# Public Expenditure: A Multiplicative Factor for Augmenting Institutional Delivery in Uttar Pradesh, India

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## Abstract

*The objective of the study was to evaluate the returns from investment incurred by government on Janani Suraksha Yojana (JSY) in Uttar Pradesh, India. The study has taken Eastern (21) and Western (22) U.P. for comparison on increase in institutional delivery under JSY. The study is statistically interpreted by using correlation and regression modelling for East and West U.P. one comprehensive model is also prepared for showing the status of whole Uttar Pradesh. The institutional delivery is a direct function of government investment. Family welfare centres are also associated component for increasing institutional delivery under JSY.*

**Keywords:** Government expenditure · Maternal Mortality ·Institutional delivery · Family Welfare Centre

## Introduction

Generally, a commodity or good is demanded for someone and supplied by someone. If this commodity is demanded by the public and supplied by the government, the equilibrium implies the point of welfare. Now, question is whether health is a commodity? If yes, then it is a public good or a private good? In economics, a public good is a good that is non-rival and non-excludable. Non-rivalry means that consumption of the good by one individual does not reduce availability of the good for consumption by others; and non-excludability that no one can be effectively excluded from using the good. In this reference, Health care should be treated as a public good. A govt. organized health care institution/centre does not exclude anyone to use its facilities and it also not affects someone else's consumption of the same facility. In a situation of less availability of this commodity and greater demand for the same commodity, the commodity becomes demand inelastic and therefore, prices go up. If the commodity is a public good then govt can make provision of subsidy for the purpose of decreasing prices and thus maintains the welfare equilibrium. Moreover, it is treated as a public good; the prices remain equal for all consumers. But the availability and accessibility becomes relevant for the same. Here the role of govt. becomes important as it can interfere to ensure its availability and accessibility to the poor people. Increasing government expenditure on health care facilities can improve the graph of health of the people. Health services are not an ordinary commodity but more like a "public good" which should be financed using a regulated public utility model. In this line, one of the key components of the National Rural Health Mission is to provide a trained female community health activist ASHA or (Accredited Social Health Activist), with every village in the country. Selected from the village itself and accountable to it, the ASHA will be trained to work as an interface between the community and the public health system. ASHA is a coordinator under the scheme of JSY (JananiSurakshaYojana). Janani Suraksha Yojana (JSY) is a safe motherhood intervention under the National Rural Health Mission (NRHM) being implemented with the objective of reducing maternal and neo-natal mortality by promoting

institutional delivery among the poor pregnant women. The success of the scheme would be determined by the increase in institutional delivery among the poor families with increased investment for the scheme.

## Objective

The major objective of the present study is to evaluate the returns from investment incurred by government on JSY in Uttar Pradesh. It is to see whether the expenditure has been resulting in increased Institutional delivery or not.

## Hypothesis

Institutional delivery is positively related with public expenditure on Janani Suraksha Yojana (JSY).

## Data Source and Methodology

Present study is based on district level secondary data. The data regarding expenditure and institutional delivery is collected from Directorate of Health and Family Welfare, Lucknow, Uttar Pradesh. Rest of the data has been taken from Statistical Abstract, Uttar Pradesh, 2009, prepared and published by Economics & Statistics Division, State Planning Institute, Uttar Pradesh and Census-2011(Provisional Population Totals-Uttar Pradesh, data Sheet). The proposed study has taken Eastern (21) and Western (22) U.P. for comparison of increase in institutional delivery under Janani Suraksha Yojana. The three years average expenditure and average achievement (institutional delivery) has been taken to study. The study is statistically interpreted by using correlation and regression modelling for East and West U.P., one comprehensive model is also prepared for showing the status of whole Uttar Pradesh.

The models related to examine the relationship between the return from investment incurred under JSY. The model is analyzed under the following points:

a) Estimate the parameters of models: $Y_i$ Institutional Delivery $= \alpha + \beta_1 exp + \beta_2 fwc + \mu_i$
b) Estimate the standard errors and t-values of $\beta_1$, $\beta_2$ and $\beta_3$.
c) Estimate the value of $r^2$.
d) Interpret the result.

