Regional inequality in the Janani Suraksha Yojana (JSY) coverage in India: A Geo-spatial Analysis

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Abstract

Introduction

Although India has made significant progress in Iinstitutional delivery after the implementation of National Rural Health Mission under which the Janani SurakshaYojna (JSY) is a sub-programme which played a vital role in the increase of institutional delivery in public facilties. However, a huge gap still, persists in terms of coverage and utilization of the JSY scheme, not only across socio-economic groups but also at district level in India. Therefore, this paper aims to provide an understanding of the JSY coverage at the district level in India. further, it tries to carve out the factors responsible for regional disparity of JSY coverage at district levels.

Mehtods

The study used the fourth round of National Family Health Survey data and restricts sample size (n=148,145) to the women aged 15-49 years who gave recent birth in the institution during five years preceding the survey. Bivariate and multivariate regression analysis wasused to fulfill the study objectives. Additionally, Moran's I statistics and bivariate Local Indicator for Spatial Association (LISA) maps were used to understand spatial dependence and clustering of JSY coverage. Ordianry least square, spatial lag and spatial error models were used to examine the correlates of JSY utilization.

Results

The value of spatial-autocorrelation for JSY was 0.71 which depicts high dependence of the JSY coverage over districts of India. The overall coverage of JSY in India is 36.4% and it highly varied across different regions, districts, and even socioeconomic groups. The spatial error model depicts that if in a district the women with no schooling status increase by 10% than the benefits of JSY get increased by 2.3%. Similarly, if in a district the women from poor wealth quintile increases by 10% the benefits of JSY also increased by 4.6%. However coverage of JSY made greater imperative to understand it due to its clustering among distrcits of specific states only.

Conclusion

It is well reflected in the EAGs states in terms of spatial-inequality in service coverage. There is aneed to universalize the JSY programme at a very individual level. And, it is required to revisit the policy strategy and the implementation plans at regional or district levels.

Keywords: Janani Suraksha Yojana; spatial analysis; LISA; India.

Introduction

Despite given efforts by international, national,and local governments and agencies, the utilization status of maternal and child health (MCH) care services is still low in many developing countries, including India(Kruk, Prescott, & Galea, 2008;Blas et al., 2008; Boerma, 2012; Heidkamp & Group, 2017; Baru et al., 2010; Lim et al., 2010; Paul, Paul, & James, 2019).Although India has made considerable progress in reducing maternal mortality through the interventions of different health policies and programs, the national rural health mission (NRHM) is one of them andactingas multi-strategic policy interventions to promote health care accessibility while reducing health inequity (Gupta, et al., 2016; Vellakkal, et al., 2017a), however, kinds of literature show that the effectiveness and efficiency of the programs are not the same across socio-economic groups and regions that led to slow, uneven and unequaldistribution of health and health care practices (Baru, et al., 2010; Borooah, et al., 2012; Lim et al., 2010; Joe, et al., 2018; Paul, S., Paul, S., & James, K. S. 2019).

Still, a large proportion of women and children are not covered under the essential health care services (Navarro et al., 2006; Kassebaum et al., 2016; Hunter et al., 2014;Murray, et al., 2014;Paul et al., 2019)and particularly, those who are from the poor and marginalized groups of the communities(CSDH, 2008; Baru, et al., 2010; Barros, et al., 2012). India is also facing the same issue of health inequality, and even worse in the case of MCH care services(Panda & Mohanty, 2019; Nair & Panda, 2011; Pathak, Singh, & Subramanian, 2010; Vellakkal, et al., 2017a). In India, huge health disparities exist across different socio-economic groups, regions, states,and districts level in terms of accessing and utilizing maternal and child health care services(Powell-jackson et al., 2015).States like Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, Jharkhand, Chhattisgarh, Uttarakhand, and Orissa are going through tremendous inequality in accessing equitable health care services(Lim, et al., 2010; Randive, Diwan, & De Costa, 2014). These states are also together named EAGs (Empowered Action Group)

states, with low performing in socio-economic and health indicators,and that eventually lead to high maternal and child mortality compared to other states (UNICEF& India, 2010; SRS, 2019).

Higher maternal mortality rates and its variations across socio-geographical regions show that there is inaccessibility, unavailability,and unaffordability of essential maternity services thatlead tounder-utilization of MCH services among the poor and marginalized women(Baru et al., 2010).For example, institutional delivery is an important maternity service that prevents maternal and neonatal mortality. In India, still, 21% of childbirth delivery occurs at home (IIPS & ICF, 2017). Although, institutional delivery in India has increased to 79% in 2015 from 39% in 2005;still, the gap has remained wide and persistent across socio-economic groups, regions, and states(IIPS & ICF, 2017).Therefore, for plummeting health inequity and fostering health equality development by promoting institutional delivery, the *JananiSurakshaYojana*(JSY) or 'Safe Motherhood scheme'wasintroduced in 2005, under the National Rural Health Mission (NRHM), in which the poor and marginalized women areprovidedwith an incentive for delivering their child in public health facilities. It is a conditional cash transfer scheme to promote institutional delivery in order to reduce mother and child deaths (India &UNFPA, 2009).

The economic burden is one of the most important factors that restrict poor pregnant women delivering their childbirth at health institutions (Jeffery & Jeffery, 2010; Mohanty & Kastor, 2017). Further, socio-economically vulnerable and marginalized women also suffer from multiple deprivations/vulnerabilities in seeking maternal health care services, such as prenatal, natal, post-natal care, and child immunization (Adam et al., 2005; Houweling, Ronsmans, & Kunst, 2007; Mohanty, 2012; Mishra & Syamala, 2019). The JSY scheme is one of the most far-reaching demand-side financing programs in the world (Murray et al.,

2014;Purnell et al., 2016). And, it is associated with increasing institutional delivery among the most deprived groups of people.

