of health care sector and household factors in predicting use of maternal health services in other Indian states. The present study compared two high performing states. Additional research should focus on India's low performing states, which have worse maternal health indicators and lower availability of maternal health care facilities. Evaluation of JSY/CY should include examining measures of overall disease burden such as disability adjusted life years (DALYs) to evaluate improvements in maternal health as a result of financial incentives and improved access to maternal health care services. Measurement of DALYs will also facilitate comparisons of JSY to conditional cash transfer schemes being implemented in other countries.

Finally, longitudinal studies are needed to establish causal linkages between health care sector and household characteristics and poor, rural women's utilization of various maternal health care services. A deeper understanding of these relationships, gained from longitudinal research, will shed additional light on how women's experiences with public and private facilities influence their future use of these services, as well as the information they communicate to other village women. Such research may help to improve coordination between public and private sector services, enhancing women's health care over time.

Conclusion

The current study utilized the Health System Framework for Maternal, Neonatal and Child Health to examine the role of JSY financial assistance and other health sector

and household factors in predicting utilization of maternal health services among poor, rural women in Gujarat and Tamil Nadu. Overall, Tamil women reported better use of maternal health services than Gujarati women. However, Gujarat's incentivizing of the private sector increased poor, rural women's births in private facilities to half of all institutional deliveries in just two years. Access to an all-weather road also predicted institutional deliveries in both states, and adequate antenatal care by Tamil women. Maternal education was a significant predictor of utilizing maternal health services in Tamil Nadu, while paternal education predicted such usage in Gujarat. Parity predicted women's use of all services.

Differential patterns of findings within these two states underscore the complexity of designing Indian interventions to enhance poor, rural women's use of maternal health services. Findings suggest the need for states to conduct careful contextual analyses and leverage existing resources to increase the access, quality and equity of maternal care. Further research should examine why relatively low percentages of poor, rural women in both states report receiving JSY financial assistance. Findings also underscore the need to probe the failure of available primary health centers to predict utilization of maternal health services. It will be important to examine how enhancements in PHC personnel, infrastructure, supplies and referral processes impact use of maternal health services. Current findings also suggest potential benefits of incentivizing adequate antenatal care and improving the training of community workers to better prepare women for childbirth. Finally, investments in maternal education and family planning programs that discourage adolescent childbirth and encourage smaller family size may increase poor, rural women's utilization of all maternal health services. Additional study of JSY, health

sector and household factors, particularly within the context of state socio-cultural, socioeconomic, and political conditions, should contribute to interventions that reduce India's maternal mortality ratio and influence maternal health schemes throughout the world.

Appendix A: Survey Questions

Demographic background

The DLHS-3 data has information on maternal age, maternal education, paternal education, paternal age, age at first birth, area of residence, religion and caste in the ever-married women dataset. Maternal and paternal ages are recorded as completed years. Education is recorded from zero years to completed years of schooling. Religion and caste of the head of the household are recorded using the categories described below.

Independent Variables

1. **Receipt of financial assistance from JSY or government scheme:** The respondent was asked **"**Did you receive any Govt. financial assistance for delivery care under the Janani Suraksha Yojana (JSY)/State Specific Scheme?" The response to the question was "yes" or "no." Yes was coded as "1" and no was coded as "2."
2. **Connected to a health facility by all-weather road:** The village leader was asked, "Whether the village is connected by all-weather road to the health facility?" and the list included SC, PHC, CHC, anganwadi, rural health centre, block PHC and DH, government hospital. The response to the question was "yes" or "no." Yes was coded as "1" and no was coded as "2."
3. **Availability of a PHC providing service round-the-clock:** The village leader was asked in the Village questionnaire: "Whether PHCs located in your area provides health care services/treatment all the days around-the-clock?" The

response to the question was “yes” or “no.” Yes was coded as “1” and no was coded as “2.”