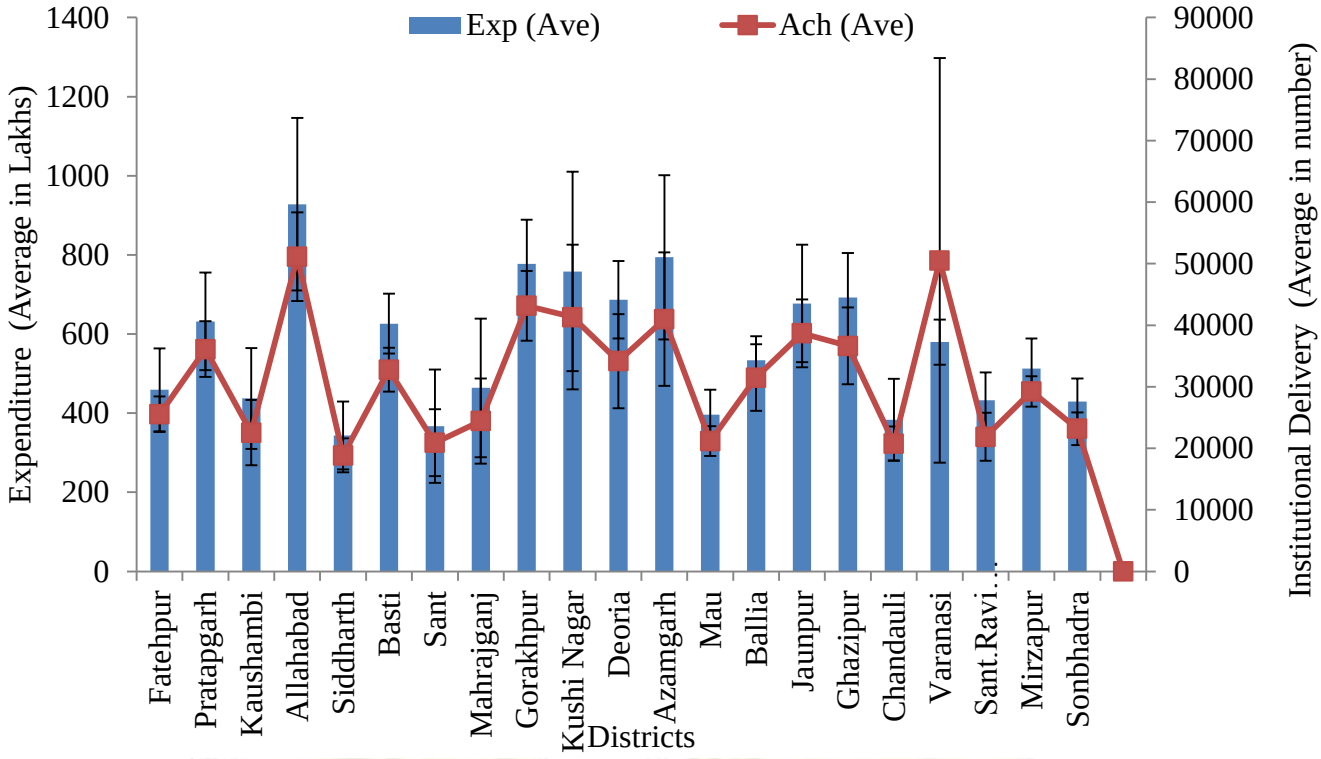
## Results

### Eastern Uttar Pradesh (21 Districts)

The whole Uttar Pradesh is divided into four regions namely Eastern, Western, Central and Bundelkhand regions. Eastern U.P consists of 21 districts while Western U.P. has 22 districts. Eastern U.P. is generally considered as backward region in comparison of western region. Both the regions are agriculture based but western region went ahead of Eastern U.P. while green revolution time period. Western U.P. is adjacent to NCR region therefore some parts of western regions are highly urbanized like G.B. Nagar and Ghaziabad

etc. From health point of views, Eastern U.P. is highly populated in some districts but the health condition of the people is poor. Poverty is found on high scale in this region.

