

Rai, Piyush Kant; Pareek, Sarla; Joshi, Hemlata

Article

MET AND UNMET NEED FOR CONTRACEPTION: SMALL AREA ESTIMATION FOR RAJASTHAN STATE OF INDIA

Statistics in Transition New Series

Provided in Cooperation with:

Polish Statistical Association

Suggested Citation: Rai, Piyush Kant; Pareek, Sarla; Joshi, Hemlata (2017) : MET AND UNMET NEED FOR CONTRACEPTION: SMALL AREA ESTIMATION FOR RAJASTHAN STATE OF INDIA, Statistics in Transition New Series, ISSN 2450-0291, Exeley, New York, NY, Vol. 18, Iss. 2, pp. 329-360, <https://doi.org/10.21307/stattrans-2016-073>

This Version is available at:

<https://hdl.handle.net/10419/207861>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/4.0/>

MET AND UNMET NEED FOR CONTRACEPTION: SMALL AREA ESTIMATION FOR RAJASTHAN STATE OF INDIA

Piyush Kant Rai¹, Sarla Pareek², Hemlata Joshi³

ABSTRACT

Nowadays, Family Planning has become the basic human right, which is closely linked to the empowerment of women and perhaps it is the only treatment that can avert many serious issues, which are an impediment in the advancement of the country like maternal mortality, infant mortality and can exert out the families from poverty and stabilize population growth etc. Increasing use of family planning can be helpful in the reduction of unmet need for family planning by which a substantial proportion of unwanted births ends in childbirths, and which are related to deaths and injuries for both mother and child.

Due to lack of availability of reliable data at the small level (area-wise) specifically in developing countries like India. In this article the small area estimation technique is used for the estimation of met and unmet need for contraception for 187 towns of Rajasthan state of India and for empirical analysis. Data is taken from the District Level Household Survey (DLHS): 2002-04 and the Census 2001 of India.

Key words: contraceptive use, met and unmet need for family planning, small area estimation, logit-link function, district level household survey, census of India.

1. Introduction

Adjustment and execution of any voluntary family planning programmes by the government of a country wish to improve the demographic situation at a particular time. If we focus on Millennium Development Goals (MDG's) that the families having lesser number of children can lead to healthy productive lives which can help in the alleviation of poverty (MDG 1). Children are more likely to attend school and attain higher education (MDG 2). Women with few number of pregnancies can lead to take up jobs and be empowered with improved status within their family as well as outside (MDG 3) and reduce the risk of maternal mortality either due to complications of pregnancy or an abortion (MDG 5). Well-spaced births can reduce malnutrition and infant mortality (MDG 4). One contraceptive method, the

¹Banasthali University. E-mail: raipiyush5@gmail.com

²Banasthali University. E-mail: psarla13@gmail.com

³Manipal University. E-mail: hemlata.joshi28@gmail.com

condom, prevents both HIV transmission and unwanted pregnancy (MDG 6). Thus the real progress of the country depends on the improved family planning programs and policies and adequate providence of family planning services. As the use of contraception is a part of family planning, in most of the developing countries like India contraception is basically used to reduce fertility and protect couples from other infectious diseases at the time of sexual intercourse. Stover and Ross (2008) argued that contraception plays an important role in reducing maternal morbidity and mortality in the developing world, not only through the reduction of births, but also through the reduction of pregnancies for risk groups, such as teenagers and older women, who already have four or more children (Stover and Ross, 2008).

India launched the National Family Welfare Program in 1951 with the objective of reducing the birth rate to the extent necessary to stabilize the population, consistent with the requirements of the national economy. Since its inception, the program has experienced significant growth in terms of financial investment, service delivery points, type of services, and the range of contraceptive methods offered. Since October 1997, the services and interventions under the Family Welfare Programme and the Child Survival and Safe Motherhood Programme have been integrated with the Reproductive and Child Health Program.

The government of India has been organizing several programs for reducing birth rate. Some of the programs and policies have been successful and the rate of increase has also reduced, but has still to reach the sustainable rate. However, the knowledge of contraception is almost universal in India but still the total met need for family planning is low, i.e. 56.3%, and the total unmet need for contraception is about 12.8% in India (NFHS-3). Unmet need for family planning is a very important indicator for evaluating the potential demand for family planning services and determining the demographic goals in the countries having the fertility level below replacement. Ross and Winfrey (2002) argued that more than 100 million women in developing countries want to avoid pregnancy but are not using any method of family planning (Ross and Winfrey, 2002) and a significant proportion of unintended births ends in pregnancy and child births related injuries and deaths (Sedgh et al. 2007; Stover and Ross 2008). Demographers and health specialists refer to these women as having an “unmet need” for family planning that influences the development of family planning programs. Over the past decade, rising rates of contraception use has reduced the unmet need for family planning in most of the countries. In some less developed countries, where unmet need remains persistently high or is increasing, it is required to have greater efforts to understand and address the causes of unmet need of family planning.

Westoff (1978), using the World Fertility Survey (WFS) data, estimated the unmet need where the exposure was limited to fecund women who wanted no more children and who were not using contraception. Pregnant and amenorrheic women, and women who wanted children within two years, were not included in the definition of unmet need. Further refinement in the estimation of unmet need for spacing and limiting was carried out by Westoff and Pebley (1981). Nortman (1982) advocated inclusion of pregnant, breastfeeding and amenorrheic women in the definition of unmet need. The most widely used measure of unmet need was developed by Westoff and Bankole (1995), based on data from Demographic and Health Surveys (DHSs). However, it has been criticized for its exclusion of married men and unmarried girls and boys, its limited scope in reducing unwanted fertility, its non-addressing of side effects of methods, and its inclusion of traditional methods (Dixon-Muller & Germain (1992); Pritchett (1994); Reddy (2003)).

The concept of unmet need admits the promise of improving the health of population, by reducing fertility and achieving reproductive goals. The Programme of Action of the International Conference on Population and Development, Cairo (1994) recognizes this need and states that ‘government goals for family planning should be defined in terms of unmet need for information and services’ (United Nations 1994). Also, universal access to reproductive health services, of which unmet need for contraception is a key component, has been acknowledged as one of the main strategies in achieving the millennium development goals (United Nations 2005). Unmet need for contraception has been adopted as one of the monitoring indicators in the 62nd General Assembly of the United Nations in 2007.

Recently, after the Cairo Conference, reproductive health became an essential component of the Indian Family Welfare Programme. As in many other countries, there was a shift in emphasis in the programme in India. Unmet need for contraception became a policy instrument to strengthen the Reproductive and Child Health programme of the country. Meeting the unmet need for contraception has been accorded priority as it has the potential for the reduction of fertility and prevention of induced abortions (Ministry of Health and Family Welfare (MOHFW) 1997). The immediate objective of the National Population Policy is to address the unmet need for contraception, health care services and health infrastructure (MOHFW 2000). The recent policy document, the National Rural Health Mission (2005-2012), also aims at addressing the unmet need for contraception along with other objectives (MOHFW 2005). Thus, the unmet need for contraception is now a well-recognized and useful indicator to steer the programme in India.

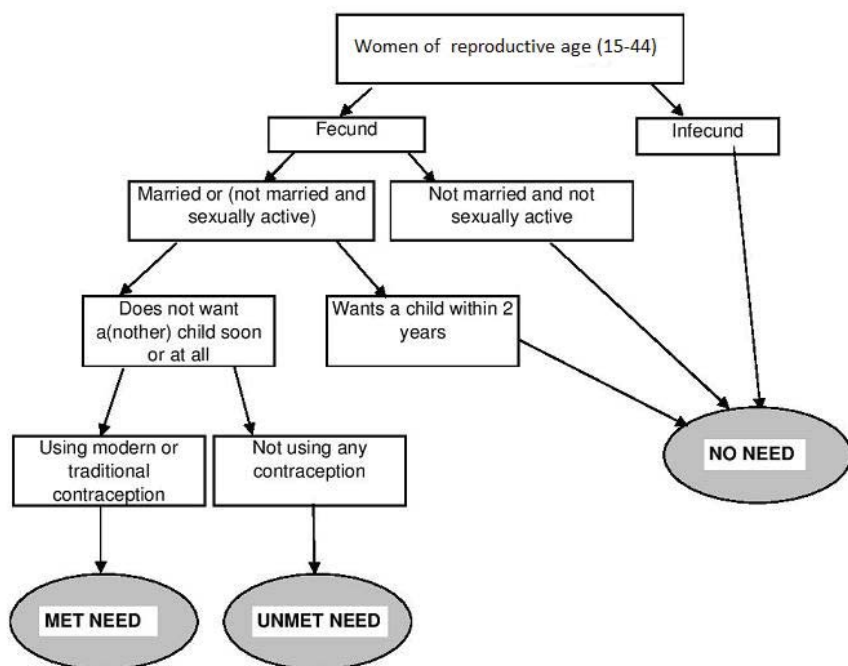
The term “unmet need” indicates the negative kind of concept in the sense that governments are unable to provide family planning programme services to those

who wish to use it but are not getting facilities. The reasons may be due to many socio-economic factors. Therefore here, the concept like KAP (women's knowledge of, attitudes toward, and practice of birth control)- gap came. In most of the cases, where a substantial proportion of women who wanted to stop childbearing or delay in pregnancy but are not practicing contraception, this discrepancy between reproductive preferences and birth control practices is referred to as the "KAP- gap" or the "unmet need" for contraception, (Bongaart, 1991). According to NFHS-3, unmet need for spacing includes pregnant women whose pregnancy was mistimed; amenorrhoeic women who are not using family planning and whose last birth was mistimed, or whose last births was unwanted but now say they want more children; and fecund women who are neither pregnant nor amenorrhoeic, who are not using any method of family planning, and say they want to wait 2 or more years for their next birth. Also, unmet need for spacing includes fecund women who are not using any method of family planning and say they are unsure whether they want another child or who want another child but are unsure when to have the birth. Unmet need for limiting refers to pregnant women whose pregnancy was unwanted; amenorrhoeic women who are not using family planning, whose last child was unwanted and who do not want any more children; and fecund women who are neither pregnant nor amenorrhoeic, who are not using any method of family planning, and who want no more children. Pregnant and amenorrhoeic women who became pregnant while using a method (these women are in need of a better method of contraception) are excluded from the unmet need category.

