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Maternal Healthcare:  
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# IMPACT OF SOCIOECONOMIC FACTORS ON UTILISATION OF MATERNAL HEALTHCARE: EVIDENCE FROM KARNATAKA

Sampriti Bhattacharjee<sup>1</sup>, T K Anil Kumar<sup>2</sup> and Krishna Raj<sup>3</sup>

## Abstract

*Maternal morbidity and mortality rates are still high among different socio-economic groups and regions in India. Access and utilisation of maternal healthcare services drastically vary among these groups and various factors influence them. Against this backdrop, this study aims to determine the impact of socioeconomic factors on the utilisation of maternal healthcare in Karnataka and the administrative districts of Karnataka. This paper uses the recent data from Round five of the National Family Health Survey (NFHS-5) for Karnataka state. The regional analysis shows that amongst the four administrative divisions, Bangalore performed the best in this measure, followed by Mysore, Belgaum, and Kalaburagi. Wealth index and education emerged as the most significant predictors of utilisation of maternal healthcare services.*

**Keywords:** Maternal Health, Socioeconomic Factors, Antenatal Care, Postnatal Care, Institutional Delivery

## Background

High maternal mortality continues to plague the world. In 2020, the world lost around 800 mothers each day to preventable causes, amounting to a death every 2 minutes. According to the World Health Organization, around 2,87,000 women died during and following pregnancy in 2020, of which 95% of the deaths were recorded in low or lower-middle-income countries. The consequences of a mother's death are multi-faceted; they extend beyond the loss of an individual and substantially affect the future generations within the community. Several studies have found that children, whose mothers have poor health, are more likely to experience poor health themselves either through predispositions to ill health or through exposure to a less nurturing household environment (Propper *et al*, 2007; Khanam *et al*, 2009). Poor maternal health has implications on the birth weight of the child, neonatal survival, cognitive development, child behaviour, school performance and adult health and productivity. A mother's presence in a child's life is extremely crucial. Studies have found that the aggregated probability of children surviving to their 10th birthday was 24% for children whose mothers died while the effect of paternal death on child survival was negligible (Onarhelm *et al*, 2016).

Moreover, in 2019 a study done in the United States estimated that the impact of maternal morbidity on mothers and their children amounts to a total of \$32.3 billion. Three-quarters of these costs stem from long-term health issues associated with children born with developmental disorders,

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highlighting the extended burden of maternal health complications. This study also unveiled that maternal health issues not only limits a mother's productivity but also lead to substantial financial instability within the household. Over a five-year period, the loss in productivity due to maternal health issues could amount to \$6.6 billion in the United States (Committee, U. S. J. E. (2022, November 17)). Poor maternal health can devastate families through mechanisms such as poor mental health and overall well-being of the family members, increased medical costs, reduced productivity at work and unemployment. A study in China found that households with maternal death experienced an average of 32% reduction in annual income and 24.9% reduction of yearly expenditure compared to households that experienced childbirth with no adverse event. Furthermore, households experiencing maternal death witnessed their accumulated debt increase on average by 3.2 times compared to those without such losses (Wang *et al*, 2013).

Consequently, the UN SDG formed in 2015 has put forth an aim to "reduce the global Maternal Mortality Rate / MMR to less than 70 per 100,000 births, with no country having a maternal mortality rate of more than twice the global average" (*World Health Organization, 2023*). *Health agencies across the world have identified the underutilisation of maternal health services as the primary factor in maternal mortality in developing countries. Hence, we want to see what are the factors driving the low uptake of maternal health services in the state of Karnataka.*

## **State of Maternal Health and Utilisation of Maternal Healthcare in Karnataka**

Karnataka is a state in the southern part of India. It is situated on the western edge of the Deccan Plateau along with Maharashtra and Goa to its north, Tamil Nadu to its south, Andhra Pradesh to its east and the Arabian Sea to its west. The state is mainly divided into three parts – the coastal region, the western ghats, and the vast plains from the ghats to the east. Since, Karnataka is the seventh largest state in India, managing the entire state by one administrative section was cumbersome. Therefore, the state was divided into four administrative divisions namely – Belagavi, Kalaburagi, Mysuru and Bengaluru – to facilitate administrative ease in the state.

Despite making strides in reducing the number of maternal deaths in the state, Karnataka still falls behind its counterparts in South India. The magnitude of the problem is visible only when we see the actual number of maternal deaths in the State. As per the Karnataka Health and Family Welfare Department's statistics for the period April to September 2022, there were 4,14, 478 live births against which there were 291 maternal deaths that have been reported! (See Annexure 1) This would mean that another 300 women will die in the coming six months – as many as 600 women will die during the current financial year due to maternal health issues!