The provision of conditioning JSY cash payment scheme to all pregnant women is marked as an irregularity to the beneficiaries and it has been found that after a decade of implementationof the JSY scheme, a huge gap persists in terms of coverage and utilization (Randive, Diwan, & De Costa, 2014; Vellakkal et al., 2017), not only across socio-economic groups but also at regional and district-levels(A. Gupta et al., 2018; Powell-jackson et al., 2015). Several studies found that the increasing trend of inequity and inequality in access to JSY services and its coverage has created policy concerns (Gupta et al., 2018; Paul et al., 2019; Randive, Diwan, & De Costa, 2014; Vellakkal et al., 2017); therefore, it requires putting forth many questions against the policies and programmefor its overall coverage(Vellakkal, Reddy, Gupta, Chandran, et al., 2017)

The literature also shows that there is a significant variation in coverage of health policy and programs interventions across the communitiesdue to unawareness and lack of knowledge(Barros et al., 2012; Jarris, Savage-narva, & Lupi, 2016; Lagarde, Haines, & Palmer, 2009).Due to the policy coverage gap and lack of programmeeffectiveness across the groups, regions, and states have made substantial incrementsin the health disparity. It is evident in the study conducted by Vellakkal et al.,that the use of JSY conditioning cash transfer during pregnancy is varied considerably across socio-economic groups, and not all eligible women get access to it (Vellakkal, Reddy, Gupta, Chandran, et al., 2017). Moroever, it also varies across geographic regions and states in India (Lim et al., 2010; Powell-jackson, Mazumdar, & Mills, 2015). Spatial disparity matters in the MCH services coverage and its utilization(Biradar & Singh, 2020; Joe, Perkins, Kumar, Rajpal, & Subramanian, 2018; Panda, Kumar, & Mishra, 2019). Studies show that there is a strong correlation between the

proximate determinants of spatial clustering and the service coverage (Panda, Kumar, & Mishra, 2019).

As it was found that a huge gap persists in the JSY coverage across various socio-econocmicgroups, states, and regions of India.Therefore, this paper aims to provide an understanding of the JSY coverage at the district level. Moreover, it tries to carve out the factors responsiblefor regionaldisparity for JSY coverage at district level.The study hypothesized that there was no spatial auto-correlation between JSY coverage and districts of India.

***JananiSurakshaYojana* (*Safe Motherhood Programme*):** India has launched several health policies and programs to protectmother and child health and to improve their survival. India's flagship scheme ofJSY launched in 2005under the auspicious program of National Rural Health Mission (NRHM)with a particular focus on reducing maternal and infant mortality through promoting antenatal, natal, and postnatal care. It is a conditioning cash-incentive scheme that promotes among pregnant women to deliver their child at public health institutions. Since, in India,one-fifth of childbirths stilltake place at home delivery (IIPS & ICF, 2017).It ensures safe delivery to all women who belong to ScheduledCastes, Scheduled Tribes, and those women who are living below the poverty line (BPL) with the age of 19 yearsand above during delivery. The ASHAas a community health worker (Accredited Social Health Activist) acts as an intermediate person to track from pregnancy to childbirth and postnatal care in the community in this scheme.In this way, ASHA is engaged with the JSY scheme to set up a linkage between the government health system and the beneficiary woman (NRHM, 2005).

Methods

The data from the National Family Health Survey round four (NFHS-4) was used to understand the spatial pattern and correlates affecting the JSY service utilization in India. NFHS is a cross-sectional national representative survey, conducted in 2015-16 under the stewardship of the Ministry of Health and Family Welfare (MoHFW), Government of India. The survey provides detailed information on population, fertility, familyplanning, reproductive right and health issue, HIV/AIDS, gender issues,women empowerment, and domestic violence. NFHS used a two-stage stratified sampling design to give the estimates at state (36) as well as district level (640). The detailed methodology and complete information on the survey design and data collection published elsewhere(IIPS & ICF, 2017). The survey collected information from 601,509 households, 699,686 women, and 112,122 number of men for the response rate of 98 percent, 97 percent, and 92 percent respectively. The study restricts sample size (n=148,145) to the women aged 15-49 years who gave recent birth in the institution during five years preceding the survey.

Outcome variable

The outcome variable for the analysis is the coverage (percentage) of the JSY scheme. The question was asked to the women ‘did you receive any financial assistance for delivery care? Further, the question was asked ‘from where did you get assistance? The response was dichotomous 1 ‘Yes (received JSY assistance)’ and 0 ‘No (not receive)’.

Independent variable

The predictor variables for this were theeducation of the women (no schooling and literate), wealth of the households (poor and non-poor), place of residence (rural and urban), caste (scheduled caste/scheduled tribe and others), religion (Hindu and non-Hindu), and mass media exposure (no exposure and some exposure)(Kumar & Dhillon, 2020).

Statistical analysis

Bivariate and multivariate logistic regression analysis was used to analyse the data.Additionally, for spatial analysis in terms of coverage of JSY among women in India univariate and bivariate Moran's I index measurements were used along with the usage of spatial regression models(Anselin et al., 2006). Spatial auto-correlation is being measured by using Moran's I statistics. Spatial autocorrelation represents the extent to which data points are similar or dissimilar to their spatial neighbours(Yandell & Anselin, 1990).

Univariate Moran's I measure the spatial auto-correlation of neighbourhood values around a specific spatial location. It determines the extent of spatial non-stationary and clustering present in the data. Bivariate Moran's Iexamines the local correlation between an outcome variable and certain characteristics of the region. While both univariate and bivariate Moran's I aim to measure similarities and dissimilarities of spatial data, they are found to be less useful in case of uneven spatial clustering(Srivastava et al., 2019). The formula to calculate the Moran's *I* statistic is as follows:

$$\text{Univariate Moran's I} = \frac{n}{S_O} \times \frac{\Sigma_i \Sigma_j W_{ij}(x_i - \bar{X})(x_j - \bar{X})}{\Sigma_i (x_i - \bar{X})^2}$$

Where x is the variable of interest and $\bar{X}$ is the mean of x; n is the number of spatial units; W_{ij} is the standardized weight matrix between observation i and j with zeroes on the diagonal; and S_O is the aggregate of all spatial weights, i.e. $S_O = \Sigma_i \Sigma_j W_{ij}$

$$\text{Bivariate Moran's I} = \frac{n}{S_O} \times \frac{\Sigma_i \Sigma_j W_{ij}(x_i - \bar{X})(Y_j - \bar{Y})}{\Sigma_i (y_i - \bar{Y})^2}$$

Where x and y are the variables of interest; $\bar{X}$ is the mean of x; $\bar{Y}$ is the mean of y; n is number of spatial units; W_{ij} is the standardized weight matrix between observation i and j with zeroes on the diagonal; and S_O is the aggregate of all spatial weights, i.e. $S_O = \Sigma_i \Sigma_j W_{ij}$.

Value of Moran's- I ranges from −1 (indicating perfect dispersion) to +1 (perfect correlation). A zero value indicates a random spatial pattern. Negative (positive) values indicate a negative (positive) spatial autocorrelation. Positive autocorrelation indicates that points with similar attribute values are closely distributed in space, whereas negative spatial autocorrelation indicates that closely associated points are more dissimilar(Srivastava et al., 2019).