4. **Maternal education:** The respondent was asked, “Have you ever attended a school?” The response was recorded as “yes” or “no.” If the answer was “yes,” then she was asked, “What was/is the highest standard you have passed?” Response was recorded in numbers and later converted to categories.
5. **Paternal education:** The respondent was asked, “Has/had your husband ever attended a school?” The dichotomous response is recorded as “yes” or “no.” If the answer was “yes,” then she was asked, “What was/is the highest standard he has passed?” and the response was recorded in numbers and later converted to categories.
6. **Age at first birth:** The respondent was asked, “How old were you when you had your first child?” and the response was recorded as age in years.
7. **Parity:** The respondent was asked, “Have you ever given birth?” and the dichotomous response was recorded as “yes” or “no.” If the answer was “yes,” she was asked, “How many sons are living with you?” and “How many daughters are living with you?” The responses were recorded and if none, the response was recorded as “00.” She was also asked, “How many sons are alive but do not live with you?” and “How many daughters are alive but do not live with you?” These responses were recorded. Respondents were also asked, “How many boys have died?” and “How many girls have died?” and the responses were recorded. The total of three questions was recorded as “total numbers of live births.” This

number is used as parity in the analysis for the present study. The number is converted into categories.

Control Variables

1. **Religion:** In the Household questionnaire, the respondent was asked, "What is the religion of the head of the household?" and the response was recorded. Hindu was coded as 01, Muslim as 02, Christian as 03, Sikh as 04, Buddhist or neo-Buddhist as 05, Jain as 06, Jewish as 07, Parsi or Zoroastrian as 08, no religion as 09 and others as 96. For the present study, religion is divided in two categories: Hindu is coded when response was 01 and non- Hindu is response other than 01.
2. **Caste:** The respondent was asked, "What is the caste or tribe of the head of the household?" and the response was recorded as caste and tribe stated by the respondent. Then the respondent was asked, "Is this a schedule caste, a scheduled tribe, other backward class, or none of them?" and the response was coded as "SC" if a schedule caste, "ST" if a schedule tribe, "OBC" if other backward class and "others" if none of them or others. For the present study, schedule caste is coded as "SC" and all other responses are coded as "non-SC."

Dependent variables

1. **Adequate antenatal care:** The respondent was asked, "After how many months of the last pregnancy did you receive antenatal care?" and the response was recorded in number of months. The respondent was asked, "How many times did you receive an antenatal checkup during the last pregnancy?" and the response was recorded in the number of visits. The respondent was asked, "During the last pregnancy, for how many days and how much did you take the iron folic acid (IFA)

tablets?" and the response was recorded as number of days and number of tablets/bottles. For the present study, adequate antenatal care is defined as a first visit in the first trimester, at least three antenatal visits and 100 or more IFA tablets. All of the conditions need to be satisfied for a "yes" response to adequate antenatal care.

2. **Institutional delivery:** The respondent was asked, "Where did your last delivery take place?" and the response was recorded. Government facilities were coded from 01 to 07 and included SC, PHC, CHC, DH, dispensary, urban health centres and ayush clinics. NGO/trust hospital was coded 08 and private clinics were coded as 09 or 10. On the way to the hospital was coded 11, at home was coded 12, parent's home was coded 13, workplace was coded 14 and others were coded as 96. Government, private and NGO hospital deliveries (code up to 10) are considered institutional deliveries in the present study.
3. **Use of a private facility:** The respondent was asked, "Where did your last delivery take place?" and the response was recorded. Government facilities were coded from 01 to 07 and included SC, PHC, CHC, DH, dispensary, urban health centres and ayush clinics. An NGO/trust hospital was coded 08 and private clinics were coded as 09 or 10. On the way to the hospital was coded 11, at home was coded 12, parent's home was coded 13, workplace was coded 14 and others were coded as 96. Only responses coded as 09 or 10 were considered to be deliveries in a private facility in this study.
4. **Use of Cesarean section:** The respondent was asked, "Was the delivery normal, Cesarean or assisted?" and the response was recorded. Normal was coded as 1,

Cesarean was coded as 2 and assisted, or operative, was coded as 3. For the present study, any delivery other than normal is considered as a Cesarean delivery because the number of other operative deliveries (use of instruments) is very low for the analytic sample.

References

1. Indian economy: some indicators [Internet]. New Delhi, India: Planning commission of India; [updated 2011 Jun 1; cited 2012 Mar 31]. Available from: http://planningcommission.nic.in/data/datatable/0211/data 1.pdf

2. India country overview September 2010: key development indicators [Internet]. Washington D.C., USA: World Bank; [cited 2011 May 12]. Available from: http://www.worldbank.org.in/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/INDIAEXTN/0,,contentMDK:20195738~pagePK:141137~piPK:141127~theSitePK:295584,00.html#overview

3. Goodburn E, Campbell O. Reducing maternal mortality in the developing world: sector-wide approaches may be the key. Bmj 2001 Apr 14; 322(7291): 917-20.