These deaths are not uniformly spread out across the districts in the state but are found to be clustered around select districts. While a substantial part of the deaths is recorded in Government Hospitals (58 per cent, source Karnataka HFW Department), nearly 14 per cent of the deaths happen in transit. Post-partum haemorrhage, pregnancy-induced Hypertension and Sepsis account for 66 per cent of the deaths in the current year. It is now an accepted fact that most of these deaths could have been avoided if proper maternal care had been made available.

The divergence in maternal deaths in Karnataka compared to all the other South Indian states can be attributed to the notable variance in the uptake of maternal health services between Karnataka and its neighbouring states. As much as 98 per cent of mothers in Kerala and 95 per cent of mothers in Tamil Nadu received antenatal care, whereas only 85 per cent of the mothers went for antenatal care in 1992. While 6 out of 10 women delivered their babies at home in Karnataka, only 3 out of 10 women did so in Tamil Nadu and 1 out of 10 women in Kerala, suggesting that women in Karnataka are about 30-35 per cent less likely to use maternal healthcare services compared to the other states in Southern India. (Navaneetham & Dharmalingam, 2001).

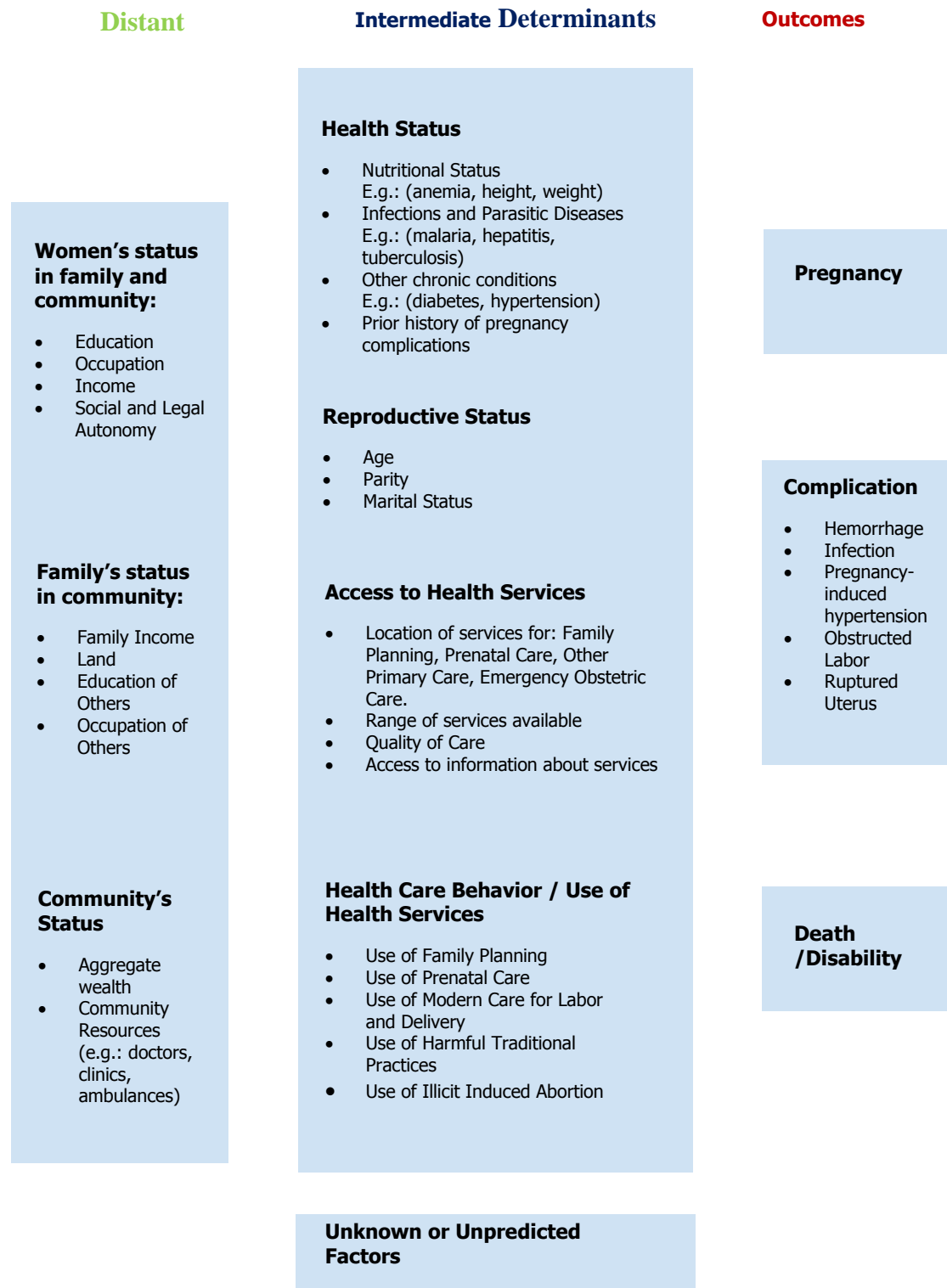
### **Socioeconomic Factors and Maternal Health**

There is common understanding that the causes of maternal deaths are a result of a mix of distant determinants, intermediate determinants, and unknown/unpredicted factors (McCarthy & Maine, 1992). Distant factors include women's status in family and community, family's status in the community and the status of the community. Intermediate determinants include the health status of the woman, her reproductive status, access to health services and her healthcare behaviour.