Univariate LISA calculates thespatial-correlation of neighbourhood values around the specific spatial location(Anselin, 1995). It determines the extent of spatial randomness and clustering present in the data. The measure (I_i) is given by the following:

$$\text{Univariate LISA: } I_i = \frac{n.(x_i - \bar{X})}{\Sigma_i (x_i - \bar{X})^2} \Sigma_j w_{ij} (x_j - \bar{X})$$

Bivariate Local Indicator of Spatial Association (LISA) measures were estimated to analyse the associationof certain characteristics of regions with different outcomes of child immunization The bivariate LISA presented as below:

$$\text{Bivariate LISA: } I_i = \frac{n.(x_i - \bar{X})}{\Sigma_i (y_i - \bar{Y})^2} \Sigma_j w_{ij} (y_i - \bar{Y})$$

Four types of spatial auto-correlation were generated based on the four quadrants of Moran'sI scatter plots which are defined as follows:

- **Hot Spots**: districts with high values, with similar neighbours (High-High).
- **Cold Spots**: districts with low values, with similar neighbours (Low-Low).

- **Spatial Outliers**: districts with high values, but with low-value neighbours (High-Low)and districts with low values, but with higher values of neighbours (Low-High).

The spatial weights $W_{ij}$are non-zero when i and j are neighbours, else it remains zero(Bivand, 2015). The weight used in the analysis is Queen Contiguity weights which represents whether spatial units share the boundary or not. If the set of boundary points of unit I is denoted by the band (i), then the Queen Contiguity Weight is defined by:

$$W_{ij}=\begin{cases} 1 \ , bnd(i) \cap bnd\ (j) \neq \ \emptyset \\ 0 \ , \ bnd(i) \cap bnd\ (j) \neq \ \emptyset \end{cases}$$

However, this allows the possibility that spatial units share only a single boundary point (such as a shared corner point on a grid of spatial units). Hence a stronger condition is to require that some *positive* portion of their boundary be shared.

In order to determine the significant correlates of coverage of JananiSurakshaYojana (JSY) in India, a set of regression models had been used. Spatial ordinary least square (OLS) regression model was used to see the extent of autocorrelation in the error term. Since the OLS confirmed spatial autocorrelation in its error term for the dependent variable, we further estimated spatial lag model (SLM) and spatial error model (SEM)(Sharma et al., 2020)**.** The underlying assumption of a spatial lag model is that the observations of the outcome variable are affected in the neighbourhood areas whereas the spatial error model is used to consider the effect of those variables which are absent in the regression model but had an effect on the outcome variable. The basic difference between the two models is that the spatial lag model unlike the spatial error model does not consider the spatial dependence of the error term.

The basic equation for OLS is as follows:

$$Y=\alpha + BX +\mathcal{E}$$

Where Y is the outcome variable, X is the vector of predictor variables and α is the model intercept and β is the corresponding coefficient vector.

Spatial lag model suggests that the units are spatially dependent on each other and lagging to each in the nearby spatial locations(Sharma et al., 2020). A typical spatial lag model can be written as follows:

$$Y_i = \delta \sum_{j \neq 1} W_{ij} Y_j + \beta X_j + \varepsilon_j$$

Here Y_i denotes the JSY coverage for the ith district, δ is the spatial autoregressive coefficient, W_{ij} denotes the spatial weight of proximity between district i and j, Y_j is the JSY coverage in the jth district, $\beta_j$denotes the coefficient, X_j is the predictor variable and εj is the residual.

Spatial error model, on the other hand, considers the contribution of omitted variables that are not included in the model but can have a significant effect in the analysis(Sharma et al., 2020)**.**A Spatial Error Model (SEM) is expressed as follows:

$$Y_i = \beta X_j + \lambda \sum_{j \neq 1} W_{ij} Y_j \, \varepsilon_j + \varepsilon_i$$

Here, Y_i denotes the JSY coverage for the ith district, λ is the spatial autoregressive coefficient, W_{ij} denotes the spatial weight of proximity between district i and j, Y_j is JSY coverage in thej^{th} district, β_j denotes the coefficient, X_j is the predictor variable and ε_i is the residual.

Results

Background analysis

Table-1 represents the socio-economic profile of the study population in India. As per 2015-16 estimates, 36.4% of women in India got benefited from JananiSurakshaYojana (JSY). Of the total women selected 21.6% were having no schooling. Every 3 in 10 women were from the Scheduled Caste/Scheduled Tribe caste category. About 8 in 10 women were fromthe Hindu religion. About 37.6% of women belonged to poor wealth quintile and 19% of women had no media exposure. About 67% of women belonged to rural areas in India.

Table-2 depicts bivariate and logistic regression analysis to find an association between JSY and background factors in India, 2015-16. Women who were educated were having significantly lower odds for receiving JSY benefits in reference to women who had no schooling [OR: 0.80, $p<0.01$]. Odds for JSY benefits were higher among women those from Scheduled Caste/Scheduled Tribe category than women from non-Scheduled Caste/ Scheduled Tribe [OR: 0.80, $p<0.01$].Women from non-Hindu religion were 25% significantly less likely to receive benefits form JSY in comparison to women from Hindu religion[OR: 0.75, $p<0.01$]. Women from non-poor wealth quintiles were 52% significantly less likely to receive JSY benefits in comparison to women from Poor wealth quintile[OR: 0.48, $p<0.01$]. Women who had some media exposure had lower odds of receiving JSY benefits than women who had no media exposure [OR: 0.90, $p<0.01$].Odds for receiving JSY benefits were higher for women from a rural place of residence than women from urban areas [OR:1.56, $p<0.01$].

Table-3 presents the values of univariate and bivariate Moran's I statistics. Univariate Moran's I statistics represent the spatial auto-correlation of outcome and predictor variables. The value of spatial-autocorrelation for JSY was 0.71 which depicts high dependence of the outcome variable over districts of India. Additionally, highest Moran's I value among

predictor variables was witnessed by women from poor wealth quintile (0.75) followed by women from Hindu religion (0.74) and women who had no mass media exposure (0.72).It was found that the spatial auto-correlation of JSY and women with no schooling was 0.35 and that with women from poor wealth quintile was 0.52. Additionally, the spatial auto-correlation of JSY and women from rural areas was 0.31, and women who had no media exposure was 0.42.

Table 4 provides estimates for spatial regression estimates for JSY and its predictors for 640 districts of India. From the OLS estimates, it was confirmed that no schooling status [β: 0.169, $p<0.05$], poor wealth quintile [β: 0.648, $p<0.05$] and rural place of residence [β: 0.100, $p<0.05$ were found to be significant spatial predictors of JSY in India.The value of adjusted R-square was 0.45 and the value for AIC was found to be 5509.

