INTRODUCTION

The population of Uttar Pradesh (UP) has been growing at annual exponential rate of 2.3 percent during 1991-2001 and its population is expected to reach 249 million by 2026 from a base population of 166 million in 2001.1 The total fertility rate (TFR) in UP was 3.8 children per woman in 2008; with a decline of about one children in the last 10 years.1 In terms of utilization of maternal and child health (MCH) services, the state is far behind many states. Even after the introduction of the Janani Suraksha Yojana (JSY) under the National Rural Health Mission (NRHM), the coverage of institutional delivery, immunization, and antenatal and postnatal care has been substantially low.

The maternal mortality ratio (440)1 and under-five mortality rate (51)1 in UP is amongst the highest in the country and hence improving coverage of the aforementioned MCH services continues to be a major challenge for policy makers and program implementers. In addition, in view of the progress made in the last 10 years on maternal and child indicators, the state may not be able to achieve the Millennium Development Goals (MDGs) by 2015. Moreover, the achievement of the MDGs at the national level would largely depend on the progress made in states like UP, Bihar, Rajasthan and Madhya Pradesh. In spite of the high unmet need for contraception, utilization of modern contraceptives has been very low and an increasing number of people have been relying on traditional methods, predominantly the rhythm method (12-15 percent currently, as compared to less than 2 percent in the early 1990s).
**OBJECTIVES**

In the context of increasing input under the NRHM and the proposed behavior change communication (BCC) activities, in 2010, the International Institute for Population Sciences (IIPS), a partner in the Population Council-led consortium, conducted a study to assess:

a) the expected increase in workload of public health facilities in providing various MCH services until 2015,

b) the extent to which this increased demand could be met by the existing network of health facilities.

The study was funded by the Population Council as a subcontract to IIPS, from an award granted by the Bill and Melinda Gates Foundation.

**METHODOLOGY**

Projecting future demand for various services is one of the tools to estimate required investment. One method is to define the goals of the program for the next 5-10 years and accordingly estimate the demand for services. Based on these estimates, resources are allocated to ensure that all essential requirements—physical infrastructure, human resources, supply of essential drugs and vaccines and quality of care—are in place. A second approach is to look at the issue in terms of global commitments, such as the MDGs and the International Conference on Population and Development (ICPD). In this case, the desired goal at the end of the period is known and one has to work out the intermediate commitments and activities required to achieve the desired goal. It is important to note that in the global framework commitments are generally made at the national level and there are no state-level commitments. Some of the goals that are tenable at the national level may not be applicable at the state or local level. In order to achieve these goals at the state or local level, there is a need to translate national goals so that area-specific interventions can be worked out. However, meeting these goals at the state/local level may require greater investment, for example, by improving the supply including human resources and by creating demand through education/communication.

Another approach, which has been adopted in this study, is to look at past trends in the utilization of selected services and extrapolate the expected level of coverage over the next 5 or more years. It is assumed that the rate of change in socio-economic conditions would remain constant or change very slightly over the next 5 years. Under this assumption, past trends in the utilization of required services are less likely to deviate substantially from their current path.

In this study, simple linear regression models have been used to extrapolate the trends in future utilization of required services. The regression equation may be written as

\[ Y = a + b \times t \]

Where, 'Y' is the required program indicator and 't' is the time.

To predict the demand for particular services related to family health, indicators that will increase the load on physical and human resources and have a bearing on quality of care have been selected. These indicators are: (a) institutional delivery, (b) IFA (100 tablets given) and TT injection (at least two) coverage, (c) use of modern methods of contraception (limiting and spacing), and (d) immunization coverage (full immunization and measles vaccination).

The expected increase in institutional delivery has been segmented into public and private health facilities, as in this study the concern is the workload of the public sector. The pattern of utilization of
required services are taken from DLHS-3, conducted in 2007-08 by the IIPS, Mumbai and a formative survey conducted in rural UP by the Population Council in 2009. The estimated trend lines for each of these indicators are presented in Table 1.

The future demand for selected services, as mentioned earlier, is extrapolated based on these estimated trend lines. To convert the estimates into absolute numbers, the population of eligible women has been obtained by multiplying the projected population by 16.5 (assuming that at any given time point of time, of every 100 women approximately 16.5 would be eligible to utilize the required services). Input data for estimating the trend lines are presented in Appendix 1.

**Key Findings**

**Institutional delivery**

Table 2 presents the percentage of institutional deliveries estimated to take place in UP. If the current trend in institutional delivery continues, the rate of institutional delivery in UP is expected to reach 69 percent by 2015 from a present rate of about 44 percent in 2009. If these projected percentages are converted into absolute numbers, the demand for institutional delivery would increase from 1,150,000 deliveries during the pre-NRHM period to 2,525,000 in 2010 and 3,900,000 by 2015. Thus, if the current trend continues over the next 5-6 years, the demand for institutional delivery in UP is likely to go up over three times.