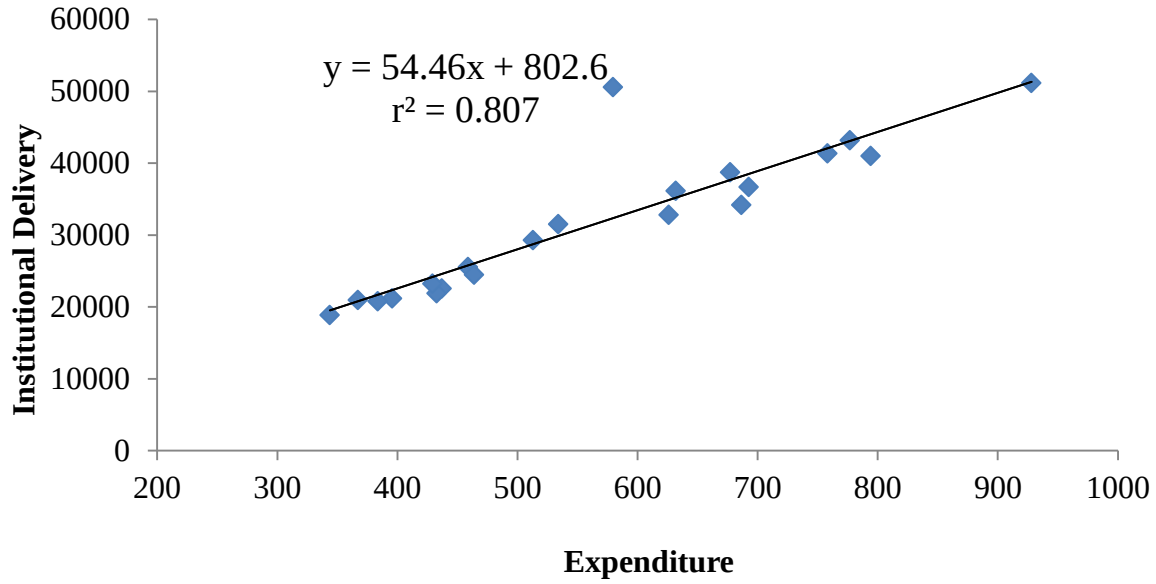
**Figure: 1**Expenditure and Institutional Delivery in Eastern U.P.




The Figure 1 is showing expenditure on left axis and achievement on right axis. The T is showing the variation in both the variables for a particular district. In almost districts, expenditure is greater than achievement or institutional delivery except one district i.e. Varanasi. The variation is highest in Varanasi district but achievement or institutional delivery is very high in comparison of expenditure incurred for the purpose. On contrary, Allahabad is showing great variation in its opposite. Here expenditure is much more than delivery. The target is not fulfilled as per the expectations. Azamagarh, Gorakhpur, Kushinagar etc. are coming in the line of Allahabad.

It is a linear correlation with direct relationship between expenditure and achievement (Figure 2). The $r^2$value of 0.80 (approx.) means that about 80% of the variation in institutional delivery is explained by expenditure on JSY. In this two variable case, $r^2$measures the goodness of fit of the regression equation that is it gives the proportion or percentage of the total variation in the dependent variable y explained by the explanatory variable x. Both the variables are positively correlated.

**Figure: 2 Correlation Analyses between Expenditure and Institutional Delivery in Eastern U.P.**




**Multiple Regression Analysis of Eastern Uttar Pradesh**

**Model 1.Institutional deliveries = f (Expenditure on Janani Suraksha Yojana, Total Family Welfare Centres)**

Multiple regression model is used here keeping as institutional delivery as dependent variable and expenditure on JSY and total family welfare centres as independent variables. Therefore, the regression model is as follows.