There are key states (Bihar, Uttar Pradesh, Rajasthan, Madhya Pradesh, Jharkhand and Orissa) in India, where met need for family planning is low and unmet need for family planning is high in comparison with the national average, i.e. (56.3%) and 12.8% respectively. Also, the adolescent fertility rates in these states contribute largely to high TFR. Bihar, Uttar Pradesh, Rajasthan, Madhya Pradesh, Jharkhand and Orissa itself constitute 50 per cent of the total population of India. The comparative data suggest that alongside of TFR, the age at marriage, female education, and contraceptive prevalence rate are also lower in these states, whereas Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR) are quite high compared to the national average. There is an urgent need to focus on spacing and limiting methods of family planning. Thus, it will be very fruitful to us to understand the extent of met and unmet need that can be a powerful tool to manage the family planning programme effectively.

Combining the estimate of unmet need with the contraceptive use provides a picture of the total potential demand for family planning in a country, that is what the demand would be if all married women acted on their stated preferences. For

Figure 1: Conceptual framework of women with unmet need, met need and no need for contraception



family planning services and for policy purposes, this estimate is useful because it helps reveal the size and characteristics of the potential market for contraceptives and to project how much fertility could decline if the additional need for family planning were met.

The present study is conducted in Rajasthan state of India, where met need for family planning is 43.8% and approximately 14.65 per cent women want to delay or avoid pregnancy but are not using an effective method of family planning (NFHS-3). Small-Area Estimation technique is used for estimation of met and unmet need for family planning at town level in Rajasthan state of India. For the analysis, the data has been taken from the District Level Household Survey(DLHS):2002-04 and Census 2001 of 32 districts of Rajasthan, India and the met and unmet need for family planning are estimated for 187 towns of Rajasthan using the traditional small area technique.

Being a developing country, India does not provide complete and reliable statis-

tical, demographic and health data. It is well known to us that, however, census is a complete enumeration and provides demographic information as detailed as the settlement level, but this information is very limited and has some inadequacies. Also it is not possible to get useful information from the registration system even for the nation as a whole while sample surveys provide accurate and detailed demographic information and some basic health information, and this information is limited to nation totals, urban and rural area and at most to geographical regions due to the nature of sample surveys. In recent years there has been an ample growth in the demand for statistical data relating to various subdivisions into the country. Sometimes, the geographical subdivisions of our interest include relatively large units, such as states, and some subdivisions include smaller units, such as towns, rural communities, local government districts, or health service areas. Statistics for geographical subdivisions, commonly referred to as small area statistics, are of great interest in many countries throughout the world (Kalton, et. al, 1993).

The use of small area statistics germinated several centuries ago. Brackstone (1987) mentions the existence of such statistics in 11th century England and 17th century Canada. As well, various powerful statistical methods with theoretical foundations have emerged for the analysis of local data. Indirect Small Area estimation techniques can be classified into two main groups (Rao, 2000, Marker 1999): Traditional Techniques and Model Based Techniques. Synthetic Estimates are considered as one the Traditional Techniques and this technique requires relatively available data from the surveys and censuses.

Deriving small-area statistics for maternal health indicators, such as contraceptive use, unmet need, and satisfied demand for contraception, are particularly important for a country that lacks the infrastructure and resources to mount surveys to collect representative data at the district level. In recent times, policy makers, health care providers, and planners have shown increased interest in small area statistics, particularly where decentralized approaches to health planning and resource allocation have been adopted.

2. Data

The findings in this paper are based on data taken from the District Level Household and Facility Survey(DLHS):2002-04 and Census 2001 of 32 districts of Rajasthan, India, DLHS is designed to provide estimates on maternal and child health, family planning and other reproductive health services.

For the assessment of district level Reproductive and Child Health indicators, Government of India intended to undertake district level household surveys through the non-governmental agencies on an annual basis. The District Level Household

Survey (DLHS) was the result of government's initiative. In Rajasthan, IHMR, India was confided the work of carrying out of the survey. The survey for Phase-1 of the DLHS covering 9 districts of the state was conducted during May 2002 to August 2002. The survey for Phase-2 covering the remaining districts of the state was carried out during Feb 2004 to June 2004. The focus of the survey was on: i) Coverage on antenatal care (ANC) and immunization services, ii) Extent of safe deliveries, iii) Contraceptive prevalence rate and unmet need for family planning, iv) Awareness about RTI/STI and HIV/AIDS, and v) Utilization of government health services and user's satisfaction.

For both the phases together, the data was collected from 33,833 households in Rajasthan. From these households, 32,911 eligible women (usual resident or visitors who stayed in the sample household the night before the interview, currently married aged 15-44 whose marriage was consummated) and 20,980 husbands of eligible women were interviewed.

3. Methodology and Model Diagnostics

In this paper, we are interested in estimating such a model in which the dependent variable is dichotomous in nature and takes values 0 and 1. Here, we want to estimate the met and unmet need for family planning methods as a function of several variables like female literacy rate (FLR), female work participation rate (FWPR), proportion of urban population (PUP), density, any government health facility (GHF), decadal increase during census 1999-2001 (growth rate), number of illiterate persons of age group (7 and above). The most commonly used approach for estimating such models is the linear probability model i.e. Logit model.

The Logit regression analysis is the uni/ multivariate technique which allows us for estimating the probability that an event occurs or not by predicting the binary dependent outcome for a set of independent variables.

The linear probability model is depicted as

$$\begin{aligned} p_i &= E(y = 1|X_i) \\ &= \beta_0 + \beta_i X_i \end{aligned}$$

where $y = 1$ is the met need for family planning or the unmet need for family planning and X_i are the independent variables.

Let us consider the following representation of the above model (Logit model)

$$p_i = \frac{1}{1 + e^{-(\beta_0 + \beta_i X_i)}} \quad (3.1)$$

For ease of exposition, we write equation (3.1) as

$$p_i = \frac{1}{1 + e^{-z_i}} = \frac{e^{z_i}}{1 + e^{z_i}} \quad (3.2)$$

where $z_i = \beta_0 + \beta_i X_i$

The equation (3.2) is called the logistic distribution function. Here z_i ranges from $-\infty$ to ∞ , p_i ranges from 0 to 1, p_i is non linearly related to z_i i.e. X_i , thus satisfying two conditions of the required probability model. Here, an estimation problem has occurred because p_i is not only non linear in X_i but also in β 's. This means that OLS estimator cannot be used to estimate the parameters.

Here, p_i is the probability of using contraception, given in equation 3.2, then $(1 - p_i)$, the probability of not using contraception is given as

$$1 - p_i = \frac{1}{1 + e^{z_i}} \quad (3.3)$$

Therefore, we can write

$$\frac{p_i}{1 - p_i} = \frac{1 + e^{z_i}}{1 + e^{-z_i}} = e^{z_i} \quad (3.4)$$

$\frac{p_i}{1 - p_i}$ is the odds ratio in favour of using contraception. Taking natural log of equation (3.4), we obtain

$$L_i = \ln\left(\frac{p_i}{1 - p_i}\right) = z_i = \beta_0 + \beta_i X_i \quad (3.5)$$

Let N_i and n_i be the total number of married women of age group 15-44 in the population and number of married women selected in the sample of reproductive age group of any i^{th} district ($i = 1, 2, \dots, D$) respectively, where $D = 32$ districts of Rajasthan state of India. Let y_i be the number of women possessing the given attribute in the district i.e. the number of women having met need for family planning. Also, let y_{si} and y_{nsi} be the women selected in the sample who possess the given characteristic and the women who are not counted in the sample but have the same characteristic. As we have discussed above, that the response variable Y_{si} follows binomial distribution with parameters n_i and p_i . then obviously y_{nsi} will also follow the binomial distribution with parameters $N_i - n_i$ and p_i , where p_i is the probability that a woman possesses the attribute of using contraception in the district i . Then,

$$L_i(p_i) = \ln\left(\frac{p_i}{1 - p_i}\right) = z_i = \beta_0 + \beta_i X_i + u_i; \quad i = 1, 2, \dots, 32 \quad (3.6)$$

Here, β is the k-vector of unknown fixed effects parameters and we assume that u_i are the random effects that accounts for between district variability in the response

not explained by the independent variables in the model and independently identically normally distributed with mean 0 and variance ϕ . Now, from equation (3.6), we can write

$$p_i = e^{z_i} (1 + e^{z_i})^{-1} = e^{\beta_0 + \beta_i X_i + u_i} \left(1 + e^{\beta_0 + \beta_i X_i + u_i} \right)^{-1} \quad (3.7)$$

Equation (3.6) relates the area-level proportions to area-level covariates. This type of model is often referred to as an area-level model in SAE terminology (Rao 2003). Fay and Herriot's (1979) used this model for the prediction of mean income per head in small geographic areas (less than 500 persons) within counties in the USA. Fay and Herriot method is based on an area-level linear mixed model for small area estimation, which is applicable for a continuous variable. In contrast, equation (3.6) is a special case of Generalized Linear Mixed Model (GLMM) with logit-link function (Breslow and Clayton 1993) and it is suitable for discrete variable, particularly for binary variable. Alternative approaches to estimating the logistic model for the small-area-estimation case include the empirical Bayes and the hierarchical Bayes methods (Rao 2003). Saei and Chambers (2003) described equation (3.6) in the context of SAE.