The value of lag coefficient was 0.71 ($p<0.01$) from the SLM which signifies that a change in the JSY coverage in a particular district may statistically lag the rate of JSY coverage by 71% in the neighboring districts. In the spatial lag model, it was found that no schooling status [β: 0.128, $p<0.05$], poor wealth quintile [β: 0.251, $p<0.05$], rural place of residence [β: 0.087, $p<0.05$] and no mass media exposure [β: -0.157, $p<0.05$] were significantly associated with JSY coverage in India. The respective model splits the value of adjusted R-square as 0.75 and value for AIC was found as 5096.

However, as per the theory of spatial regression models, the model with the lowest AIC value and highest R-squarevalue is considered to be the best fit model. Therefore, as per our model estimates the lowest AIC and highest adjusted R-square value was found to be of spatial error model (SEM) which makes it the best fit model among all the three models.The spatial error model was having an AIC value of 5062.4 and an adjusted R-square value of 0.77. Interestingly the value of Lambda (spatial autoregressive coefficient)/error lag value was 0.81

($p<0.01$) which signifies that spatial influence on JSY coverage through the omitted variables not present in the SEM.

The model depicts that if in a district the women with no schooling status increase by 10% than the benefits of JSY get increased by 2.3%. Similarly, if in a district the women from poor wealth quintile increases by 10% the benefits of JSY also increased by 4.6%. However, if in a district there is a 10% increase of women who had no mass media exposure than the JSY benefits get declined by 1.4%.Moreover, rural place of residence [β: 0.030, $p>0.05$], Scheduled caste/Scheduled tribe status residence [β: 0.024, $p>0.05$] and Hindu religion status residence [β: 0.081, $p>0.05$]were positively associated with JSY estimates, but the results were not significant except for Hindu religion status. The results simply imply that districts with a higher percentage of women having no schooling status and belong to poor wealth quintile had higher chances to get benefited from the JSY programme.

Map-1 shows the coverage and spatial distribution of the JSY scheme across the districts of India. The colour pattern shows the spatial differences in the service utilization of the JSY scheme. Moreover, deeper colour indicates a higher proportion of JSY coverage and light colour indicates the lower coverage. More than 50% of the women utilizing JSY services in the districts of Odisha, Chhattisgarh, Madhya Pradesh, Uttar Pradesh, Uttarakhand, Assam, and few districts of Rajasthan, Bihar, Jharkhand, and Meghalaya.

Figure-1represents univariate LISA (cluster and significance) maps for dependent and outcome variables for districts of India, 2015-16.A significant high-high clustering of JSY service utilizing found in 162 districts, which belonged to the above-mentioned states. There were 162 cold spots in Gujarat, Maharashtra, Telangana Andhra Pradesh, Punjab, Chandigarh, and Haryana showed lower service utilization of the JSY scheme.

On the other hand, no schooling hotspots (132 districts) were found in Rajasthan, Bihar, and few districts of Madhya Pradesh, Uttar Pradesh, and Odisha. While the clustering of poor women weremore in (160 districts) the districts of Uttar Pradesh, Bihar, Jharkhand, Chhattisgarh, Odisha, and few parts of Assam. Furthermore, the hotspots (151 districts) of the Hindu religion were found in empowering action group states and the clustering of no mass media was high (123 districts) Uttar Pradesh, Bihar, Jharkhand, and few districts of Maharashtra.

Figure-2 displays the bivariate LISA cluster map which indicated that 117 of 640 districts had the highest JSY service utilization and no schooling among women. These districts mostly from Rajasthan, Madhya Pradesh, and some parts of Uttar Pradesh, Bihar, and Odisha. However, cold spots (127 districts) of JSY utilization and no education were found in the southern part of India. Bivariate LISA map suggested that around 142 districts constitute the hot spots of high JSY utilization and high poverty. Majority of these districts from Uttar Pradesh, Bihar, Jharkhand, Chhattisgarh, Odisha, West Bengal, and Assam. Only 85 districts constitute the hot spots of high JSY coverage and rural areas. These districts from Uttar Pradesh, Bihar, and few districts from Chhattisgarh, Odisha, and Assam. About 20% of districts (121 districts) of India were observed as hot spots (high JSY utilization and high Hindu religion population) while 53 districts were found as cold spots (low JSY coverage and low Hindu population). Mostly hot spots districts from Madhya Pradesh, Chhattisgarh, Odisha, and some part of Uttar Pradesh and Uttarakhand. Similarly, around 109 districts were identified as hot spots (high JSY coverage and high no mass media exposure) and 147 districts as cold spots (low JSY coverage and low no mass media coverage). These hot spots district from Uttar Pradesh, Bihar, Jharkhand, and few districts from Madhya Pradesh whereas cold spots were found in the southern part of India and the states of Punjab Chandigarh, Haryana, and Himachal Pradesh.

Discussion

Regional inequality and high severity in social policies have made profound effects on MCH outcomes in many developing countries, including India. Historically, a lack of policy consistency and programme intervention on evidence-based maternal healthcare in India has made a lesser imperative in the development of mother and child health. Further, there has also been a little intervention on socio-behavioral change in the community that paved to rural women to deliver their child at health institutions except for JSY that helps financially after the child born at public health institutions (Lim et al., 2010).Although the program was to support rural pregnant women to deliver their baby in public health institutions, however, the results show that there is still inequality in the distributional patterns of service utilization among the population who are eligible toadhare it (Randive et al., 2014). The findings of this study clearly show that the service utilization among the poor and disadvantaged groups of women is higher compared to their counterparts, even though the programme was for the targeted groups, however, the results showed that it is still lacking the full coverage of service utilization among them (Chaturvedi, Randive, Diwan, & De Costa, 2014). As the previous studies have also provided the evidence and supported the analysis in the context of service coverage where the women deprived form multiple grounds face inequity in the use of JSY service (Gupta et al., 2018; Vellakkal, et al., 2017). Moreover, previous literature argued that after JSY in 2005-07, the benefit was more weighted towards rural, illiterate and women from lower socio-economic strata (S. K. Gupta et al., 2012). Additioanly, it was too argued that the concentration of JSY coverage was high among women from lowe socio-economic strata because of cash incentive system of JSY (Powell-jackson et al., 2015).The use of public institutional delivery has increased many folds among the poor socio-economic women after the launch of the National Rural Health Mission (NRHM) in 2005 and it turned up as pro-poor programme(Joe et al., 2018). However, the gap remained the same in accessing the JSY

service (Under the NRHM) by marginalized and disadvantaged women which are shown in this study as well. The findings are also consistent with previous evidence that the probability of service utilization is more among those who not deprived of multiple socio-economic and political grounds(Jeffery & Jeffery, 2010).