4. WHO, UNICEF, UNFPA, World Bank: trends in maternal mortality: 1990-2008. WHO library cataloguing-in-publication data. Geneva, Switzerland: WHO; 2010.

5. Vora KS, Mavalankar DV, Ramani KV, et al. Maternal health situation in India: a case study. J Health Popul Nutr 2009; 27(2): 184-201.

6. Mavalankar DV, Vora KS, Ramani KV, Raman P, Sharma B, Upadhyaya M. Maternal health in Gujarat, India: a case study. J Health Popul Nutr 2009; 27(2): 235-48.

7. Padmanaban P, Raman PS, Mavalankar DV. Innovations and challenges in reducing maternal mortality in Tamil Nadu, India. J Health Popul Nutr 2009; 27(2): 202-19.

8. Das J, Quy-Toan D, Ozler B. Conditional cash transfers and the equity-efficiency debate [Internet]. Washington D.C., USA: World Bank; [updated 2004 Apr 19; cited 2011 Jul 5]. Available from: http://econ.worldbank.org/external/default/main?pagePK=64165259&piPK=64165421&theSitePK=469372&menuPK=64216926&entityID=000009486_20040520150423/Rendered/PDF/wps3280transfers.pdf

9. Janani Suraksha Yojana: features and frequently asked questions and answers [Internet]. New Delhi, India: Ministry of health and family welfare, government of India; [cited 2011 Jul 8]. Available from: http://mohfw.nic.in/WriteReadData/1892s/file28-99526408.pdf

10. Dagur V, Senauer K, Kimberly SP. Paying for performance: the Janani Suraksha Yojana program in India; Health system 20/20: P4P case studies. Washington D.C., USA: USAID; 2010.

11. Harrison KA, Bergstrom S. Poverty, deprivation and unsafe motherhood. In: Lawson JB, Harrison KA, Bergstrom S, editors. Maternity care in developing countries. London. RCOG Press; 2003; 1-20.

12. Claeson M, Griffin CC, Johnston TA, et al. Poverty-reduction and the health sector: the health, nutrition and population network's chapter; Poverty reduction strategy sourcebook. Washington D.C., USA: World Bank, 2001; 33.

13. Ergo A, Eichler R, Koblinsky M, Shah N. Strengthening health system to improve maternal, neonatal and child health outcomes: a framework [Internet]. Washington D.C., USA: MCHIP; [cited 2011 Jul 30]. Available from: www.mchip.net/.../HSS%20and%20MNCH%20Framework_final.pdf

14. Ergo A, Shah N, Rashidi T, Rozario A. Malawi case study: how health system strengthening efforts have affected maternal health [Internet]. Washington D.C., USA: MCHIP, [cited 2011 Jun 20]. Available from: www.mchip.net/sites/default/files/Malawi_CaseStudy_final.pdf

15. Fan L, Habibov NN. Determinants of maternity health care utilization in Tajikistan: learning from a national living standards survey. Health Place 2009; 15: 952-60.

16. Maine D, Akalin MZ, Chakraborty J, Fransisco Ad, Strong M. Why did maternal mortality decline in Matlab? Stud Fam Plann 1996; 27(4): 179-87.

17. Peters DH, Garg A, Bloom G, Walker DG, Brieger WR, Rahman MH. Poverty and access to healthcare in developing countries. Ann. N. Y. Acad. Sci. 2008; 1136: 161-71.

18. Varatharajan D, Thankappan R, Jayapalan S. Assessing the performance of primary health centres under decentralized government in Kerala, India. Health Policy Plan 2004; 19(1): 41-51.