By definition, means of y_{si} and y_{nsi} are

$$E(y_{si}|u_i) = n_i \left[e^{\beta_0 + \beta_i X_i + u_i} \left(1 + e^{\beta_0 + \beta_i X_i + u_i} \right)^{-1} \right] \quad (3.8)$$

and

$$E(y_{nsi}|u_i) = (N_i - n_i) \left[e^{\beta_0 + \beta_i X_i + u_i} \left(1 + e^{\beta_0 + \beta_i X_i + u_i} \right)^{-1} \right] \quad (3.9)$$

Now, let T_i be the total number of women possessing the characteristic of met need of family planning in the i^{th} district, then T_i can be written as

$$T_i = y_{si} + y_{nsi}; \quad i = 1, 2 \dots 32 \quad (3.10)$$

Here, T_i includes all the women with the attribute of using contraception who are selected in the sample (y_{si}) and not selected in the sample but possessing the attribute y (y_{nsi}). In the expression 3.10, the first term y_{si} (i.e. the direct estimate from the survey) is known whereas the second term y_{nsi} , the non sample count is unknown. Thus, the total number of women with met need of family planning in district i can be obtained by replacing y_{nsi} by its estimated value under the model 3.6. So,

$$\hat{T}_i = y_{si} + \hat{y}_{nsi} = (N_i - n_i) \left[e^{\beta_0 + \beta_i X_i + u_i} \left(1 + e^{\beta_0 + \beta_i X_i + u_i} \right)^{-1} \right] \quad (3.11)$$

Sometimes sample data are not available for some districts for which $n_i = 0$ and $y_{si} = 0$. In this context small area estimation technique can be used to derive the estimates for the districts for which data are not available.

Here we have used synthetic type estimator for estimating the T_i , given as,

$$\hat{T}_i = N_i \left[e^{\beta_0 + \beta_i X_i + u_i} \left(1 + e^{\beta_0 + \beta_i X_i + u_i} \right)^{-1} \right] \quad (3.12)$$

The proportion of women with the assignable property (met or unmet need (limiting or spacing) for family planning) in district i (p_i) is obtained by the ratio of the total number of women of the reproductive age group with the particular outcome (met or unmet need (limiting or spacing) for family planning) to the total number of women of the reproductive age group of that i^{th} district. Thus, (p_i) can be written as

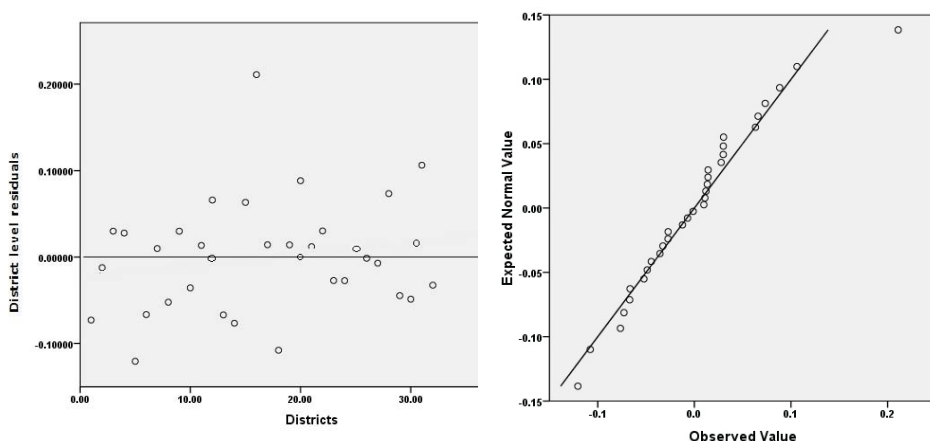
$$\hat{p}_i = \frac{\hat{T}_i}{N_i} \quad (3.13)$$

While using the logit link function, the residuals at district level are assumed to follow normal distribution with mean 0 and variance ϕ . The model diagnostics are used to verify that the model assumptions are satisfied or not. If the model assumptions are satisfied then the residuals are randomly distributed and do not differ significantly from the regression line $y = 0$. Therefore, from equation 3.6, the residuals can be written as $u_i = \hat{z}_i - (\hat{\beta}_0 + \hat{\beta}_i X_i)$, where $i = 1, \dots, 32$. Plots of the distribution of residuals given in Figure 1 show that the residuals are randomly distributed and regression line is not significantly different from the residual line of fit and the qq plot is also satisfying the normality assumption of residuals.

4. Result and Discussion

In the present study, we estimate the proportion of women having met and unmet need (spacing and limiting fertility) of family planning with 95% confidence intervals at town level (187 towns) by using the sample of 32 districts of Rajasthan, the largest state (area-wise) in India, taken from the District Level Household Survey(DLHS): 2002-04 and Census 2001 of India using special case of Generalized Linear Mixed Model with logit-link function (Breslow and Clayton, 1993). We use this model because of the providence of estimates of the binomial nature variables. The detailed discussion of the method is given in Amoako Johnson *et al.* (2010).

Figure 1: Model diagnostic plot and qq plot of residuals for districts



Here, Table 1 describes the estimates of the Parameters and their standard errors from the generalized linear mixed model of met and unmet need for contraception in Rajasthan. The results are also tested at 5% level of significance. It is found that the β -coefficients for the different covariates and random effects with “*” have the significant impact on the met and unmet need for contraception and the percentage of met and unmet need for family planning within the districts can be seen in the Figure 1, which shows that the trend of maximum use of family planning methods is in Hanumangarh (66.5%), Ganganagar (65.4%) and Jaipur (62.4%) districts and the Barmer (24.5%) and Jaisalmer (27%) are using the contraception methods at low level among all the districts of Rajasthan.

The unmet need for spacing lies within the range of 2.5% to 17.2% for the 32 districts and in overall Rajasthan, the unmet need for spacing fertility is approximately 8%. Unmet need for contraception for limiting fertility lies between 5.5% to 21.1% in districts of Rajasthan and the Rajasthan overall has 13.7% unmet need for limiting fertility. In Figure 1, it is also observed that the percentage of unmet need for limiting fertility is higher than the unmet need for spacing fertility among all the districts of Rajasthan. The total unmet need (for limiting and spacing fertility) in Rajasthan is about 21.8%. By using these estimates, the “demand satisfied” [a measure obtained by dividing the current use of contraception by the total demand i.e. the sum of met and unmet need for contraception (UNFPA 2010)] is also calculated at district level, which is an another indicator of program effectiveness and is being used increasingly. The total demand satisfied by the districts is presented in Figure 2 and it is observed that Barmer and Jaisalmer are the two districts

in which only 40% – 42% is satisfied and Hanumangarh, Ganganagar and Jaipur have the highest percentage of demand satisfied for any method of contraception, i.e. 89.26%, 87.08% and 85.01% respectively. Figure 2 also tells in almost all the districts the percentage of demand satisfied for any method vary between 50% to 70%.

To the estimation of met and unmet need for family planning at town level, the small area estimation (SAE) technique is used, which is explained in Section 3 and the obtained results are tabulated in Table 3, which suggest that the maximum use of contraception (any method) in the women in the reproductive age group 15-44 years is in Todra town of Sawai Madhopur (59.98%). It can also be inferred that, out of 100 women of the reproductive age group 15-44 years of Sawai Madhopur district approximately 60 women who are using the contraceptive devices are from Todara town followed by Jaipur (57.94%), i.e. per 100 women of the reproductive age group 15-44 years of Jaipur district 58 women are having met need for contraception and the remaining 42 women are from other towns of the same district, Bikaner town (53.89%) of Bikaner district and Mahwa town (52.18%) of Mahwa district. The minimum use of family planning methods is in Jobner town of Jaipur district (0.27%) i.e. out of 100 women of the reproductive age group 15-44 years of the Jaipur district, not even one woman is able to get the met need for contraception followed by Viratnagar (0.44%), Phulera (0.55%) and Bagru (0.56%) of Jaipur district within state of Rajasthan. In the Jaipur district, only Jaipur town is using 57.94% of the contraceptive methods and the rest of the towns of this district are using contraception methods at a very low level, which is approximately equivalent to zero (Table 3). Similarly, the results can also be seen for the unmet need for contraception from the same Table 3. The percentage of unmet need of family planning methods for limiting fertility lies between 0.22% to 53.82% in the Rajasthan state, which means approximately 54% women of their reproductive age group 15-44 years need family planning devices to limit the fertility but they are suffering from the unmet need for contraception, and the limits for unmet need for spacing fertility within towns are 0.13% and 31.11%, i.e. in overall Rajasthan, 31% of women in their reproductive age group are facing the problem of unmet need for spacing the fertility.

From Figure 3 and Table 3, it can also be concluded that approximately 70% towns of Rajasthan state using family planning (any method) at very low level i.e. approximately 10%. There are only 2.1% of the towns in which 50% of women are able to get the advantage of contraceptive devices, approximately 25 % towns have unmet need for limiting fertility i.e. more than 10 per cent and same is with the un-

met need for spacing fertility, here more than 10 per cent women of the reproductive age group 15-44 years of 17% of the towns out of 187 towns of the Rajasthan are facing the problem of unmet need family planning for spacing fertility.

The comparison of the met and unmet need for family planning for various districts of Rajasthan with the estimated values of the met and unmet need for family planning by the Annual Health Survey(2012-13) has also been done, which can be seen in Figure 4 and Table 2. This shows that the percentage of total unmet need for contraception in some of the districts (Baran, Dausa and Kota) is approximately the same during the period 2002-2013. Hanumangarh district has increased the percent of total unmet need for contraception with the highest points (9.86) followed by Bikaner, Jaisalmer and Sirohi. Churu district has reduced the total percent of unmet need for contraception with 8.46 points followed by Tonk, Jaipur and Bharatpur districts in the time duration (2002-2013). Approximately 70% of the districts reduced the percentage of the unmet need for spacing, out of which Bharatpur district reduced the maximum percentage of unmet need for spacing followed by Jaipur, Ajmer and Bhilwada. Also, in approximately 30% of the districts, there was an increment in the unmet need for spacing (highest increment is seen in Jaisalmer district). The noticeable point is that only 18% of the districts reduced the percentage of unmet need for limiting fertility and in the remaining 82% of districts, the unmet need for limiting increased. The highest reduction in the percentage of the unmet need for limiting fertility is seen in Churu (6.47%) and the highest increment is seen in Sirohi (7.93%) followed by Hanumangarh. This means that for spacing between the births, women are using the contraceptive devices in a very effective manner but for limiting the births, they are not using the contraception methods properly.