Data from NFHS-3 (2005-06) indicate the ratio of public: private facility use for institutional delivery was 37:63 in UP. After the introduction of the JSY, this ratio has shown a shift in favor of public facilities. For example, DLHS-3 (2007-08) data show that the ratio of public: private facilities was about 40:60, which changed to 60:40 in 2009.

To estimate the future workload of public health facilities, it is assumed that the share of public and private facilities will be 50:50. Further, the crude birth rate is expected to decline from 31 to 26 per 1,000 population during 2004-15. However, due to population momentum, the number of births would still increase marginally from 5,500,000 in 2009 to 5,600,000 in 2015. In such a scenario, it is expected that the number of institutional deliveries in public sector facilities will increase from 1,262,500 in 2010 to 1,950,000 by 2015 (Table 3).

This compares with only 575,000 institutional deliveries that were conducted in public facilities prior to the launching of the NRHM. These results suggest that public facilities are likely to become heavily...
burdened with the increasing demand for delivery services.

### Table 3
Projected number of births and institutional deliveries in Uttar Pradesh, 2009-15

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated number of births</th>
<th>Estimated number of institutional deliveries</th>
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</thead>
<tbody>
<tr>
<td>2009</td>
<td>5,590,134</td>
<td>2,476,429</td>
</tr>
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<td>2010</td>
<td>5,606,354</td>
<td>2,524,485</td>
</tr>
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<td>2011</td>
<td>5,619,036</td>
<td>2,796,701</td>
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<tr>
<td>2012</td>
<td>5,628,672</td>
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</tr>
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<td>2013</td>
<td>5,635,482</td>
<td>3,339,457</td>
</tr>
<tr>
<td>2014</td>
<td>5,638,955</td>
<td>3,608,965</td>
</tr>
<tr>
<td>2015</td>
<td>5,638,689</td>
<td>3,876,232</td>
</tr>
</tbody>
</table>

### IFA and TT coverage

IFA and TT, two of the indicators considered in this study, are basic components of antenatal care and help to reduce maternal mortality and child mortality. The distribution and consumption of 100 IFA tablets during pregnancy is the only intervention to reduce the risk of maternal anemia. To increase the consumption of IFA, a strong BCC strategy is needed. The projected requirement suggests no obvious trends in IFA and TT injection coverage (Table A, Appendix 1). Therefore, the projected values of IFA and TT should be interpreted with caution.

Table 4 presents the estimated number of IFA and TT injections that would be required in future. The number of IFA tablets consumed is not projected, since “given IFA” is the main requirement from the program point of view. The requirement of TT injections is estimated by multiplying the projected percentage of women getting at least two TT injections by the number of pregnant women and 2.

The results suggest that in UP, the requirement of IFA and TT would be approximately 73 percent and 84 percent, respectively, by 2015. In other words, the supply of IFA tablets would need to be increased from the current level of 339 million tablets to 453 million tablets by 2015, and the supply of TT injections from about 8.1 million in 2009 to 10.4 million in 2015.

A few key points need to be noted. One, the increase in utilization of selected MCH services under the JSY scheme was sluggish during the early period in UP. As mentioned earlier, the utilization of institutional delivery would increase at a faster rate in the next 4-5 years than the rate follow the introduction of the JSY. Consequently, the requirement of TT injections is also likely to increase tremendously as trends in any ANC visits show an upward trend.

### Contraceptive use

Information on unmet need for contraception can be effectively used to project the future demand for family planning methods. Unmet need in UP was 32.5 percent in 2007-08 (10.7 percent for spacing and 21.8 percent for limiting). If unmet need is converted into met need by improving access and addressing some of the barriers to the adoption of contraception, one could assume that the contraceptive prevalence rate could go up to 60 percent.

An attempt has been made to estimate the future requirements of limiting and spacing methods separately using time series data on contraceptive prevalence rate obtained from three rounds of the NFHS conducted in 1992-93, 1998-99, and 2005-
06. Estimates from DLHS-3 (2007-08) have not been considered as the use of spacing methods in this survey was lower than that recorded in NFHS-3 (2005-06). Estimates of future demand excluding DLHS-3 data (2007-08) are likely to be higher by only 3 percent.

Estimates from the trend analysis suggest that the use of modern contraceptives is likely to reach to 36 percent by 2015. In addition, the contraceptive prevalence rate (for both limiting and spacing methods) in UP is likely to reach 55 percent by 2015. The higher share of spacing methods in future is due to the higher rate of increase in the use of spacing methods (Table 5).