In the present study, it was found that regional disparity was visible in the case of JSY coverage across districts of India. For instance, the concentration of JSY coverage among illiterate women was visible in states of Rajasthan, Madhya Pradesh, Uttar Pradesh, Bihar and Orissa which are considered as empowered action group(EAG)(Arokiasamy & Gautam, 2008) states. Moreover, the spatial auto-correlation of JSY and women from poor wealth status was concentrated in the entire central and eastern part of India which has lower socio-economic development in comparison to other parts of India (Kumari et al., 2017; Rasul & Sharma, 2014).The regional disparity also remained the same in the coverage of the programme, although the financial incentives have led to the poor women in more service utilization under the NRHM policy (Powell-jackson et al., 2015), but, there is evidence that shows the targeted groups are lacking in availing the services (Paul et al., 2019) which need to be enhanced with the universalization of the programme to every individual. Though this spatial analysis of the JSY coverage is an attempt to find the clustering of exposure to the programme at the district level in India. The paper is acknowledged with several interesting findings, firstly, there is a need to improve the policy coverage at the very household level so that, it can make thrive the concept of universal access and enhance the socio-spatial coverage too. Secondly, in receiving the JSY services by the beneficiary groups of people, there are multiple social determinants of health that affect accessing it and therefore need to be prioritized at the individual, household, and community levels. Thirdly, a high health inequity is seen across the spatial-regional distributional patterns of JSY service and it

concentrated at one particular geographical region and it also extremely varied within and between regions.

The major finding of this study is that the regions which were already facing high inequity in health service coverage yet again spotted with socio-spatial inequality in the JSY coverage. Overall, the high concentration region of JSY coverage is shown in the central region (states included as Madhya Pradesh, Uttar Pradesh, and Chhattisgarh), the eastern region (Bihar, Jharkhand, and Orissa) and the northern region (Uttarakhand and Rajasthan and Jammu & Kashmir). These regions or states are having huge health disparities that can be also seen in the distribution of JSY services(Carvalho & Rokicki, 2019; Vellakkal, Reddy, Gupta, & Chandran, 2017). Contrary to that, the southern and western part of India is partially covering the programme, although there are some patches in Tamil Nadu (South Indian state) showed the coverage of the JSY. However, southern states are falling back with the programme coverage. Even though the southern states, the private institutional deliveries have increased irrespective of the socio-economic conditions in the last decade (IIPS and ICF, 2017), moreover, some households are eligible to get the JSY services, are still lacking in access to the services. The regional inequality in the JSY coverage has also put women's health at risk and therefore the regional planning and policy concern is highly required in India. Lower the coverage lesser the inequality, and higher the coverage the highest inequality is seen in the JSY utilization.

Although the study had some limitations too. For instance, recent advancements and implementations under the JSY could not be analyzed as the data source used of 2015-16. However, the analysis provided a broad perspective regarding inequality in JSY coverage across districts of India.

Conclusion

The overall utilization of JSY services in India after the launch of programme in 2005 is 36 percent.The coverage of JSY highly varied across different regions, districts, and even socioeconomic groups. It was reflected that the coverage was concentrated in EAG states and among poor and illiterate women. There is a need to mobilize the resource and implement JSY in every district of the country so that every woman should get benefit from JSY. Though the JSY programme has been less known among families, for example, those who had have no mass media exposure, no education, lower-caste groups, and poorer households. Also, to counter social determinants of women health a need-based policy intervention is required. To make an effective the programme, the CHWs (community health workers) need to be trained and engaged for diffusing the information at the individual and household levels.

Declarations

Ethics approval and consent to participate: The data is freely available in public domain and survey agencies that conducted the field survey for the data collection have collected a prior consent from the respondent. Local ethics committee of International Institute for Population Sciences (IIPS), Mumbai, ruled that no formal ethics approval was required to carry out research from this data source.

Consent for publication: Not applicable

Availability of data and materials: The study utilises secondary source of data which is freely available in public domain through http://iipsindia.org.

Competing Interests: The authors declare that they have no competing interests.

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Author's Contribution: The concept was drafted by PSM; PK and SS contributed to the analysis design; PSM and SS advised on the paper and assisted in paper conceptualization; PSM, PK and SS contributed in the comprehensive writing of the article. All authors read and approved the final manuscript.

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Table-1. Socio-demographic profile of the study population in India, 2015-16	
Variables	N=148,185
	[n(weighted %)]
Received Janani SurakshaYojana	
No	84,520 (63.6)
Yes	63,665 (36.4)
Educational level	
No schooling	33,814 (21.6)
Educated	114,371 (78.4)
Caste	
Scheduled caste/scheduled tribe	51,896 (31.0)
Non-scheduled caste/scheduled tribe	90,060 (69.0)
Religion	
Hindu	111,810 (80.6)
Non-hindu	36,375 (19.4)
Wealth index	
Poor	59,298 (37.6)
Non-poor	88,887 (62.4)
Mass media exposure	
No exposure	29,725 (19.0)
Some exposure	118,460 (81.0)
Place of residence	
Urban	42,215 (33.1)
Rural	105,970 (66.9)

%: percentage; N: Sample

Table-2. Results from bivariate and logistic regression analysis for JSY utilizationby background factors in India, 2015-16		
Variables	JSY (%)	OR [95% C.I.]
Educational level		
No schooling	51.4	Ref.
Educated	32.3	0.80***(0.78 -0.82)
Caste		
Scheduled caste/scheduled tribe	44.3	Ref.
Non-scheduled caste/scheduled tribe	33.0	0.80***(0.78 -0.82)
Religion		
Hindu	37.9	Ref.
Non-hindu	29.9	0.75***(0.73 -0.77)
Wealth index		
Poor	53.2	Ref.
Non-poor	26.2	0.48***(0.47 -0.49)
Mass media exposure		
No exposure	54.4	Ref.
Some exposure	32.12	0.90***(0.87 -0.93)
Place of residence		
Urban	21.4	Ref.
Rural	43.8	1.56***(1.52 -1.6)