Since unmet need for family planning is an indicator to evaluate the effectiveness of the family planning programme, the policy makers and family planning programme planners use it to know the demand for family planning services/supplies. Thus, it is very important to focus on the problems which affected the unmet need for contraception. Also, We cannot refuse the fact that Rajasthan, a prime state of country, is suffering from various serious demographic and social issues like early age at marriage, low level of education, high TFR rate and low rate of contraception use. The nature of the present study supports the planners in implementing policies and programmes based on the results in the large scale, not only within the state but also within the country.

References

- [1] AMOAKO, J. F. & MADISE, N. J., (2009). Examining the geographical heterogeneity associated with risk of mistimed and unwanted pregnancy in Ghana. *Journal of Biosocial Science*. 41(2). pp. 249–267.
- [2] AMOAKO, J. F., CHANDRA, H., BROWN, J. J. & PADMADAS, S. S., (2010), District-level estimates of institutional births in Ghana: application of small area estimation technique using Census and DHS data. *Journal of Official Statistics*. 26(2). pp. 341–359.
- [3] BATTESE, G. E., HARTER, R. M. & FULLER, W. A., (1988). An error-components model for prediction of county crop area using survey and satellite data. *Journal of the American Statistical Association*. 83(401). pp. 28–36.
- [4] BONGAARTS, J., (1991). The KAP-gap and the unmet need for contraception. *Population and Development Review*. 17(2). pp. 293–313.
- [5] BONGAARTS, J., (2006). The causes of stalling fertility transitions, *Studies in Family Planning*. 37(1). pp. 1–16.
- [6] BRADLEY, S. E. K., CROFT, T. N., FISHEL, J. D., & WESTOFF, C. F. (2012) Revising unmet need for family planning. DHS Analytical Studies No. 25, Calverton, MA: ICF International.
- [7] BRESLOW, N. E. & CLAYTON, D. G., (1993). Approximate inference in generalized linear mixed models. *Journal of the American Statistics Association*. 88(421). pp.9–25.
- [8] CAMPBELL, O. M. R. & GRAHAM, W. J., (2006). Strategies for reducing maternal mortality: Getting on with what works. *The Lancet*. 368(9543). pp. 1284–1299.
- [9] CHOUDHARY, S., SALUJA, N., SHARMA. S., GAUR, D. and PANDEY, S., (2009). A study on the extent and reasons of unmet need for family planning among women of reproductive age group in rural area of Haryana. *Internet J Health*. 12(1).
- [10] CLELAND, J., NDUGWA, R. P. & ZULU, E. M., (2011). Family planning in sub-Saharan Africa: Progress or Stagnation? *Bulletin of the World Health Organisation*. 89. pp. 137–143.

- [11] DATTA, G. S., GHOSH, M. & WALLER, L. A., (2000). Hierarchical and empirical Bayes method for environmental risk assessment. *Handbook of Statistics*. 18. pp. 223–245.
- [12] DEMOMBYNES, G., ELBERS, C., LANJOUW, J. O. & LANJOUW, P., (2007). How good a map? Putting small area estimation to the test. World Bank Policy Research Working Paper 4155. *The World Bank, Washington DC*. Available from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=967547.
- [13] DIXON-MULLER, R. & GERMAIN, A. (1992) Stalking the elusive: unmet need for family planning. *Studies in Family Planning*. 23(25). pp. 330–335.
- [14] ELBERS, C., LANJOUW, J. O. & LANJOUW, P., (2002). Micro-level estimation of welfare. World Bank Policy Research Working Paper 2911. *The World Bank, Washington DC*. Available from: <http://are.berkeley.edu/courses/ARE251/2004/assignments/mapping.pdf>.
- [15] ELBERS, C., LANJOUW, J. O. & LANJOUW, P., (2003). Micro-level estimation of poverty and inequality. *Econometrica*. 71(1). pp. 355–364.
- [16] FAY, R. E. & HERRIOT, R. A., (1979). Estimation of income from small places: An application of James-Stein procedures to Census data. *Journal of the American Statistics Association*. 74(366). pp. 269–277.
- [17] FUJII, T., (2010). Micro-level estimation of child under nutrition indicators in Cambodia. *World Bank Economic Review*. 24(3). pp. 520–553.
- [18] GONZALEZ-MANTEIGA, W., LOMBARDIA, I., MOLINA, M. J., MORALES, D. & SANTAMARIA, L., (2007). Estimation of the mean squared error of predictors of small area linear parameters under a logistic mixed model. *Computational Statistics & Data Analysis*. 51(5). pp. 2720–2733.
- [19] GULATI, S. C., and DAS, A., (2013). Demand for contraception in EAG states in India: Family planning strategies to meet the unmet need. *Health and Population - Perspectives and Issues*. 36(3 & 4). pp. 115–132.
- [20] KUMAR, S., PRIYADARSHNI A., KANT, S., ANAND, K. and YADAV, B. K., (2005). Attitude of women towards family planning methods and its use - study from a slum of Delhi. *Kathmandu Univ Med J*. 3. pp. 259–62.
- [21] MARSTON, C. & CLELAND, J., (2004). The effects of contraception on obstetric outcomes. Working Paper No. 630, Department of Reproductive

Health and Research, *World Health Organisation, Geneva*. Available from: <http://whqlibdoc.who.int/publications/2004/9241592257.pdf>.

- [22] Ministry of Health and Family Welfare (MOHFW), (1997). Reproductive and Child Health Programme: Schemes for Implementation, Department of Family Welfare. MOHFW, New Delhi.
- [23] Ministry of Health and Family Welfare (MOHFW), (2000). National Population Policy 2000, Department of Family Welfare. MOHFW, New Delhi.
- [24] Ministry of Health and Family Welfare (MOHFW), (2005). National Rural Health Mission (2005-2012) Mission Document, Department of Family Welfare. MOHFW, New Delhi.
- [25] NORTMAN, D. L., (1982). Measuring the unmet need for contraception to space and limit births. *International Family Planning Perspectives*. 87(4). pp. 125–134.
- [26] PATIL, S. S., RASHID, A. K. and NARAYAN, K. A., (2010). Unmet needs for contraception in married women in a tribal area of India. *Malaysian J Public Health Med*. 10. pp. 44–51.
- [27] PFEFFERMANN, D., (2002). Small area estimation: new developments and directions. *International Statistical Review*. 70(1). pp. 125–143.
- [28] PRATESI, M. & SALVATI, N., (2008). Small area estimation: The EBLUP estimator with autoregressive random area effects. *Statistical Methods and Application*. 17. pp. 113–141.
- [29] PRITCHETT, L. H., (1994). Desired fertility and the impact of population policies. *Population and Development Review*. 20(1). pp. 1–55.
- [30] REDDY, P. H., (2003). Unmet need for contraception: how real is it?. *Economic and Political Weekly*. 38(3). pp. 188–191.
- [31] RAO, J. N. K., (2003). *Small Area Estimation*. John Wiley & Sons, New Jersey.
- [32] ROSS, J. A. & WINFREY, W. L., (2002). Unmet need for contraception in the developing world and the former Soviet Union: an updated estimate. *International Family Planning Perspectives*. 28(3). pp. 138–143.

- [33] ROSS, J. A. & WINFREY, W. L., (2001). Contraceptive Use, Intention to Use and Unmet Need during the Extended Postpartum Period. *International Family Planning Perspectives*. 27(1). pp. 20–27.
- [34] SAEI, A. & CHAMBERS, R., (2003). Small area estimation under linear and generalized linear mixed models with time and area effects. Methodology Working Paper No. M03/15. Southampton Statistical Sciences Research Institute, *University of Southampton, Southampton*.
- [35] SEDGH, G., HENSHAW, S., SINGH, S., AHMAN, E. & SHAH, I. H., (2007). Induced abortion: Estimated rates and trends worldwide. *The Lancet*. 370(9595). pp. 1338–1345.
- [36] SONFIELD, A. (2006) Working to eliminate the world's unmet need for contraception. *Guttmacher Policy Review*. 9(1). p.10-13.
- [37] STOVER, J. & ROSS, J. (2008) How contraceptive use affects maternal mortality. Washington, DC: US Agency for International Development, Health Policy Initiative, Task Order 1. Available from: http://www.healthpolicyinitiative.com/Publications/Documents/668_1_TMIH_FINAL_12_19_08.pdf.
- [38] United Nations (1994). Programme of Action for the 1994 International Conference on Population and Development. *United Nations, New York*.
- [39] United Nations (2005). Investing in Development: A Practical Plan to Achieve the Millennium Development Goals. [online] Available from: <http://www.unmillenniumproject.org/reports/index.htm> [Accessed: 24th February 2009].
- [40] UNFPA (2010) How Universal is Access to Reproductive Health: A Review of the Evidence. *New York: United Nations Population Fund*. Available from: <http://www.unfpa.org/public/home/publications/pid/6526>.
- [41] WESTOFF, C. F. (1978) The unmet need for birth control in five Asian countries. *Family Planning Perspectives*. 10(3). p.173-181.
- [42] WESTOFF, C. F. & BANKOLE, A. (1995) Unmet need: 1990-94, DHS Comparative Studies No. 16. *Macro International Inc.. Calverton, MD*.
- [43] WESTOFF, C. F. & PEBLEY, A. R. (1981) Alternative measures of unmet need for family planning in developing countries. *International Family Planning Perspectives*. 7(4). p.124-136.

- [44] World Health Organisation. (2009) Achieving Millennium Development Goal 5: Target 5A and 5B on Reducing Maternal Mortality and Achieving Universal Access to Reproductive Health, WHO/RHR/09.06. *Geneva: World Health Organisation*. Available from: http://www.who.int/reproductivehealth/publications/monitoring/rhr_09_06/en/index.html.