19. Madhavan S, Bishai D. Private sector engagement in reproductive and sexual health and maternal and neonatal health: a review of the evidence [Internet]. Baltimore, USA: Johns Hopkins University; [cited 2012 Jan 21]. Available from: www.dfid.gov.uk/.../Private-Sector-Engagement-in-SRH-MNH.pdf

20. Pomeroy A, Koblinsky M, Alva S. Private delivery care in developing countries: trends and determinants [Internet]. Calverton, USA: ICF Macro; [cited 2011 Jul 30]. Available from: pdf.usaid.gov/pdf_docs/PNADT572.pdf

21. Summary of findings: national report: NFHS 3. Mumbai, India: Indian Institute for Population Sciences; 2007.

22. Thind A, Mohani A, Banerjee K, Hagigi F. Where to deliver? Analysis of choice of delivery location from a national survey in India. BMC Public Health 2008; 8: 29.

23. Madhavan S, Bishai D, Stanton C, Harding A. Engaging the private sector in maternal and neonatal health in low and middle income countries. Baltimore, USA: Future Health Systems; 2010.

24. Desai S, Wu L, Joshi BL. Utilization of maternal health care services in India: understanding the regional differences. College Park, USA: University of Maryland and National Council of Applied Economics Research; 2006.

25. Govindasamy P, Ramesh BM. Maternal education and the utilization of maternal and child Health services in India. Mumbai, India: International Institute for Population Sciences; 1997.

26. Stephenson R, Tsui AO. Contextual influences on reproductive health service use in Uttar Pradesh, India. Stud Fam Plann 2002; 33(4): 309-20.

27. Rajna PN, Mishra AK, Krishnamoorthy S. Impact of maternal education and health services on child mortality in Uttar Pradesh, India. Asia Pac Popul J 1998; 13(2): 27-38.

28. Bloom SS, Wypij D, Gupta MD. Dimensions of women's autonomy and the influence on maternal health care utilization in a north Indian city. Demography 2001; 38(1): 67-78.

29. Nigussie M, Mariam DH, Mitike G. Assessment of safe delivery service utilization among women of childbearing age in north Gondar zone, North West Ethiopia. Ethiop. J. Health Dev. 2004; 18(3): 145-52.

30. Kilaru A, Brookes M, Ganapathy S, Matthews Z. Maternal health care in south India: do adolescents seek more care than older women? Opportunities and choices working papers [Internet]. South Hampton, UK: University of South Hampton; [updated 2002; cited 2011 Aug 12]. Available from: http://www.dfid.gov.uk/r4d/Output/61071/Default.aspx

31. Navaneetham K, Dharmalingam A. Utilization of maternal health care services in southern India. Soc Sci Med 2002; 55(10): 1849-69.

32. China: basic indicators. [Internet] New York, USA: UNICEF; [cited 2011 Jul 5]. Available from: http://www.unicef.org/infobycountry/china_statistics.html

33. India: basic indicators [Internet]. New York, USA: UNICEF; [cited 2011 Jul 5]. Available from: http://www.unicef.org/infobycountry/india_statistics.html#75

34. Maternal mortality in 2005: estimates developed by WHO, UNICEF, UNFPA and the World Bank [Internet]. Geneva, Switzerland: WHO; [cited 2011 Jul 23]. Available from: www.who.int/whosis/mme_2005.pdf

35. Special bulletin on maternal mortality in India 2004-06 [Internet]. New Delhi, India: Registrar general of India; [updated 2009 Apr; cited 2011 Jul 24]. Available from: www.mp.gov.in/health/MMR-Bulletin-April-2009.pdf

36. Achievement of objectives and outcomes: implementation completion report, RCH I. Washington D.C., USA: World Bank; 2005.

37. Mari Bhat PN. Maternal mortality in India: an update. Stud Fam Plann 2002; 33(3): 227-36.

38. National health profile 2010: demographic indicators [Internet]. New Delhi, India: Central bureau of health intelligence, government of India; [cited 2011 Jul 24]. Available from: http://cbhidghs.nic.in/writereaddata/mainlinkFile/File1131.pdf

39. Country health system profile: India [Internet]. New Delhi, India: WHO SEARO; [cited 2011 Jul 18]. Available from: http://www.searo.who.int/en/Section313/Section1519_10857.htm

40. Nations online project. Administrative map of India [Internet]. 1: 100,000. New Delhi, India: Nations online project; [cited 2011 Oct 4]. Available from: http://www.nationsonline.org/oneworld/india_map.html

41. District Level Household and Facility Survey 2007-08: India. Mumbai, India: International Institute for Population Sciences; 2009.