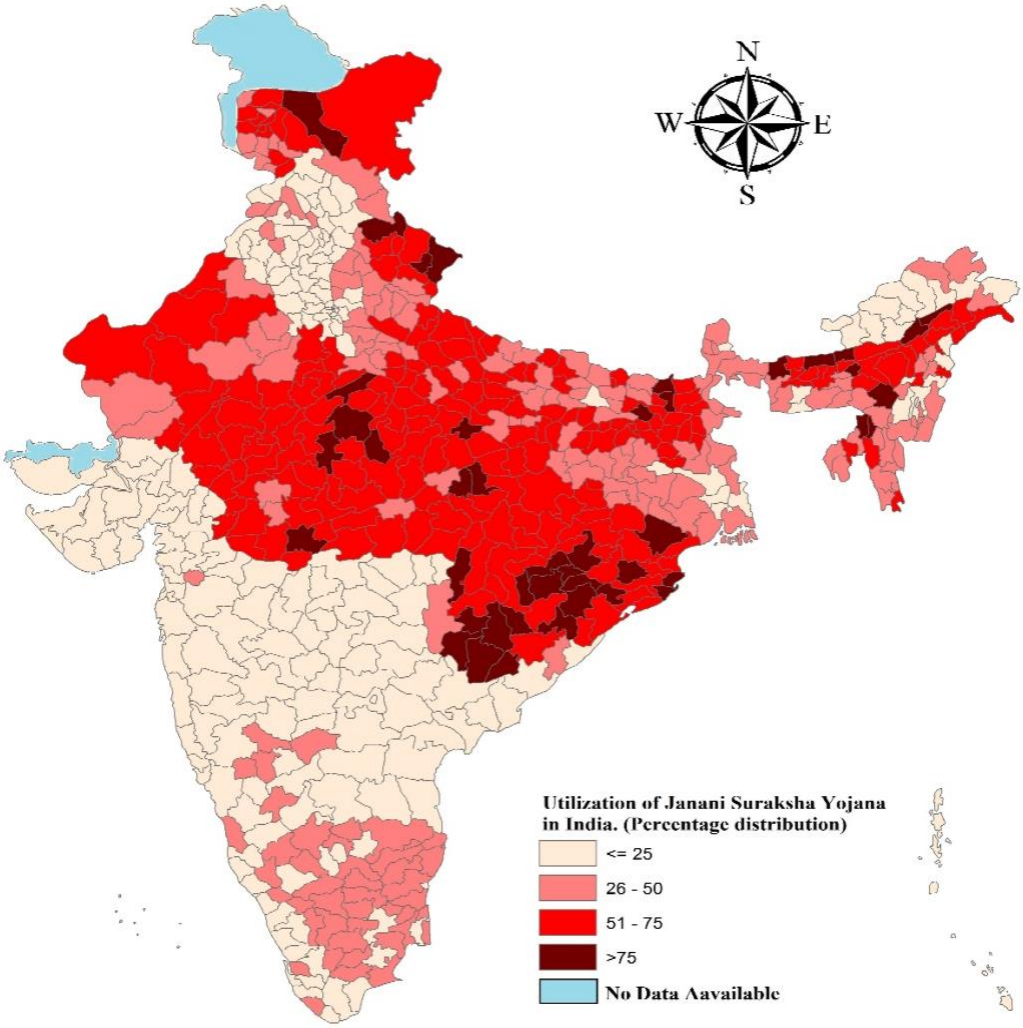
*JSY: JananiSurakshaYojana; OR: Odds Ratio; CI: Confidence Interval; ***if p<0.01; Ref: Reference; %: percentage*

Table-3 Univariate and Bivariate Moron's I Values for outcome and predictors in India, 2015-16		
Variables	**Univariate**	**Bivariate**
		Janani Suraksha Yojana
JananiSurakshaYojana (%)	0.71 (0.001)	-
No schooling (%)	0.71 (0.001)	0.35 (0.001)
Poor wealth quintile (%)	0.75 (0.001)	0.52 (0.001)
Rural place of residence (%)	0.41 (0.001)	0.31 (0.001)
Scheduled Caste/Scheduled Tribe(%)	0.60 (0.001)	0.06 (0.001)
Hindu (%)	0.74 (0.001)	0.11 (0.001)
No mass media exposure (%)	0.72 (0.001)	0.42 (0.001)

%: Percentage

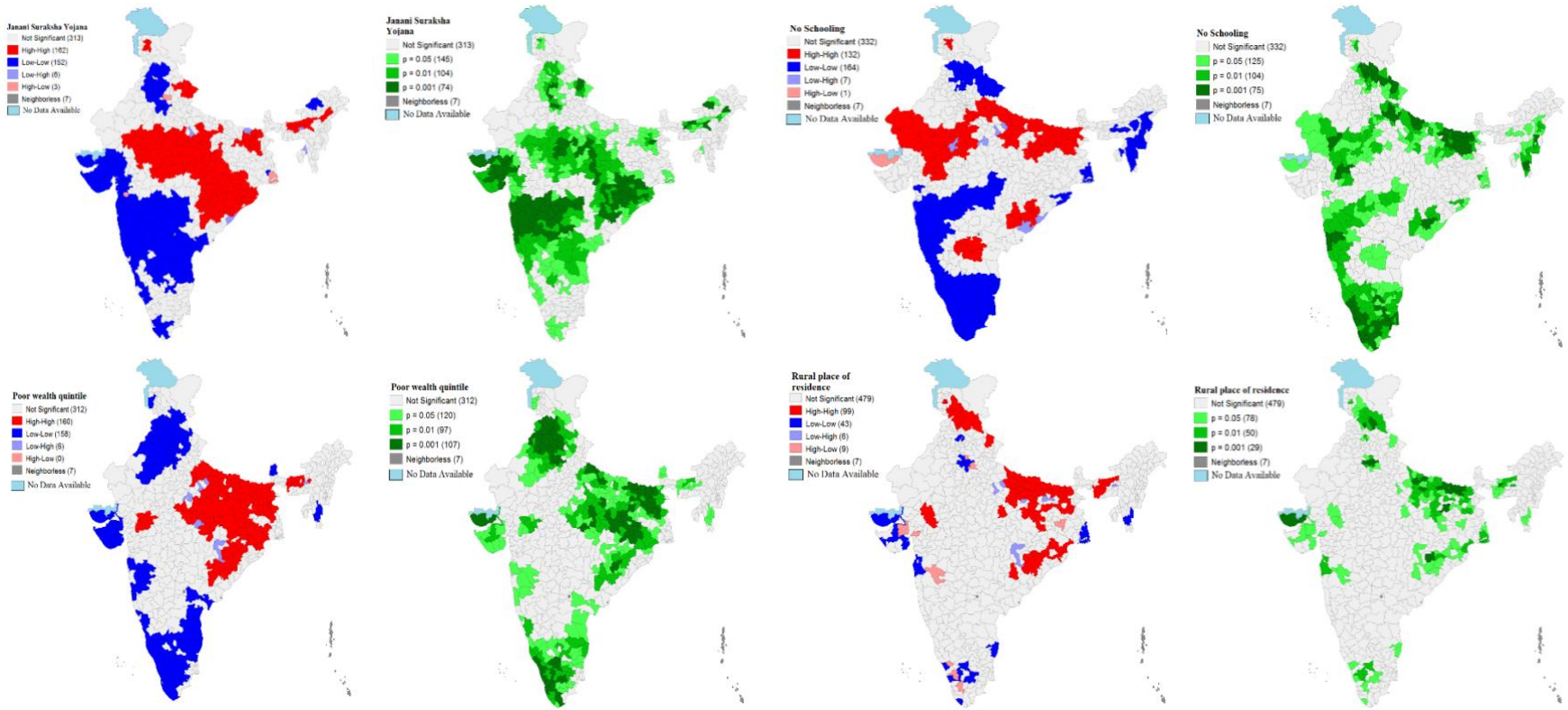
Table-4 Spatial regression model for estimating spatial association between JananiSurakshaYojana and background factors in India, 2015-16			
Variables	**OLS (p-value)**	**SLM (p-value)**	**SEM (p-value)**
No schooling (%)	0.169 (0.013)	0.128 (0.005)	0.232 (0.000)
Poor wealth quintile (%)	0.648 (0.000)	0.251 (0.000)	0.458 (0.000)
Rural place of residence (%)	0.100 (0.011)	0.087 (0.001)	0.030 (0.352)
Scheduled Caste/Scheduled Tribe(%)	-0.263 (0.414)	0.002 (0.940)	0.024 (0.468)
Hindu (%)	0.003 (0.913)	0.017 (0.372)	0.081 (0.011)
No mass media exposure (%)	-0.263 (0.003)	-0.157 (0.009)	-0.137 (0.069)
N (Sample)	640	640	640
Rho		0.710 (0.000)	
Lambda			0.810 (0.000)
AIC	5508.8	5096.2	5062.4
Adjusted R	0.450	0.752	0.773