Appendix:

Table 1: Parameter estimates and their standard errors from the generalized linear mixed model of met and unmet need for contraception, Rajasthan

Covariates and random effects	Met need for contraception	Unmet need for contraception	
	Any method	For limiting fertility	For spacing fertility
	β SE	β SE	β SE
Intercept	0.4577* (0.1936)	0.1340* (0.0853)	-0.0107 (0.0951)
Female literacy rate	0.0073* (0.0033)	-0.0015* (0.0014)	0.0011 (0.0016)
Female work participation rate	-0.0028 (0.0032)	0.0015 (0.0014)	0.0022* (0.0016)
Percentage of urban population	-0.0024 (0.0028)	0.0003* (0.0012)	-0.0002 (0.0014)
Density	0.0000 (0.0002)	0.0000 (0.0000)	-0.0001* (0.0001)
Any govt. health facility	-0.0020* (0.0017)	0.0004 (0.0007)	0.0008 (0.0008)
Growth rate	-0.0052 (0.0045)	0.0000 (0.0020)	-0.0007 (0.0022)
No. of illiterate persons	0.0235* (0.0167)	-0.0061 (0.0074)	-0.0082* (0.0082)

Note - * $p < 0.05$; β refers to the parameters and SE refers to the standard error.

Table 2: Comparison of observed estimates of met and unmet need for family planning of various districts of Rajasthan with the estimates of Annual Health Survey (2012-13)

Districts	Annual Health Survey (2012-13)			Observed estimates		
	Spacing	Limiting	Total	Spacing	Limiting	Total
Ajmer	5.18	8.84	14.02	9.6	8.3	17.9
Alwar	4.44	7.62	12.06	6.5	7.7	14.2
Banswara	5.66	4.57	10.23	4.6	2.3	6.9
Baran	5.19	8.93	14.12	7.7	6.4	14.1
Barmer	12.56	11.86	24.42	10	9.7	19.7
Bharatpur	3.89	6.63	10.52	10.2	4.8	15
Bhilwara	3.89	6.79	10.68	8	4.8	12.8
Bikaner	10.37	12.81	23.18	8.5	8.7	17.2
Bundi	7.78	13.47	21.25	10.1	8.7	18.8
Chittaurgarh	3.98	6.74	10.72	5.7	2.7	8.4
Churu	3.11	5.33	8.44	5.1	11.8	16.9
Dausa	6.22	10.71	16.93	8.7	7.5	16.2
Dhaulpur	11.27	15.56	26.83	10	15.4	25.4
Dungarpur	6.81	5.66	12.47	5.9	2.9	8.8
Ganganagar	3.11	5.26	8.37	4	2.5	6.5
Hanumangarh	5.19	8.87	14.06	2.8	1.4	4.2
Jaipur	2.83	4.75	7.58	7.8	4.7	12.5
Jaisalmer	15.56	9.56	25.12	12	7.2	19.2
Jalor	10.37	6.66	17.03	11.5	7.2	18.7
Jhalawar	3.89	6.71	10.6	6.1	7.1	13.2
Jhunjhunun	3.46	5.87	9.33	4.3	6.7	11
Jodhpur	10.75	5.45	16.2	9.2	4.3	13.5
Karauli	10.37	17.82	28.19	12.3	12.9	25.2
Kota	3.46	5.83	9.29	5.7	4.5	10.2
Nagaur	7.9	5.33	13.23	7.4	7.7	15.1
Pali	8.67	13.64	22.31	9.2	11.3	20.5
Rajsamand	9.67	7.4	17.07	9.8	6.1	15.9
Sawai Madhopur	7.58	6.44	14.02	8.5	9.9	18.4
Sikar	4.44	7.57	12.01	6	8.2	14.2
Sirohi	7.78	13.43	21.21	10.2	5.5	15.7
Tonk	5.19	8.99	14.18	9	11.8	20.8
Udaipur	5.45	5.9	11.35	8.4	4.6	13

Figure 1: Percentage of women with met and unmet need for contraception within districts of Rajasthan, 2002-2004

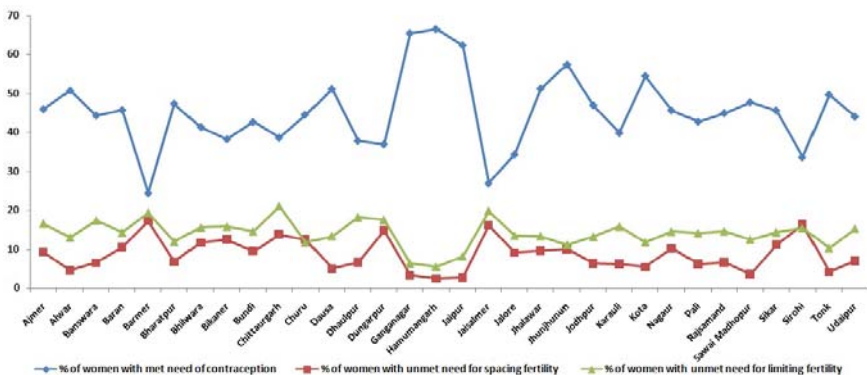


Figure 2: Percentage of women with demand satisfied for contraception within districts of Rajasthan, 2002-2004

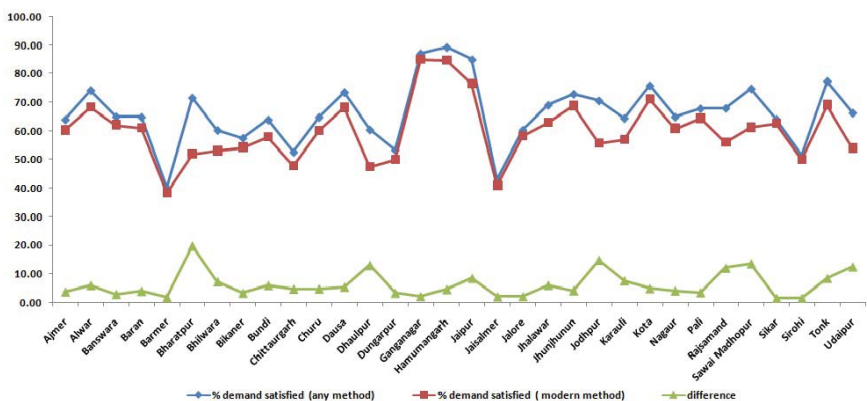


Figure 3: Percentage of towns with met and unmet need for contraception within Rajasthan, 2002-2004

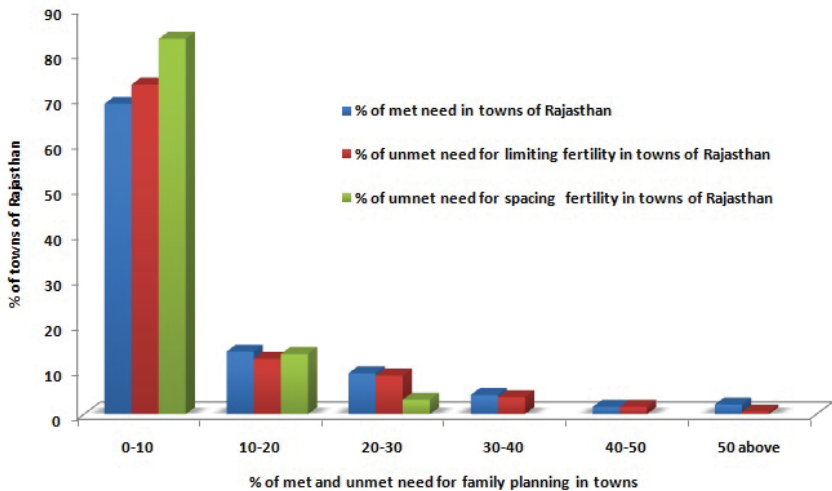


Figure 4: Comparison of observed unmet need for contraception (%) of various districts of Rajasthan with the data of Annual Health Survey (2012-13)

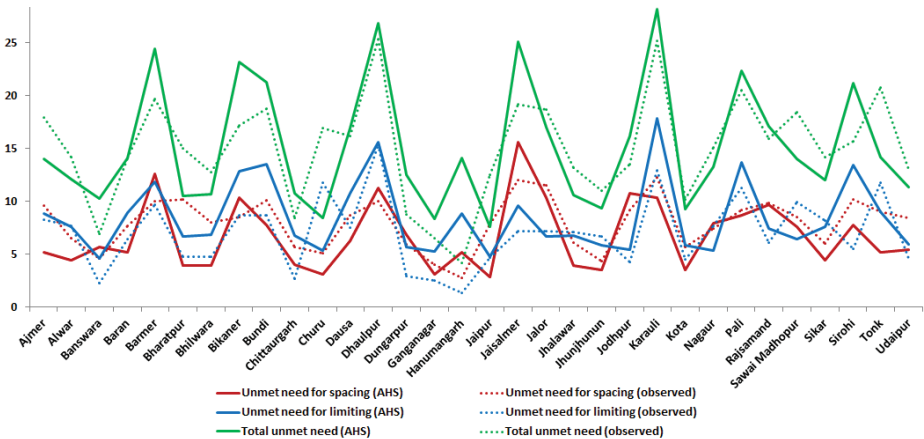


Table 3: Model-based estimates of proportion of women with met and unmet need for contraception in 187 towns within 32 districts of Rajasthan, India