42. Paxton A, Bailey P, Lobis S. The United Nations process indicators for emergency obstetric care: reflections based on a decade of experience. Int J Gynaecol Obstet 2006; 95(2): 192-208.

43. National fact sheet: 2009 coverage evaluation survey [Internet]. New Delhi, India: UNICEF; [cited 2011 Aug 2]. Available from: www.unicef.org/india/National_Fact_Sheet_CES_2009.pdf

44. Lim SS, Dandona L, Hoisington JA, James SL, Hogan MC, Gakidou E. India's Janani Suraksha Yojana, a conditional cash transfer programme to increase births in health facilities: an impact evaluation. Lancet 2010; 375(9730): 2009-23.

45. Boerma JT, Bryce J, Kinfu Y, Axelson H, CG V. Mind the gap: equity and trends in coverage of maternal, newborn, and child health services in 54 countdown countries. Lancet 2008; 371(9620): 1259-67.

46. Cavagnero E, Daelmans B, Gupta N, Scherpbier R, Shankar A. Assessment of the health system and policy environment as a critical complement to tracking intervention coverage for maternal, newborn, and child health. Lancet 2008; 371(9620): 1284-93.

47. The Partnership for Maternal, Newborn and Child Health [Internet]. Geneva, Switzerland: WHO; [cited 2011 Aug 12]. Available from: http://www.who.int/pmnch/about/en/

48. Poverty estimates for 2004-05 [Internet]. New Delhi, India: Planning commission of India; [cited 2011 Aug 20]. Available from: http://planningcommission.nic.in/news/prmar07.pdf

49. Pathak PK, Singh A, Subramanian SV: Economic inequalities in maternal health care: prenatal care and skilled birth attendance in India, 1992-2006. PLoS One; 5(10): e13593.

50. Balarajan Y, Selvaraj S, Subramanian SV. Health care and equity in India. Lancet 2011; 377(9764): 505-15.

51. National Family Health Survey 1: summary of findings. Mumbai, India: Indian Institute for Population Sciences; 1995.

52. Dalal K, Dawad S. Non-utilization of public healthcare facilities: examining the reasons through a national study of women in India. Rural and Remote Health [Internet]. 2009 [cited 2011 Aug 10]; 9: 1178. Available from: http://www.rrh.org.au

53. Haub C, Sharma OP. What is poverty, really? The case of India [Internet]. Washington D.C., USA: Population Reference Bureau; [cited 2011 Jul 23]. Available from: www.prb.org/Articles/2010/indiapoverty.aspx

54. Devadasan N, Elias MA, John D, Grahacharya S. A conditional cash assistance programme for promoting institutional deliveries among the poor in India: process evaluation results. Studies in HSO&P 2008; 24: 257-73.

55. Bhat R, Mavalankar DV, Singh PV, Singh N. Maternal healthcare financing: Gujarat's Chiranjeevi Scheme and its beneficiaries. J Health Popul Nutr 2009; 27(2): 249-58.

56. Mavalankar D, Singh A, Patel SR, Desai A, Singh PV. Saving mothers and newborns through an innovative partnership with private sector obstetricians: Chiranjeevi Scheme of Gujarat, India. Int J Gynaecol Obstet 2009; 107(3): 271-6.

57. National health profile 2010: socio-economic indicators [Internet]. New Delhi, India: Central bureau of health information, government of India; [cited 2011 Jul 21]. *http://*cbhidghs.nic.in/index2.asp?slid=1125&sublinkid=929

58. Programs [Internet]. Gandhinagar, India: Ministry of health and family welfare, government of Gujarat; [cited 2011 Jul 20]. Available from: http://www.gujhealth.gov.in/programs.htm

59. Gupta M, Mavalankar D, Ramani KV. Referral transport. In: Visaria L, editor. Midwifery and maternal health in India: a situational analysis. Ahmedabad, India: Centre for Management of Health Systems 2010; 90-9.