**In.del = $\beta_1$ +$\beta_2$exp + $\beta_3$fwc + $\mu_i$**

**4.764708 + 0.7884018 +0.1852002**

**se= (0.5560013) (0.1080971) (0.0636465)**

**T-value= (8.57) (7.29) (2.91)**

**$r^2$ = 0.9126**

Where,

**In.del**=Institutional deliveries (Average of 3 year 2008, 2009 and 2010)

**exp**= Expenditure on .Janani Suraksha Yojana (Average of 3 year 2008, 2009 and 2010)

**fwc=** Total Family Welfare Centres (2009)

**se**= standard error

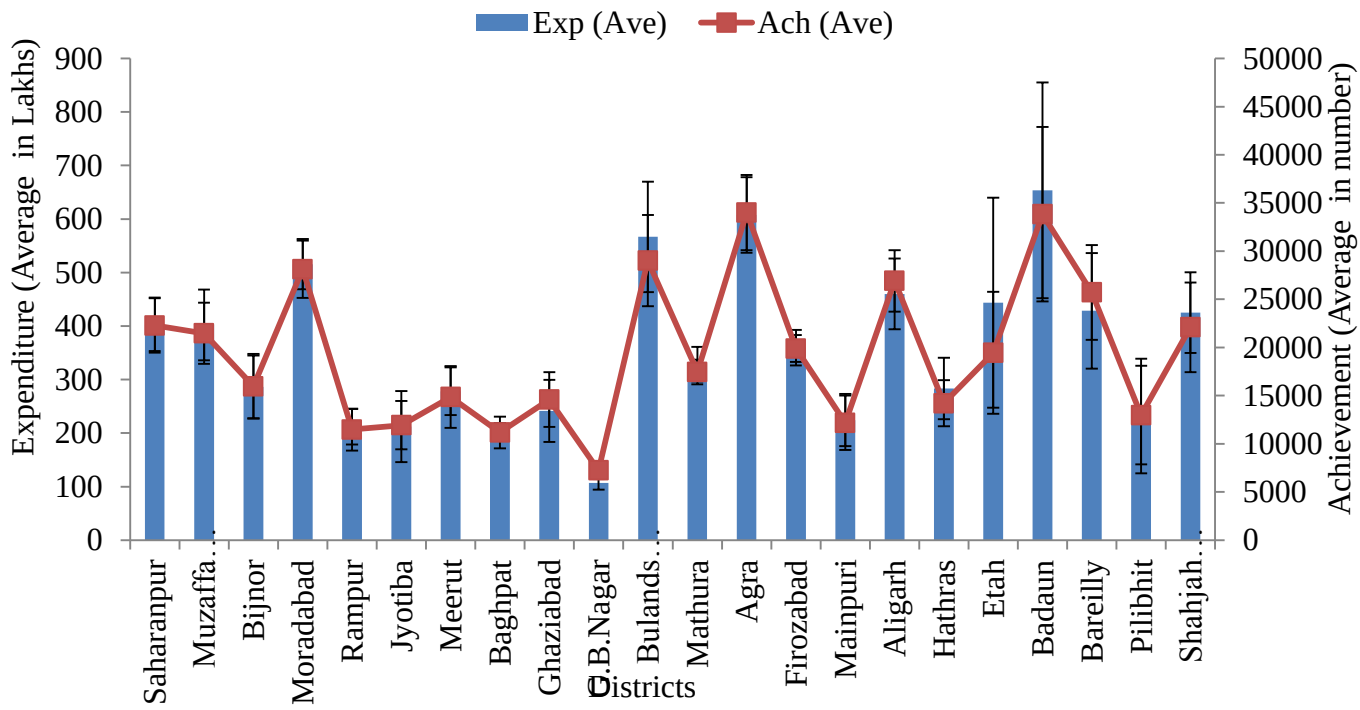
This model suggests that there exists a positive relation between institutional deliveries with **e**xpenditure on Janani Suraksha Yojana and family welfare centres. This is showing a strong relationship between the three variables. Coefficient 0.7884018 is the partial regression coefficient of expenditure on JSY and tells that with the influence of family welfare centre held constant, as expenditure increases, by a one percentage on average, institutional delivery goes up by 0.7884018 percent.

In other words, if the expenditure increases by one percent on average, the number of institutional delivery increases by about 78 percent. The coefficient 0.1852002 tells that holding the influence of expenditure on JSY constant, on average the institutional delivery goes up by about 18 percent. The intercept value 4.764708 means that if the value of expenditure and family welfare centre were fixed at zero, the mean institutional deliveries would be about 4 institutional deliveries. The $r^2$ value of 0.91means that about 91 percent of the variation in institutional delivery is explained by expenditure on JSY and FWC, a fairly high value considering that the maximum value of $r^2$ can at most be 1.