District/Town	Met need for family planning (any method)				Unmet need for family planning							
	Proportion of women of age group 15-44 in tehsils using contraception	per cent	Lower limit	Upper limit	unmet need for family planning for limiting fertility	Per cent	Lower limit	Upper limit	unmet need for family planning for spacing fertility	Per cent	Lower limit	Upper limit
Ajmer												
Kishangarh (M)	0.29	28.85	0.28	0.29	0.24	24.29	0.24	0.25	0.142	14.25	0.14	0.15
Nasirabad (CB)	0.11	10.92	0.10	0.12	0.09	9.19	0.09	0.10	0.054	5.39	0.05	0.06
Pushkar (M)	0.04	3.58	0.03	0.04	0.03	3.01	0.02	0.04	0.018	1.77	0.01	0.02
Kekri (M)	0.09	8.63	0.08	0.09	0.07	7.26	0.07	0.08	0.043	4.26	0.04	0.05
Sarwar (M)	0.04	4.11	0.03	0.05	0.03	3.46	0.03	0.04	0.020	2.03	0.02	0.03
Vijainagar (M)	0.07	6.93	0.06	0.08	0.06	5.83	0.05	0.06	0.034	3.42	0.03	0.04
Alwar												
Bhiwadi (CT)	0.12	12.19	0.11	0.13	0.10	10.37	0.10	0.11	0.060	6.05	0.05	0.07
Govindgarh (CT)	0.05	4.71	0.04	0.06	0.04	4.01	0.03	0.05	0.023	2.34	0.02	0.03
Khairthal (M)	0.15	14.74	0.14	0.16	0.13	12.55	0.12	0.13	0.073	7.31	0.07	0.08
Kherli (M)	0.07	7.08	0.06	0.08	0.06	6.02	0.05	0.07	0.035	3.51	0.03	0.04
Tijara (M)	0.09	9.27	0.08	0.10	0.08	7.89	0.07	0.09	0.046	4.60	0.04	0.05
Behror (M)	0.10	10.38	0.09	0.11	0.09	8.84	0.08	0.10	0.052	5.15	0.05	0.06
Kishangarh (CT)	0.04	4.35	0.03	0.05	0.04	3.70	0.03	0.05	0.022	2.16	0.02	0.03
Banswara												
Partapur (CT)	0.30	30.39	0.28	0.32	0.27	27.27	0.25	0.29	0.157	15.71	0.14	0.17
Kushalgarh (M)	0.30	29.81	0.28	0.32	0.27	26.76	0.25	0.29	0.154	15.41	0.14	0.17

Table 3 Continued

District/Town	Met need for family planning (any method)				Unmet need for family planning							
	Proportion of women of age group 15-44 in tehsils using contraception	per cent	Lower limit	Upper limit	unmet need for family planning for limiting fertility	Per cent	Lower limit	Upper limit	unmet need for family planning for spacing fertility	Per cent	Lower limit	Upper limit
Baran												
Kherliganj (CT)	0.02	2.05	0.01	0.03	0.02	1.81	0.01	0.03	0.011	1.05	0.00	0.02
Mangrol (M)	0.08	7.81	0.07	0.09	0.07	6.91	0.06	0.08	0.040	4.01	0.03	0.05
Baran (M)	0.28	27.70	0.27	0.28	0.25	24.50	0.24	0.25	0.142	14.22	0.14	0.15
Antah (M)	0.09	9.39	0.09	0.10	0.08	8.31	0.08	0.09	0.048	4.82	0.04	0.05
Chhipabarod (CT)	0.06	5.75	0.05	0.07	0.05	5.08	0.04	0.06	0.030	2.95	0.02	0.04
Chhabra (M)	0.08	7.89	0.07	0.09	0.07	6.98	0.06	0.08	0.041	4.05	0.03	0.05
Barmer												
Barmer (M)	0.34	33.86	0.33	0.35	0.31	30.81	0.30	0.32	0.178	17.85	0.17	0.18
Balotra (M)	0.25	25.17	0.24	0.26	0.23	22.91	0.22	0.24	0.133	13.27	0.13	0.14
Bharatpur												
Bhusawar (M)	0.06	5.87	0.05	0.07	0.05	4.93	0.04	0.06	0.029	2.89	0.02	0.03
Bayana (M)	0.10	10.35	0.10	0.11	0.09	8.69	0.08	0.09	0.051	5.10	0.05	0.06
Deeg (M)	0.13	12.65	0.12	0.13	0.11	10.61	0.10	0.11	0.062	6.23	0.06	0.07
Kaman (M)	0.09	9.45	0.09	0.10	0.08	7.93	0.07	0.09	0.047	4.65	0.04	0.05
Kumher (M)	0.06	6.27	0.06	0.07	0.05	5.27	0.05	0.06	0.031	3.09	0.03	0.04
Weir (M)	0.05	5.41	0.05	0.06	0.05	4.54	0.04	0.05	0.027	2.67	0.02	0.03
Nadbai (M)	0.07	6.65	0.06	0.07	0.06	5.58	0.05	0.06	0.033	3.27	0.03	0.04
Nagar (M)	0.07	6.53	0.06	0.07	0.05	5.48	0.05	0.06	0.032	3.22	0.03	0.04

Table 3 *Continued*

District/Town	Met need for family planning (any method)				Unmet need for family planning							
	Proportion of women of age group 15-44 in tehsils using contraception	per cent	Lower limit	Upper limit	unmet need for family planning for limiting fertility	Per cent	Lower limit	Upper limit	unmet need for family planning for spacing fertility	Per cent	Lower limit	Upper limit
Bhiwara												
Gulabpura (M)	0.03	3.40	0.03	0.04	0.03	3.05	0.03	0.04	0.018	1.76	0.01	0.02
Gangapur (M)	0.03	2.52	0.02	0.03	0.02	2.26	0.02	0.03	0.013	1.31	0.01	0.02
Jahazpur (M)	0.03	2.78	0.02	0.03	0.02	2.50	0.02	0.03	0.014	1.44	0.01	0.02
Asind (M)	0.02	2.11	0.02	0.03	0.02	1.89	0.01	0.02	0.011	1.09	0.01	0.01
Bhiwara (MCI)	0.40	40.15	0.40	0.41	0.36	36.03	0.36	0.36	0.208	20.83	0.20	0.21
Beejoliya Kalan (CT)	0.02	1.83	0.01	0.02	0.02	1.64	0.01	0.02	0.009	0.95	0.00	0.01
Mandalgarh (M)	0.03	3.01	0.03	0.04	0.03	2.71	0.02	0.03	0.016	1.56	0.01	0.02
Shahpura (M)	0.04	4.18	0.04	0.05	0.04	3.75	0.03	0.04	0.022	2.17	0.02	0.03
Bikaner												
Bikaner (M CI)	0.54	53.89	0.54	0.54	0.47	47.43	0.47	0.48	0.276	27.61	0.27	0.28
Deshnoke (M)	0.02	1.67	0.01	0.02	0.01	1.47	0.01	0.02	0.009	0.86	0.01	0.01
Nokha (M)	0.05	5.15	0.05	0.06	0.05	4.54	0.04	0.05	0.026	2.64	0.02	0.03
Bundi												
Kaprain (M)	0.07	7.46	0.07	0.08	0.07	6.72	0.06	0.08	0.039	3.88	0.03	0.05
Bundi (M)	0.37	37.08	0.36	0.38	0.33	33.41	0.33	0.34	0.193	19.29	0.19	0.20
Nainwa (M)	0.06	6.38	0.06	0.07	0.06	5.75	0.05	0.07	0.033	3.32	0.03	0.04
Keshoraiapatan (M)	0.09	8.88	0.08	0.10	0.08	8.01	0.07	0.09	0.046	4.62	0.04	0.05

Table 3 Continued

District/Town	Met need for family planning (any method)				Unmet need for family planning							
	Proportion of women of age group 15-44 in tehsils using contraception	per cent	Lower limit	Upper limit	unmet need for family planning limiting fertility	Per cent	Lower limit	Upper limit	unmet need for family planning for spacing fertility	Per cent	Lower limit	Upper limit
Chittaurgarh												
Rawatbhata (M)	0.07	7.15	0.07	0.08	0.06	6.38	0.06	0.07	0.037	3.68	0.03	0.04
Pratapgarh (M)	0.07	7.38	0.07	0.08	0.07	6.58	0.06	0.07	0.038	3.80	0.03	0.04
Nimbahera (M)	0.11	11.23	0.11	0.12	0.10	10.02	0.09	0.11	0.058	5.78	0.05	0.06
Kapasan (M)	0.04	3.96	0.03	0.05	0.04	3.54	0.03	0.04	0.020	2.04	0.02	0.02
Begun (M)	0.04	4.06	0.03	0.05	0.04	3.62	0.03	0.04	0.021	2.09	0.02	0.03
Bari Sadri (M)	0.03	3.18	0.03	0.04	0.03	2.84	0.02	0.03	0.016	1.64	0.01	0.02
Chhoti Sadri (M)	0.04	3.52	0.03	0.04	0.03	3.14	0.03	0.04	0.018	1.81	0.01	0.02
Chittaurgarh (M)	0.20	19.93	0.19	0.20	0.18	17.79	0.17	0.18	0.103	10.26	0.10	0.11
Churu												
Rajaldesar (M)	0.03	3.43	0.03	0.04	0.03	3.02	0.03	0.04	0.018	1.76	0.01	0.02
Rajgarh (M)	0.04	3.58	0.03	0.04	0.03	3.15	0.03	0.04	0.018	1.84	0.01	0.02
Ratangarh (M)	0.09	9.49	0.09	0.10	0.08	8.35	0.08	0.09	0.049	4.87	0.05	0.05
Chhappar (M)	0.03	2.71	0.02	0.03	0.02	2.39	0.02	0.03	0.014	1.39	0.01	0.02
Ratanagar (M)	0.02	1.68	0.01	0.02	0.01	1.48	0.01	0.02	0.009	0.86	0.00	0.01
Sardarshahar (M)	0.12	11.98	0.11	0.12	0.11	10.54	0.10	0.11	0.061	6.15	0.06	0.07
Sujangarh (M)	0.13	12.53	0.12	0.13	0.11	11.02	0.11	0.11	0.064	6.43	0.06	0.07
Taranagar (M)	0.04	4.02	0.04	0.05	0.04	3.53	0.03	0.04	0.021	2.06	0.02	0.02
Bidasar (M)	0.04	4.47	0.04	0.05	0.04	3.93	0.03	0.04	0.023	2.29	0.02	0.03
Dungargarh (M)	0.07	6.75	0.06	0.07	0.06	5.94	0.05	0.06	0.035	3.46	0.03	0.04
Dausa												
Dausa (M)	0.17	17.45	0.17	0.18	0.24	24.10	0.23	0.25	0.140	14.00	0.13	0.15
Bandikui (M)	0.07	7.26	0.06	0.08	0.06	6.38	0.06	0.07	0.037	3.70	0.03	0.04
Lalsot (M)	0.13	12.99	0.12	0.14	0.11	11.41	0.11	0.12	0.066	6.63	0.06	0.07
Mandawar (CT)	0.04	4.49	0.04	0.05	0.04	3.94	0.03	0.05	0.023	2.29	0.02	0.03
Mahwa (CT)	0.32	32.18	0.31	0.34	0.08	7.72	0.07	0.09	0.045	4.48	0.04	0.05