According to projected figures, approximately 7,160,000 couples in the state would require permanent methods of contraception in 2015. This compares with 5,700,000 couples undergoing sterilization in 2008. Therefore, there will be approximately 1,500,000 additional couples requiring permanent family planning methods. Similarly, around 4,040,000 couples in UP were using modern spacing method in 2008. Study results suggest that this is likely to increase by approximately 1,800,000 couples, i.e. approximately 58,000,000 couples will be using modern spacing methods in 2015. Comparative data from service statistics for UP suggest that approximately 4,500,000 sterilizations were being conducted annually during the period 2008-11. The number of sterilizations obtained from the service statistics and our estimates differ slightly this difference could be because service statistics may not be capturing sterilizations cases in the private sector, ranging between 15-20 percent of overall sterilization cases. About 14-15 percent of family planning users in the state depend on traditional methods of family planning. Further, the use of postpartum contraception among low parity women is presently low.

**Immunization**

Current estimates of child immunization suggest that only 30 percent of children aged 12-23 months were fully immunized in UP whereas measles coverage was around 47 percent. Regression analysis based on full immunization coverage and measles vaccination as dependent variables and institutional delivery as the independent variable suggests that full immunization and measles coverage are likely to increase to 73 percent and 75 percent respectively, by 2015 (Table 6).

Figure 1 presents the linear trend line for full immunization and measles in UP based on regression analysis, taking institutional delivery as the independent variable.

Based on the expected number of births, and excluding infant deaths, it is estimated that annually around 5,300,000 –5,400,000 children would need to be vaccinated. In other words, 4,000,000
children need to be covered by measles vaccination in 2015 as compared to only 2,000,000 children being covered currently.

**Potential Burden of Increase in Demands on the Public Health Infrastructure**

*Skilled birth attendance*

UP has 20,521 health sub-centers (HSCs), 3,660 primary health centers (PHCs), 386 community health centers (CHCs), 50 sub district facilities and 74 women district hospitals (WDHs). According to DLHS-3 (2007-08), out of around 1,200,000 deliveries in 2007, 40 percent (around 500,000) were managed by existing public health facilities. After the introduction of the JSY, an increasing number of deliveries have been shifting to public health facilities. A 10 percent point increase in the use of public health facilities has been assumed; thus the percentage of institutional deliveries in public facilities would increase to 50 percent. Assuming that in UP only WDHs (74) and CHCs/First Referral Units (FRUs; 436 taken together) are conducting deliveries, on an average of 10 deliveries per day and 3 deliveries per day, respectively, potentially about 750,000 deliveries can be conducted in existing public health facilities annually. Further, according to DLHS-3, around 32 percent of PHCs had conducted at least 10 deliveries in the one month prior to the survey, which is an average of 150,000 deliveries annually. Thus, all these facilities together have the potential to conduct about 900,000 deliveries annually. According to the UP government, in 2007-08, a total of 964,376 institutional deliveries were covered by the JSY, that is, in public health facilities. This figure corresponds with the existing capacity of the public health facilities discussed above. The total number of expected deliveries under the JSY for the year 2008-09 works out to be 1.54 million. The Government of Uttar Pradesh has also launched the Saubhagyavati Surakshit Matretev Yojana under the public-private partnership (PPP) model to promote institutional deliveries in the state.

In 2015, out of a total of 3,900,000 institutional deliveries, based on the assumption that the share of public-private sector facility use will be 50:50, almost 1,900,000 deliveries are expected to take place in public health facilities. This amounts to 10 deliveries per day per facility, taking 510 CHCs, FRUs and WDHs together. As mentioned earlier, currently 120 deliveries per year are being conducted in existing PHCs. If it is assumed that each PHC will attend three times more delivery cases per year (i.e., 360 per year), all functioning PHCs taken together will conduct 421,560 deliveries. As a result, the workload of the 510 CHCs, FRUs and WDHs may reduce from 10 to 7 deliveries per day. Given the number of deliveries that all these facilities are presently conducting, it would be difficult for these facilities to meet the demand of even 50 percent of women who may opt for a delivery at a public health facility.

A key factor that constrains public facilities from functioning at optimum capacity is the huge shortfall of human resources at the CHC level. Although
nearly 89 percent of CHCs have functional operation theatres (OTs), there is a shortfall of physicians (68 percent), surgeons (60 percent), anesthetists (84 percent) and pediatricians (97 percent). CHCs and WDHs are expected to handle complicated cases in addition to normal deliveries in their catchment area; however, due to limited human resources, cases are probably concentrated either in WDHs or a few functioning CHCs, resulting in heavy workload and deteriorating quality of care at these facilities.

Moreover, PHCs that should be managing normal deliveries and other basic services are not adequately equipped. Nearly half the PHCs have less than 4 beds, less than 1 in 2 PHCs has a functional OT and only 55 percent have essential drugs. Very few PHCs have a regular supply of electricity (12 percent) and only 1 in 5 PHCs has cold chain equipment. Just around 1 in 3 PHCs has a referral system for delivery. Monitoring by civil society, which the Ministry of Health and Family Welfare plans to implement at the district and PHC level, is lagging; only 2 in 5 PHCs have a Rogi Kalyan Samiti in place, which are in fact not functioning efficiently.