AIC: Akaike information criterion; OLS: Ordinary least square; SLM: Spatial lag model; SEM: Spatial error model



Map-1 Percentage distribution ofJananiSurakshaYojana coverage among women in India.

Figure-1 UnivariateLocal Indicator of Spatial Association (LISA) (cluster and significance) maps for dependent and outcome variables for districts of India, 2015-16



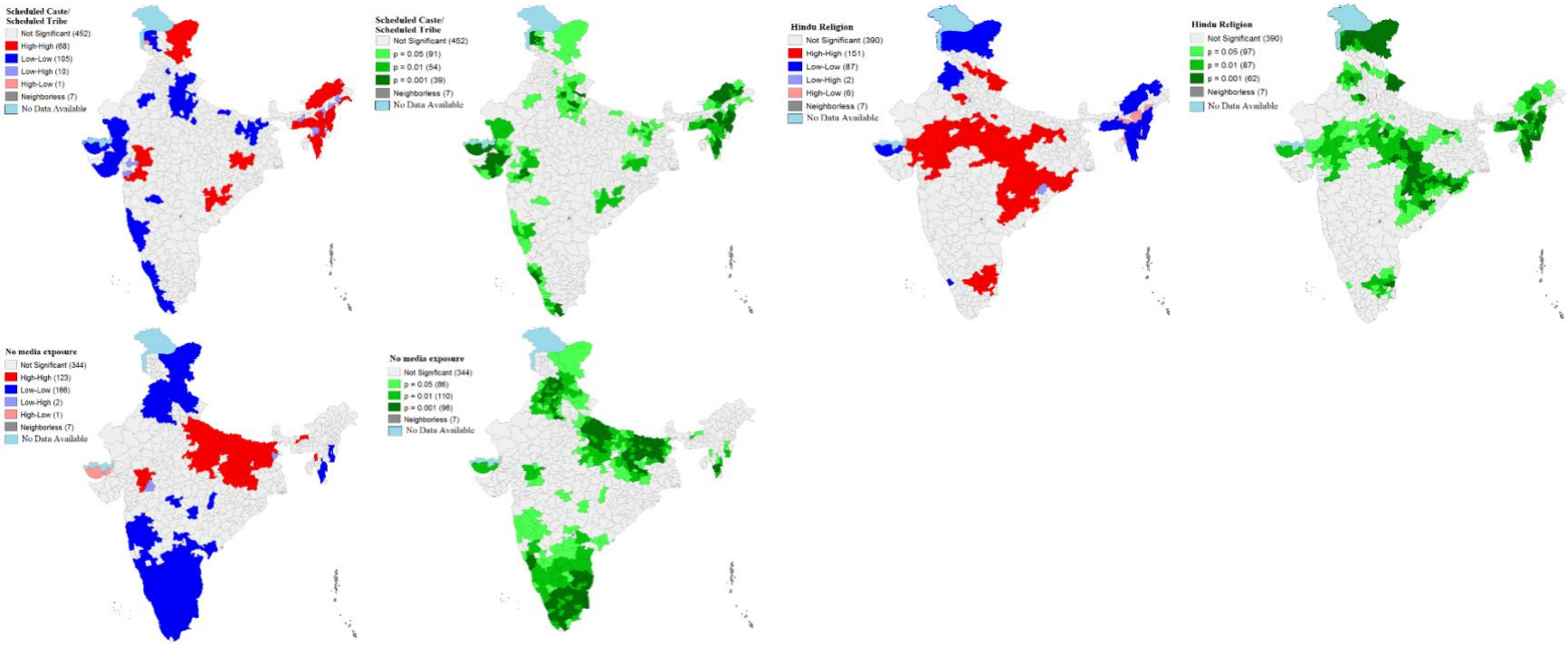
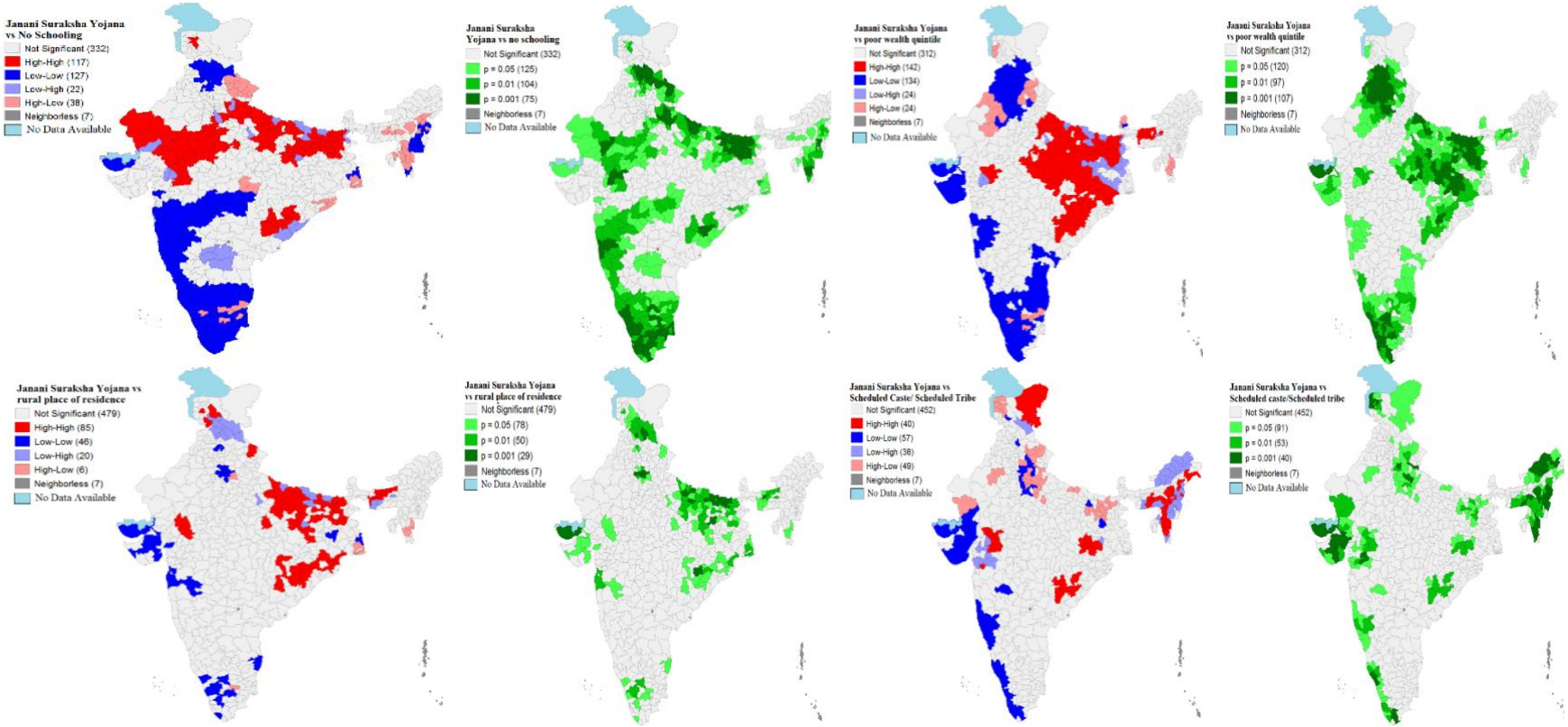
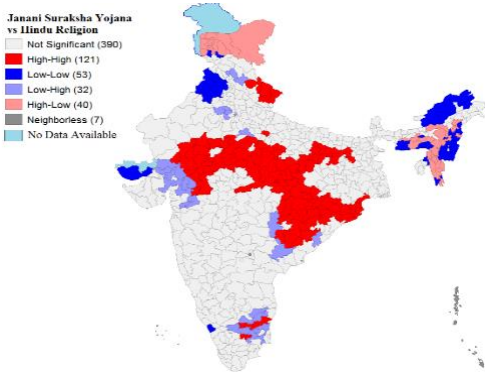
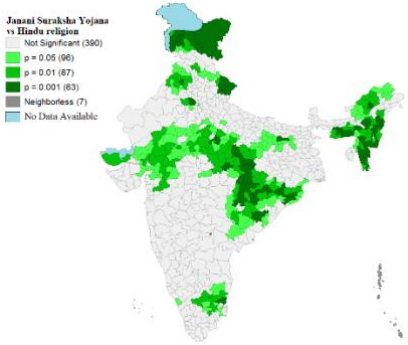
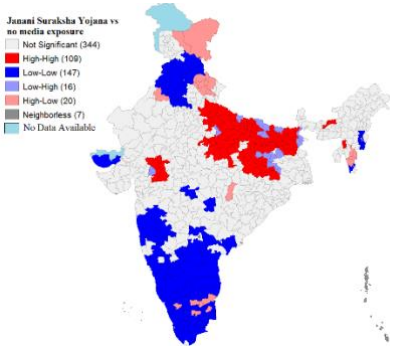