Table 3 *Continued*

District/Town	Met need for family planning (any method)				Unmet need for family planning							
	Proportion of women of age group 15-44 in tehsils using contraception	per cent	Lower limit	Upper limit	unmet need for family planning for limiting fertility	Per cent	Lower limit	Upper limit	unmet need for family planning for spacing fertility	Per cent	Lower limit	Upper limit
Dhaulpur												
Rajakhera (M)	0.22	21.80	0.21	0.23	0.19	19.12	0.18	0.20	0.111	11.12	0.10	0.12
Bari (M)	0.39	39.17	0.38	0.40	0.34	34.35	0.33	0.35	0.200	19.99	0.19	0.21
Dungarpur												
Dungarpur (M)	0.31	31.31	0.30	0.32	0.28	27.69	0.27	0.29	0.160	15.97	0.15	0.17
Galiakot (CT)	0.05	5.10	0.04	0.06	0.05	4.51	0.03	0.06	0.026	2.60	0.02	0.03
Sagwara (M)	0.25	24.57	0.24	0.26	0.22	21.73	0.21	0.23	0.125	12.54	0.12	0.13
Ganganagar												
Suratgarh (M)	0.16	16.48	0.16	0.17	0.13	13.46	0.13	0.14	0.080	7.97	0.07	0.08
3STR (CT)	0.03	3.09	0.02	0.04	0.03	2.52	0.02	0.03	0.015	1.49	0.01	0.02
Anupgarh (M)	0.08	8.27	0.08	0.09	0.07	6.76	0.06	0.07	0.040	4.00	0.03	0.05
Gajsinghpur (M)	0.03	2.73	0.02	0.03	0.02	2.23	0.02	0.03	0.013	1.32	0.01	0.02
Karapur (M)	0.06	5.90	0.05	0.07	0.05	4.82	0.04	0.05	0.029	2.85	0.02	0.03
Kesrisinghpur (M)	0.04	3.80	0.03	0.05	0.03	3.11	0.02	0.04	0.018	1.84	0.01	0.02
Padampur (M)	0.05	4.87	0.04	0.06	0.04	3.98	0.03	0.05	0.024	2.35	0.02	0.03
Raisinghnagar (M)	0.08	7.80	0.07	0.09	0.06	6.37	0.06	0.07	0.038	3.77	0.03	0.04
Sadulshahar (M)	0.06	6.35	0.06	0.07	0.05	5.19	0.05	0.06	0.031	3.07	0.03	0.04
Vijainagar (M)	0.05	5.06	0.04	0.06	0.04	4.14	0.03	0.05	0.024	2.45	0.02	0.03
Hanumangarh												
Bhadra (M)	0.07	7.17	0.07	0.08	0.06	6.24	0.06	0.07	0.036	3.65	0.03	0.04
Hanumangarh (M)	0.26	25.86	0.25	0.26	0.23	22.50	0.22	0.23	0.132	13.15	0.13	0.14
Nohar (M)	0.09	8.63	0.08	0.09	0.08	7.51	0.07	0.08	0.044	4.39	0.04	0.05
Rawatsar (M)	0.06	5.77	0.05	0.06	0.05	5.03	0.04	0.06	0.029	2.94	0.03	0.03
Pilibanga (M)	0.07	6.76	0.06	0.07	0.06	5.88	0.05	0.06	0.034	3.44	0.03	0.04
Sangaria (M)	0.07	6.97	0.06	0.08	0.06	6.07	0.06	0.07	0.035	3.55	0.03	0.04

Table 3 Continued

District/Town		Met need for family planning (any method)				Unmet need for family planning							
		Proportion of women of age group 15-44 in tehsils using contraception	per cent	Lower limit	Upper limit	unmet need for family planning for limiting fertility	Per cent	Lower limit	Upper limit	unmet need for family planning for spacing fertility	Per cent	Lower limit	Upper limit
Jaipur													
Bagru (M)		0.01	0.56	0.00	0.01	0.00	0.45	0.00	0.01	0.003	0.27	0.00	0.02
Chaksu (M)		0.01	0.74	0.01	0.01	0.01	0.60	0.00	0.01	0.004	0.36	0.00	0.01
Chomu (M)		0.01	1.29	0.01	0.02	0.01	1.04	0.01	0.01	0.006	0.62	0.00	0.01
Jaipur (M Corp.)		0.58	57.94	0.58	0.58	0.47	46.70	0.47	0.47	0.278	27.82	0.25	0.28
Kishangarh Renwal (M)		0.01	0.71	0.00	0.01	0.01	0.57	0.00	0.01	0.003	0.34	0.00	0.03
Kotputli (M)		0.01	1.00	0.01	0.01	0.01	0.81	0.01	0.01	0.005	0.48	0.00	0.01
Sambhar (M)		0.01	0.57	0.00	0.01	0.00	0.46	0.00	0.01	0.003	0.27	0.00	0.04
Phulera (M)		0.01	0.55	0.00	0.01	0.00	0.45	0.00	0.01	0.003	0.27	0.00	0.02
Jobner (M)		0.00	0.27	0.00	0.00	0.00	0.22	0.00	0.00	0.001	0.13	0.00	0.02
Shahpura (M)		0.01	0.71	0.00	0.01	0.01	0.58	0.00	0.01	0.003	0.34	0.00	0.01
Viratnagar (M)		0.00	0.44	0.00	0.01	0.00	0.35	0.00	0.01	0.002	0.21	0.00	0.02
Jaisalmer													
Jaisalmer (M)		0.44	44.00	0.43	0.45	0.40	39.89	0.39	0.41	0.231	23.07	0.22	0.24
Pokaran (M)		0.15	15.33	0.14	0.16	0.14	13.90	0.13	0.15	0.080	8.04	0.07	0.09
Jalor													
Jalor (M)		0.23	23.48	0.23	0.24	0.22	21.95	0.21	0.23	0.126	12.56	0.12	0.13
Bhimtal (M)		0.21	20.92	0.20	0.22	0.20	19.55	0.19	0.20	0.112	11.19	0.10	0.12
Sanchoe (M)		0.14	13.77	0.13	0.15	0.13	12.87	0.12	0.14	0.074	7.36	0.07	0.08

Table 3 *Continued*

District/Town	Met need for family planning (any method)				Unmet need for family planning							
	Proportion of women of age group 15-44 in tehsils using contraception	per cent	Lower limit	Upper limit	unmet need for family planning for limiting fertility	Per cent	Lower limit	Upper limit	unmet need for family planning for spacing fertility	Per cent	Lower limit	Upper limit
Jhalawar												
Aklara (M)	0.07	6.53	0.06	0.07	0.06	5.80	0.05	0.07	0.034	3.36	0.03	0.04
Bhawani Mandi (M)	0.13	12.67	0.12	0.13	0.11	11.25	0.11	0.12	0.065	6.52	0.06	0.07
Bakani (CT)	0.03	2.87	0.02	0.04	0.03	2.55	0.02	0.03	0.015	1.48	0.01	0.02
Jhalawar (M)	0.17	17.24	0.16	0.18	0.15	15.31	0.15	0.16	0.089	8.87	0.08	0.09
Jhalrapatan (M)	0.11	10.85	0.10	0.12	0.10	9.64	0.09	0.10	0.056	5.58	0.05	0.06
Kolvi Mandi Rajendrapur (CT)	0.03	2.83	0.02	0.04	0.03	2.51	0.02	0.03	0.015	1.46	0.01	0.02
Manoharthana (CT)	0.03	3.34	0.03	0.04	0.03	2.97	0.02	0.04	0.017	1.72	0.01	0.02
Pirawa (M)	0.04	4.11	0.03	0.05	0.04	3.65	0.03	0.04	0.021	2.12	0.02	0.03
Jhunjhunum												
Baggar (M)	0.03	2.76	0.02	0.03	0.02	2.29	0.02	0.03	0.013	1.35	0.01	0.02
Bissau (M)	0.04	4.38	0.04	0.05	0.04	3.63	0.03	0.04	0.021	2.14	0.02	0.03
Chirawa (M)	0.07	7.47	0.07	0.08	0.06	6.19	0.06	0.07	0.036	3.65	0.03	0.04
Jhunjhunum (M)	0.20	20.17	0.20	0.21	0.17	16.72	0.16	0.17	0.099	9.85	0.09	0.10
Mandawa (M)	0.04	4.31	0.04	0.05	0.04	3.58	0.03	0.04	0.021	2.11	0.02	0.03
Surajgarh (M)	0.04	3.76	0.03	0.04	0.03	3.12	0.03	0.04	0.018	1.84	0.01	0.02
Udaipurwari (M)	0.06	5.62	0.05	0.06	0.05	4.66	0.04	0.05	0.027	2.74	0.02	0.03
Mukandgarh (M)	0.04	3.67	0.03	0.04	0.03	3.04	0.02	0.04	0.018	1.79	0.01	0.02
Nawalgarh (M)	0.12	11.55	0.11	0.12	0.10	9.57	0.09	0.10	0.056	5.64	0.05	0.06
Jodhpur												
Bilara (M)	0.33	32.88	0.32	0.34	0.29	28.83	0.28	0.30	0.168	16.82	0.16	0.18
Pipar City (M)	0.28	27.94	0.27	0.29	0.24	24.50	0.23	0.26	0.143	14.29	0.13	0.15