**Western Uttar Pradesh (22 Districts)**

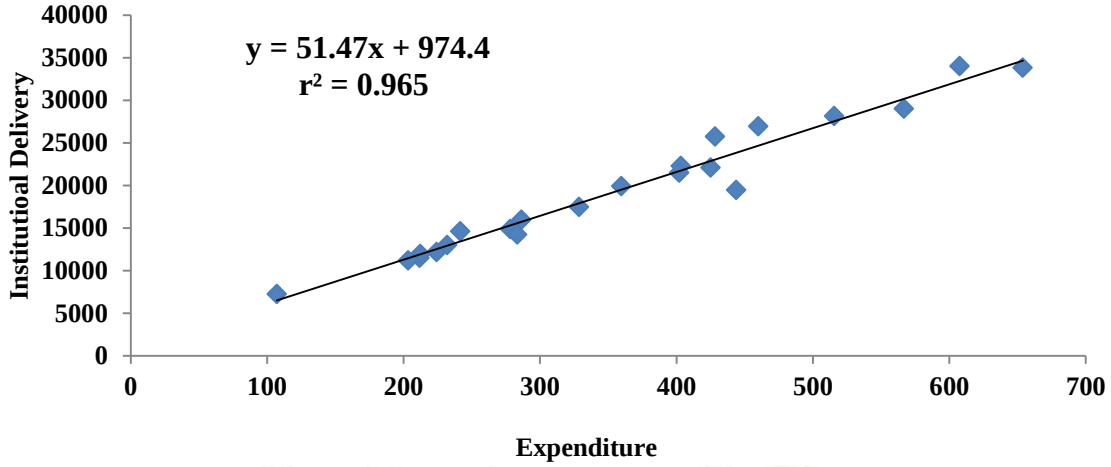
The Figure3 depicts the average expenditure on one axis and average achievement in the form of institutional delivery on another axis. The districts like Moradabad, Bulandshahar, Agra and Badaun are doing higher expenditure in comparison of other districts. The T is showing standard deviation from the equilibrium point. It is showing the variation between the two variables of expenditure and achievement. The same districts mentioned above are also showing variation on their part. But two type of variation is seen here. One is variation from expenditure to achievement and another is from achievement to expenditure. For example, in Etah, Bulandhshahar and Badaun, expenditure is greater than achievement. But in Bareli and Aligarh, the achievement is greater than expenditure, which is a good indicator.

**Figure: 3**Expenditure and Institutional Delivery in Western U.P.



Here, the line of correlation is depicting a linear and positive relationship between expenditure and institutional delivery under JSY (Figure 4). The $r^2$ value of 0.96means that about 96% of the variation in institutional delivery is explained by expenditure on JSY. Both the variables are highly correlated.

**Figure: 4** Correlation Analyses between Expenditure and Institutional Delivery in Western U.P.




**Multiple Regression Analysis of Western Uttar Pradesh (22 Districts)**

**Model 2.Institutional deliveries = f (Expenditure on Janani Suraksha Yojana, Total Family Welfare Centres)**

Multiple regression models are used here keeping as institutional delivery as dependent variable and expenditure on JSY and total family welfare centres as independent variables.

Therefore, the regression model is as follows-

$$\textbf{In.del} = \beta_1 + \beta_2 \textbf{exp} + \beta_3 \textbf{fwc} + \mu_i$$

$$4.692098 + 0.8324061 + 0.0914235$$

$$\textbf{Se= (0.2261444) (0.0584204) (0.0550953)}$$

$$\textbf{t- Value = (20.75) (14.25) (1.66)}$$

$$r^2 = 0.9733$$

Where,

**In.del**=Institutional deliveries (Average of 3 year 2008, 2009, 2010)

**exp**= Expenditure on .Janani Suraksha Yojana (Average of 3 year 2008, 2009, 2010)

**fwc=** Total Family Welfare centres (2009)

**se**= standard error.

This model suggests that there exists a positive relation between institutional deliveries with **e**xpenditure on Janani Suraksha Yojana and family welfare centres Western U.P, which reflects that increase of expenditure on Janani Suraksha Yojana by one percent would be increasing institutional deliveries by 83 percent and increase of Total Family Welfare Centres by one percent would be increase institutional deliveries by 9 percent. This is showing a strong relationship between the three variables.

Coefficient .8324 is the partial regression coefficient of expenditure on JSY and tells that with the influence of family welfare centre held constant, as expenditure increase, by a percentage on average; institutional delivery goes up by .8324percent. In other words, if the expenditure increases by one percent on average, the number of institutional delivery increases by about 83percent. The coefficient, .0914 tells that holding the influence of expenditure on JSY constant, on average the institutional delivery goes up by about 9 percent. The intercept value 4.2874 means that if the value of expenditure and FWC were fixed at zero, the mean institutional deliveries would be about 4 institutional deliveries. The $r^2$ value of 0.9733 means that about 97 percent of the variation in institutional delivery is explained by expenditure on JSY and FWC.A fairly high value considering that the maximum value of $r^2$ can at most be 1.