Scheduled Caste/ Scheduled Tribe
Not Significant (452)
High-High (68)
Low-Low (105)
Low-High (10)
High-Low (1)
Neighborless (7)
No Data Available
Scheduled Caste/ Scheduled Tribe
Not Significant (452)
p = 0.05 (91)
p = 0.01 (54)
p = 0.001 (39)
Neighborless (7)
No Data Available
Hindu Religion
Not Significant (390)
High-High (151)
Low-Low (87)
Low-High (2)
High-Low (6)
Neighborless (7)
No Data Available
Hindu Religion
Not Significant (390)
p = 0.05 (97)
p = 0.01 (87)
p = 0.001 (62)
Neighborless (7)
No Data Available
No media exposure
Not Significant (344)
High-High (123)
Low-Low (166)
Low-High (2)
High-Low (1)
Neighborless (7)
No Data Available
No media exposure
Not Significant (344)
p = 0.05 (86)
p = 0.01 (110)
p = 0.001 (96)
Neighborless (7)
No Data Available

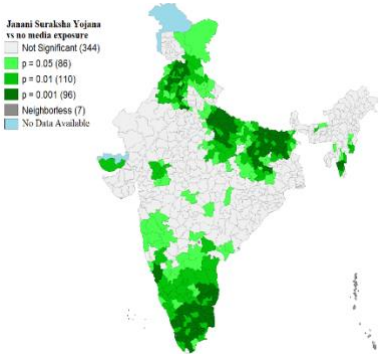
Figure-2 Bivariate Local Indicator of Spatial Association (BiLISA) (cluster and significance) maps for dependent vs outcome variables for districts of India, 2015-16




Janani Suraksha Yojana
vs Hindu Religion
Not Significant (390)
High-High (121)
Low-Low (53)
Low-High (32)
High-Low (40)
Neighborless (7)
No Data Available


Janani Suraksha Yojana
vs Hindu religion
Not Significant (390)
p = 0.05 (96)
p = 0.01 (87)
p = 0.001 (63)
Neighborless (7)
No Data Available


Janani Suraksha Yojana vs
no media exposure
Not Significant (344)
High-High (109)
Low-Low (147)
Low-High (16)
High-Low (20)
Neighborless (7)
No Data Available


Janani Suraksha Yojana
vs no media exposure
Not Significant (344)
p = 0.05 (86)
p = 0.01 (110)
p = 0.001 (96)
Neighborless (7)
No Data Available