Table 3 *Continued*

District/Town	Met need for family planning (any method)				Unmet need for family planning							
	Proportion of women of age group 15-44 in tehsils using contraception	per cent	Lower limit	Upper limit	unmet need for family planning for limiting fertility	Per cent	Lower limit	Upper limit	unmet need for family planning for spacing fertility	Per cent	Lower limit	Upper limit
Karauli												
Hindaun (M)	0.30	29.65	0.29	0.30	0.26	26.20	0.26	0.27	0.153	15.25	0.15	0.16
Karauli (M)	0.23	23.38	0.23	0.24	0.21	20.66	0.20	0.21	0.120	12.02	0.11	0.13
Todabhim (M)	0.07	7.46	0.07	0.08	0.07	6.60	0.06	0.07	0.038	3.84	0.03	0.04
Kota												
Chechat (CT)	0.05	4.83	0.04	0.06	0.04	3.97	0.03	0.05	0.024	2.35	0.02	0.03
Kaithoon (M)	0.10	9.79	0.09	0.11	0.08	8.04	0.07	0.09	0.048	4.77	0.04	0.05
Kumbhkot (CT)	0.03	2.72	0.02	0.04	0.02	2.23	0.01	0.03	0.013	1.32	0.01	0.02
Modak (CT)	0.04	3.96	0.03	0.05	0.03	3.25	0.02	0.04	0.019	1.93	0.01	0.03
Suket (CT)	0.08	8.01	0.07	0.09	0.07	6.57	0.06	0.07	0.039	3.90	0.03	0.05
Satalkheri (CT)	0.07	6.96	0.06	0.08	0.06	5.71	0.05	0.07	0.034	3.39	0.03	0.04
Ramganj Mandi (M)	0.15	14.68	0.14	0.16	0.12	12.05	0.11	0.13	0.071	7.15	0.07	0.08
Sangod (M)	0.09	8.91	0.08	0.10	0.07	7.32	0.06	0.08	0.043	4.34	0.04	0.05
Udptura (CT)	0.04	4.06	0.03	0.05	0.03	3.33	0.02	0.04	0.020	1.98	0.01	0.03
Nagaur												
Basni Belima (CT)	0.05	4.71	0.04	0.05	0.04	4.11	0.04	0.05	0.024	2.40	0.02	0.03
Didwana (M)	0.09	9.28	0.09	0.10	0.08	8.11	0.08	0.09	0.047	4.73	0.04	0.05
Goredi Chancha (CT)	0.02	2.01	0.01	0.03	0.02	1.75	0.01	0.02	0.010	1.02	0.01	0.01
Kuchaman City (M)	0.11	10.64	0.10	0.11	0.09	9.29	0.09	0.10	0.054	5.43	0.05	0.06
Kuchera (M)	0.04	4.09	0.03	0.05	0.04	3.57	0.03	0.04	0.021	2.09	0.02	0.03
Ladnu (M)	0.12	12.10	0.12	0.13	0.11	10.57	0.10	0.11	0.062	6.17	0.06	0.07
Nawa (M)	0.04	3.75	0.03	0.04	0.03	3.27	0.03	0.04	0.019	1.91	0.01	0.02
Parbatsar (M)	0.03	2.76	0.02	0.03	0.02	2.41	0.02	0.03	0.014	1.41	0.01	0.02
Merta City (M)	0.08	8.25	0.08	0.09	0.07	7.21	0.07	0.08	0.042	4.21	0.04	0.05
Mundw.Āq (M)	0.03	3.41	0.03	0.04	0.03	2.98	0.02	0.04	0.017	1.74	0.01	0.02

Table 3 Continued

District/Town	Met need for family planning (any method)				Unmet need for family planning							
	Proportion of women of age group 15-44 in tehsils using contraception	per cent	Lower limit	Upper limit	unmet need for family planning for limiting fertility	Per cent	Lower limit	Upper limit	unmet need for family planning for spacing fertility	Per cent	Lower limit	Upper limit
Pali												
Bali (M)	0.03	2.90	0.02	0.03	0.03	2.56	0.02	0.03	0.015	1.49	0.01	0.02
Falna (M)	0.03	3.26	0.03	0.04	0.03	2.89	0.02	0.03	0.017	1.68	0.01	0.02
Jaitaran (M)	0.03	3.00	0.02	0.04	0.03	2.65	0.02	0.03	0.015	1.54	0.01	0.02
Pali (MCI)	0.29	28.67	0.28	0.29	0.25	25.34	0.25	0.26	0.147	14.72	0.14	0.15
Rani (M)	0.02	1.95	0.01	0.02	0.02	1.72	0.01	0.02	0.010	1.00	0.01	0.01
Sadri (M)	0.04	3.97	0.03	0.04	0.04	3.51	0.03	0.04	0.020	2.04	0.02	0.02
Sumerpur (M)	0.05	4.86	0.04	0.05	0.04	4.30	0.04	0.05	0.025	2.50	0.02	0.03
Takhatgarh (M)	0.03	2.51	0.02	0.03	0.02	2.22	0.02	0.03	0.013	1.29	0.01	0.02
Sojra (M)	0.06	6.05	0.06	0.07	0.05	5.35	0.05	0.06	0.031	3.11	0.03	0.03
Sojra Road (CT)	0.02	1.76	0.01	0.02	0.02	1.56	0.01	0.02	0.009	0.91	0.01	0.01
Marwar Junction (CT)	0.02	1.65	0.01	0.02	0.01	1.45	0.01	0.02	0.008	0.85	0.00	0.01
Rajsamand												
Nahdwarra (M)	0.24	24.43	0.23	0.25	0.21	21.31	0.20	0.22	0.124	12.41	0.12	0.13
Rajsamand (M)	0.37	36.80	0.36	0.38	0.32	32.09	0.31	0.33	0.187	18.70	0.18	0.19
Sawai Madhopur												
Todra (CT)	0.60	59.98	0.57	0.63	0.54	53.82	0.51	0.57	0.311	31.11	0.28	0.34

Table 3 *Continued*

District/Town	Met need for family planning (any method)				Unmet need for family planning							
	Proportion of women of age group 15-44 in tehsils using contraception	per cent	Lower limit	Upper limit	unmet need for family planning limiting fertility	Per cent	Lower limit	Upper limit	unmet need for family planning spacing fertility	Per cent	Lower limit	Upper limit
Sikar												
Reengus (M)	0.05	5.29	0.05	0.06	0.04	4.50	0.04	0.05	0.026	2.64	0.02	0.03
Neem-Ka-Thana (M)	0.07	6.89	0.06	0.08	0.06	5.86	0.05	0.06	0.034	3.44	0.03	0.04
Ramgarh (M)	0.07	6.94	0.06	0.08	0.06	5.90	0.05	0.06	0.035	3.47	0.03	0.04
Sri Madhopur (M)	0.07	6.71	0.06	0.07	0.06	5.71	0.05	0.06	0.034	3.35	0.03	0.04
Lachhmangarh (M)	0.11	11.26	0.11	0.12	0.10	9.58	0.09	0.10	0.056	5.62	0.05	0.06
Losal (M)	0.06	6.28	0.06	0.07	0.05	5.34	0.05	0.06	0.031	3.14	0.03	0.04
Fatehpur (M)	0.19	18.91	0.18	0.20	0.16	16.09	0.16	0.17	0.094	9.45	0.09	0.10
Sirohi												
Mount Abu (M)	0.12	11.69	0.11	0.13	0.11	10.55	0.10	0.12	0.061	6.11	0.05	0.07
Pindwara (M)	0.12	12.19	0.11	0.13	0.11	11.00	0.10	0.12	0.064	6.37	0.06	0.07
Sheoganj (M)	0.15	14.78	0.14	0.16	0.13	13.34	0.12	0.14	0.077	7.72	0.07	0.08
Sirohi (M)	0.21	20.87	0.20	0.22	0.19	18.84	0.18	0.20	0.109	10.91	0.10	0.12

Table 3 *Continued*

District/Town	Met need for family planning (any method)				Unmet need for family planning							
	Proportion of women of age group 15-44 in tehsils using contraception	per cent	Lower limit	Upper limit	unmet need for family planning for limiting fertility	Per cent	Lower limit	Upper limit	unmet need for family planning for spacing fertility	Per cent	Lower limit	Upper limit
Tonk												
Banasthali (CT)	0.03	2.51	0.02	0.03	0.02	2.27	0.02	0.03	0.013	1.31	0.01	0.02
Deoli (M)	0.05	5.02	0.04	0.06	0.05	4.54	0.04	0.05	0.026	2.62	0.02	0.03
Unlira (M)	0.03	2.86	0.02	0.04	0.03	2.59	0.02	0.03	0.015	1.49	0.01	0.02
Todaraisingh (M)	0.06	5.57	0.05	0.06	0.05	5.04	0.04	0.06	0.029	2.91	0.02	0.03
Niwai (M)	0.08	8.08	0.07	0.09	0.07	7.31	0.07	0.08	0.042	4.21	0.04	0.05
Tonk (M CI)	0.36	35.60	0.35	0.36	0.32	32.20	0.32	0.33	0.186	18.57	0.18	0.19
Udaipur												
Dhartiawad (CT)	0.01	1.37	0.01	0.02	0.01	1.18	0.01	0.02	0.007	0.69	0.00	0.01
Bhinder (M)	0.02	2.15	0.02	0.03	0.02	1.86	0.01	0.02	0.011	1.09	0.01	0.01
Kherwara Chhaoni (CT)	0.01	0.85	0.00	0.01	0.01	0.74	0.00	0.01	0.004	0.43	0.00	0.01
Fatehnagar (M)	0.03	2.57	0.02	0.03	0.02	2.22	0.02	0.03	0.013	1.30	0.01	0.02
Kanor (M)	0.02	1.55	0.01	0.02	0.01	1.34	0.01	0.02	0.008	0.78	0.00	0.01
Salunbar (M)	0.02	2.07	0.02	0.03	0.02	1.79	0.01	0.02	0.010	1.05	0.01	0.01
Rikhabdeo (CT)	0.01	1.02	0.01	0.02	0.01	0.88	0.00	0.01	0.005	0.52	0.00	0.01
Udaipur (M CI)	0.49	49.21	0.49	0.50	0.42	42.47	0.42	0.43	0.248	24.84	0.24	0.25
Bhalaria (CT)	0.01	0.82	0.00	0.01	0.01	0.71	0.00	0.01	0.004	0.42	0.00	0.01