**Uttar Pradesh (70 Districts)**

**Model 3.Institutional deliveries = f (Expenditure on Janani Suraksha Yojana, Total Family Welfare Centres) 70 Districts of Uttar Pradesh.**

Multiple regression model is used here keeping as institutional delivery as dependent variable and expenditure on JSY and total family welfare centres as independent variables.

Therefore, the regression model is as follows.

$$\textbf{In.del} = \beta_1 + \beta_2 \textbf{exp} + \beta_3 \textbf{fwc} + \mu_i$$

$$\textbf{4.28747} + \textbf{0.9051038} + \textbf{0.0952392}$$

$$\textbf{se} = \textbf{(0.1335955)} \quad \textbf{(0.0285047)} \quad \textbf{(0.0268953)}$$

$$\textbf{T-value} = \textbf{(32.09)} \quad \textbf{(31.75)} \quad \textbf{(3.54)}$$

$$\textbf{r}^2 = \textbf{0.9689}$$

Where,

**In.del**=Institutional deliveries (Average of 3 year 2008, 2009 and 2010)

**exp**= Expenditure on Janani Suraksha Yojana (Average of 3 year 2008, 2009 and 2010)

**fwc=** Total Family Welfare centres (2009)

**se**= standard error.

This model suggests that there exists a positive relation between institutional deliveries with **e**xpenditure on Janani Suraksha Yojana and family welfare centres of Western U.P, which reflects that increase of expenditure on Janani Suraksha Yojana by one percent would be increasing institutional deliveries by 90 percent and increase of Total Family Welfare centres by one percent would be increase institutional deliveries by 9 percent. This is showing a strong relationship between the three variables. Coefficient 0.9051 is the partial

regression coefficient of exp on JSY and tells that with the influence of family welfare centre held constant, as exp increase, by a percentage on average; institutional delivery goes up by 0.9051percent. In other words, if the exp increases by one percent on average, the number of institutional delivery increases by about 90percent. The coefficient, 0.0952 tells that holding the influence of expenditure on JSY constant, on average the institutional delivery goes up by about 9 percent. The intercept value 4.2874 means that if the value of exp and family welfare centre were fixed at zero, the mean institutional deliveries would be about 4 institutional deliveries. The $r^2$ value of 0.9689means that about 96 percent of the variation in institutional delivery is explained by expenditure on JSY and FWC, a fairly high value considering that the maximum value of $r^2$ can at most be 1.

**Finding and Conclusion**

It is to summarize that institutional delivery is a direct function of government investment incurred on delivery related health facilities in government institutions. Family welfare centers are also associated component for increasing institutional delivery under Janani Suraksha Yojana. Now, it can be concluded here that Government expenditure is an effective instrument to scale up health care, especially in rural India. The inelastic demand for health care can be meet with improved supply side by investment on health infrastructure, modern equipments and institutions along with easy to access by everyone. The literacy is not directly related with better health of the people but may be used to make the people aware regarding their health. The awareness may also reduce the peak demand arisen by community ailment or epidemic. Maternal deaths can be effectively reduced by ensuring institutional delivery of the mother and it also diminishes neo-natal deaths. Institutional delivery, in turn, largely depends on the infrastructure and other medical facilities that can only be provided by the government for small and scattered villages of India. Hence, the role of state has become more important with such socio- economic environment, like unequal distribution of wealth, concentration of wealth, poor health infrastructure, less accessibility, more dependency on government facilities, excludability.

The value of $r^2$ (0.97) is higher in western U.P. in comparison of the value of $r^2$ (0.91) in Eastern U.P. This is suggesting that the expenditure incurred on JSY in Western U.P. is much more fruitful in increasing institutional delivery in Western U.P. and the expenditure incurred on JSY in Eastern U.P. is not that much productive in return. Hence, it is suggested that the government should take into consideration the ratio of existing health facilities in both the regions. The accessibility, affordability and quality of care may be the causes for less institutional delivery in Eastern region. More urbanization, more accessibility to the transport facility, better means for awareness may be contributing factors in western U.P. for increasing institutional delivery.

The most important factor that may exist for variation in both the regions is awareness. Looking at the other factors like literacy, female literacy, mode of transportation, accessibility to government. Institutions etc is high in western U.P. people are more aware about the socio-economic changes. Hence, the health care especially institutional delivery

with government expenditure is welcomed by the respondents. Thus, the hypothesis is proved thatInstitutional delivery is positively related with expenditure on JSY.

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