60. Key indicators for Gujarat from NFHS-3. Mumbai, India: International Institute for Population Sciences; 2007.

61. Health statistics: Gujarat: 2009-10 [Internet]. Gandhinagar, India: Vital statistics division, government of Gujarat; [cited 2011 Jul 3]. Available from: www.gujhealth.gov.in/images/pdf/Health-review-09-10.pdf

62. Safer pregnancy in Tamil Nadu: from vision to reality. New Delhi, India: WHO SEARO; 2009.

63. Chandran P, Subbiah A. Health programme initiatives in Tamil Nadu-a review. Chennai, India: RUWSEC; Undated.

64. Key indicators for Tamil Nadu from NFHS-3. Mumbai, India: International Institute for Population Sciences; 2007.

65. Griffiths P, Stephenson R. Understanding users' perspectives of barriers to maternal health care use in Maharashtra, India. J Biosoc Sci 2001; 33(3): 339-59.

66. Health indicators [Internet]. Chennai, India: Ministry of health & family welfare government of Tamil Nadu; [cited 2011 Aug 3]. Available from: http://www.tnhealth.org/healthindicators.htm

67. Narayanan KR. Social exclusion, caste & health: a review based on the social determinants framework. Indian J Med Res 2007(126): 355-63.

68. Thaddeus S, Maine D. Too far to walk: maternal mortality in context. Soc Sci Med 1994; 38(8): 1091-110.

69. Ensor T, Cooper S. Overcoming barriers to health service access: influencing the demand side. Health Policy Plan 2004; 19(2): 69-79.

70. Powell-Jackson T, Hanson K. Financial incentives for maternal health: Impact of a national programme in Nepal. J Health Econ Jan 2012; 31(1): 271-84.

71. Khan ME, Hazra Abhishek, Isha. B. Impact of Janani Suraksha Yojana on selected family health behaviors in rural Uttar Pradesh. J Fam Welf 2010; 56(Special): 9-22.

72. Chakrabarti A, Chaudhuri K. Antenatal and maternal health care utilization: evidence from northeastern states of India. Appl Econ 2007; 39: 683-95.

73. Pandey A, Roy N, Sahu D, Acharya R. Maternal health care services: observations from Chhattisgarh, Jharkhand and Uttaranchal. Econ Polit Wkly 2004; 39(7): 713-20.

74. Raju SS. Variations in the utilization of reproductive health (RH) services and its determinants: an empirical study in India. Paper presented at: CICRED seminar on reproductive health, unmet needs, and poverty: issues of access and quality of services; 2002 Nov 25-30; Bangkok, Thailand.

75. Cham M, Sundby J, Vangen S. Maternal mortality in the rural Gambia, a qualitative study on access to emergency obstetric care. Reprod Health 2005; 2(1): 3.

76. Mazumdar PG, Kanjilal B, Barman D, Mandal A. Revisiting the role of geographical accessibility in women's access to healthcare. Jaipur, India: Indian Institute of Health Management Research; 2009.

77. New all-weather roads boost rural income: IDA at work: India [Internet]. Washington D.C., USA: International Development Association; [cited 2012 Mar 20]. Available from: http://web.worldbank.org/WBSITE/EXTERNAL/EXTABOUTUS/IDA/0,,contentMDK:22311357~menuPK:4754051~pagePK:51236175~piPK:437394~theSitePK:73154,00.html

78. Lalmalsawmzauva KC, Nayal DK. Maternal health care utilization in India: role of surface road networks. Paper presented at: XXVI IUSSP International population conference; 2009 Sept 27-Oct 2; Morocco.

79. India: transport sector [Internet]. Washington D.C., USA: World Bank; [cited 2011 Mar 21]. Available from: http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/EXTSARREGTOPTRANSPORT/0,,contentMDK:20703625~menuPK:868822~pagePK:34004173~piPK:34003707~theSitePK:579598,00.html

80. Gabrysch S, Campbell O. Still too far to walk: literature review of the determinants of delivery service use. BMC Pregnancy Childbirth 2009; 9: 34.

81. Nagdeve D, Bharati D. Urban-rural differentials in maternal and child health in Andhra Pradesh, India. Rural Remote Health [Internet]. 2003 [cited 2011 Aug 5]; 3(1): 146. Available from: www.rrh.org.au/publishedarticles/article_print_146.pdf

82. Tewodros B, G/Mariam A, Dibaba Y. Factors affecting antenatal care utilization in Yem Special Yoreda, southwest Ethiopia. Ethiop. J. Health Sci. 2009; 19(1): 45-51.