Given the limited preparedness of PHCs and CHCs, it would be difficult for these facilities to meet the growing demand for institutional delivery due to the JSY. These findings point to the urgent need to strengthen health facilities, and locate them across the districts, so as to evenly distribute the case load and ensure quality of care.

**Contraceptive use**

If users of traditional methods of contraception and low parity women who need postpartum contraception shift to modern spacing methods as a result of increased BCC efforts and greater contact with health workers due to the phenomenal increase in institutional delivery, there would be a huge demand for methods like oral contraceptive pills and condoms. As a result, maintaining and managing the supply chain would be a challenging task.

**Maternal and child health care**

The increase in the case load for immunization would need to be managed by approximately 20,521 HSCs and 3,360 PHCs. As mentioned earlier, PHCs are currently not equipped to manage this increased demand. The numbers suggest that each HSC has been covering 100 children annually (assuming all cases are managed/vaccinated by them, as the share of the private sector is small and focused in urban areas), which is likely to increase to 200 children by 2015. Given the current level of preparedness of health facilities, the increased case load may be too much to handle, considering their other responsibilities.

Of the total HSCs surveyed in DLHS-3 (2007-08), only 35 percent had essential supplies (i.e., IFA, vaccines, Vitamin A, ORS). Among HSCs located in government buildings (which is only 42 percent of all HSCs), only 7 percent had a regular supply of electricity. Little more than half the ANMs are residing in HSC quarters or within 1 km of the village. Good road connectivity, transport facilities and communication links, like mobile/telephones/helplines, are necessary to manage any emergency cases. DLHS-3 (2007-08) data indicate that only 18 percent of the PHCs had a functioning vehicle.

**Implications for policy and the BCC strategy**

The projected requirement of various services in UP indicates that there will be a huge pressure on the public health facilities in future, particularly in view of the shortage of human resources at the different levels of public health facilities. The demand for required services is likely to increase three or four times in the next 5-6 years. Recent data from facility survey
conducted under the DLHS-3 (2007-08) by IIPS present a grim picture of the public health infrastructure and the availability of trained human resources to provide basic and emergency services. Unless strategic planning is done to ensure that facilities are adequately equipped as per norms (including human resources, infrastructure as well as supplies) and are easily accessible (located within a radius of 5-8 km), it would be difficult to handle the increased workload without compromising the quality of care.

In addition, there is an urgent need to ensure a regular supply of electricity to all functional PHCs. In the absence of regular electricity supply, working hours are restricted even in 24x7 health facilities as both providers and clients would like to leave the facility before dark. Rigorous efforts are needed to make public facilities more efficient and accessible to the people. Public health facilities should be spread across districts to reduce the workload of a few functioning facilities.

Attempts should be made to curb the trend of people shifting from the private sector to the public sector for institutional delivery due to the JSY incentive to accredited private clinics as well. Given that the increasing volume of service requirements cannot be managed by the public sector alone, public-private partnership models could be tested and successful ones scaled up.

Addressing fertility desires and promoting spacing between births needs attention to reduce both unwanted pregnancy and the unmet need for spacing. Increasing awareness of emergency contraceptives would be an important step to avoid both unwanted pregnancies and induced abortions. It is estimated that in just 5 years more than 150,000 maternal deaths would be averted by increasing the contraception rate to meet women's need for spacing and limiting. The data indicate that a large number of people depend on traditional contraceptive methods to regulate fertility, and this practice has been rapidly increasing. This could be largely because of system failure or program emphasis on sterilization as there is no reason to believe in increased choice for traditional methods overnight. To reduce unwanted pregnancies, programs need to look into supply and access issues. If traditional methods are preferred, then the standard days method should be promoted as, if used correctly, this method could be more reliable than other traditional methods.

To realize these projections, BCC efforts should create a demand for services and address the perception that it is “not necessary” to access health care services. BCC must play a greater role in motivating women to move to health facilities not just for institutional delivery but for other services as well. BCC can also play a role in increasing the demand for contraceptives and educating people to make choices appropriate to their needs.

REFERENCES


**APPENDIX 1**

<table>
<thead>
<tr>
<th>Year and source</th>
<th>Institutional delivery</th>
<th>Atleast 2 TT injections</th>
<th>IFA tablets given</th>
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<th>Measles</th>
<th>Contraceptive use (modern)</th>
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<td></td>
<td></td>
<td></td>
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**TABLE B**

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<th>Year</th>
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*Obtained from survey conducted by Population Council under the PC-UP project*