83. Abera M, G/Mariam A, Belachew T. Predictors of safe delivery service utilization in Arsi zone, southwest Ethiopia. Ethiop. J. Health Sci. 2011; 21(special): 101-13.

84. Atuyambe L, Mirembe F, Tumwesigye NM, Annika J, Kirumira EK, Faxelid E. Adolescent and adult first time mothers' health seeking practices during pregnancy and early motherhood in Wakiso district, central Uganda. Reprod Health 2008; 5: 13.

85. Reynolds HW, Wong EL, Tucker H. Adolescents' use of maternal and child health services in developing countries. Int Fam Plan Perspect 2006; 32(1): 6-16.

86. Nisar N, White E. Factors affecting utilization of antenatal care among reproductive age group women (15-49 years) in an urban squatter settlement of Karachi. JPMA 2003; 53(47).

87. Adiraju KMR, Famula M, Thangavelu T, Whiffen A. Promoting safe deliveries among below poverty line women: the process of social inclusion of Gujarat [Internet]. New Delhi, India: Knowledge community on children in India, UNICEF; [updated 2009; cited 2012 Apr 4]. Available from: http://www.akmrs.com/uploads/7/9/7/0/7970223/09_gujarat_institutional_deliveries.pdf

88. Mushtaq MU. Public health in British India: a brief account of the history of medical services and disease prevention in colonial India. Indian J Community Med 2009; 34(1): 6-14.

89. District Level Household and Facility Survey: 2007-08: fact sheet-India. Mumbai, India: International Institute for Population Sciences; 2010.

90. Kishowar Hossain AH. Utilization of antenatal care services in Bangladesh: an analysis of levels, patterns, and trends from 1993 to 2007. Asia Pac J Public Health; 22(4): 395-406.

91. Kinoti S. Effects of performance based financing on maternal care in developing countries: access, utilization, coverage, and health impact [Internet]. Washington D.C., USA: USAID; [cited 2012 Jan 29]. Available from: www.tractionproject.org

92. Jat TR, Ng N, San Sebastian M. Factors affecting the use of maternal health services in Madhya Pradesh state of India: a multilevel analysis. Int J Equity Health; 10(1): 59.

93. Wildman K, Bouvier-Colle MH. Maternal mortality as an indicator of obstetric care in Europe. Bjog 2004; 111(2): 164-9.

94. Krupp K, Madhivanan P. Leveraging human capital to reduce maternal mortality in India: enhanced public health system or public-private partnership? Hum Resour Health 2009; 7: 18.

95. Gage AJ, Calixte MG. Effects of the physical accessibility of maternal health services on their use in Rural Haiti. Popul Stud 2006; 60(3): 271-88.

96. District Level Household and Facility Survey: 2007-08: Gujarat. Mumbai, India: International Institute of Population Sciences; 2010.

97. Desai S, Wu L. Structured inequalities-factors associated with spatial disparities in maternity care in India. J App Econ Res 2010; 4(3): 293-319.

98. District Level Household and Facility Survey: 2007-08: Tamil Nadu. Mumbai, India: International Institute of Population Studies; 2010.

99. Paul VK. India: conditional cash transfers for in-facility deliveries. Lancet; 375(9730): 1943-4.

100. Wenjuan W, Alva S, Shanxiao W, Alfredo F: Levels and trends in the use of maternal health services in developing countries. Calverton, Maryland, USA: ICF Macro; 2011.

101. Rural Health Statistics Bulletin [Internet]. New Delhi, India: Ministry of health and family welfare, Government of India; [updated 2007 Mar; cited 2011 Dec 20]. Available from: http://nrhm-mis.nic.in/UI/RHS/RHS2007/Title%20Page.htm

102. Ho PC, So WK, Ma HK: Obstetric performance of elderly primiparae. Asia Oceania J Obstet Gynaecol 1986; 12(4): 499-504.

103. Ghuman BS, Mehta A. Health care services in India: problems and prospects. Paper presented at: International conference on the Asian social protection in comparative perspective; 2009 Jan 7-9; Singapore.

104. Storey D, Lee K, Blake C, Lee P, Lee H-Y, Despasquale N. Social & behavior change interventions; landscaping study: a global overview. Baltimore, USA: Johns Hopkins center for communication programs, 2011; 68.