Some studies have attempted to arrive at a framework to address the issue of maternal morbidity. The focus is to identify the determinants of maternal morbidity arising out of childbirth and is depicted in the Figure below (McCarthy & Maine, 1992). The researchers have identified distant determinants and intermediate determinants that have an impact on the outcome of maternal morbidity. The framework provides a context within which the discussion on research on maternal mortality can take place. It helps us analyse in a spatial context as to which of the determinants has a greater bearing on morbidity which can help focus the efforts of policymakers to reduce MMR in the local context.

**Figure 1: Determinant of MMR**

**A detailed framework for analysing the determinants of mortality and morbidity**



It is evident that there are socio-economic factors, along with accessibility to health infrastructure, which determine the outcome of pregnancy. Given the host of factors that impact the outcome it is necessary to understand which factors lead to a high number of maternal deaths in a district, which in turn would enable us to bolster those parameters in the state to arrest the increase in maternal deaths in the future.

Therefore, this paper aims to study the impact of socioeconomic factors on maternal health services namely, antenatal services, postnatal services, and institutional delivery in Karnataka. There already exists a few studies based in Karnataka that has looked at the impact of socioeconomic factors but all those studies have very convoluted outcomes that do not converge with one another. In our study, we use the same maternal health indicators used in the other studies while engaging in a study period with the latest data that none of the studies have explored in the past. Along with that, no study till now has looked at the impact of socioeconomic factors on maternal health services in the different administrative districts of Karnataka. In this study, we have divided the state into four administrative districts – Bangalore, Belgaum, Kalaburagi, and Mysore and analysed the impact of socioeconomic factors on antenatal visits. It will enable us to identify which administrative districts are performing well and what are the key predictors explaining the variation in utilisation of antenatal services in each district.

## **Literature Review**

There exists a gamut of theoretical and empirical literature on the impact of socioeconomic factors on child health (Khadka *et al*, 2015), (Kristanto B, 1983), (Mahadevan *et al*, 1985), (Hobcraft *et al*, 1984), (Islam & Biswas, 2021), (Kumar *et al*, 2021), (Jewell *et al*, 2014), (Dallolio *et al*, 2012) but there is comparatively lesser research done on the impact of socioeconomic factors on maternal health. Out of the existing literature, indicators like mother's education, socioeconomic status, birth order, caste, religion, age of the mother at first pregnancy, and place of residence have garnered the most attention.

Studies from the USA (Gazmararian, Adams & Pamuk, 1996), Nigeria (Babalola & Fatusi, 2009), Southern India (Navaneetham & Dharmalingam, 2001), Karnataka (Bhatia & Cleland, 1995), Madhya Pradesh (Jat *et al*, 2011), Bangladesh (Chakraborty, 2003), Jordan (Obermeyer & Potter, 1991), Peru (Elo I.T., 1992), and Turkey (Celik & Hotchkiss, 2000) have found maternal education to be the most effective parameter to consistently explain any variation in the utilisation of maternal health services. Similarly, a study from Thailand (Raghupathy & Shobana, 1996) has witnessed a similar trend along with observing a curvilinear relationship between education and consumption of maternal health. The study highlighted that for some indicators of maternal health consumption, usage of maternal health services was initially increasing with educational attainment and then proceeded to decline beyond a certain education level. Overall, it found secondary education as the most consistent predictor of maternal health service.

The Wealth Index joins the ranks of education in being one of the most significant and consistent predictors of availing of maternal health services. It was positively associated with maternal service utilisation in countries like Nigeria (Babalola & Fatusi, 2009), Madhya Pradesh, (Jat *et al*, 2011) Turkey (Celik & Hotchkiss, 2000), and Thailand (Raghupathy & Shobana, 1996). Conversely, a study

from South India (*Navaneetham & Dharmalingam, 2001*) found the Wealth Index to have a significant positive relationship in Karnataka. However, it failed to replicate that relationship in one of its neighbouring states - Andhra Pradesh. A study in Jordan (*Obermeyer & Potter, 1991*) depicted a similar positive relationship between Wealth Index and consumption of maternal health service also, but it emphasised that a high level of Wealth Index is a predictor of greater use of care only if the respondent resided in an urban or rural area outside the capital city. Contrary to all these findings, the study done in Bangladesh (*Chakraborty, 2003*) did not find any association between Wealth Index and usage of maternal health services.

The same study from Bangladesh (*Chakraborty, 2003*) and Nigeria (*Babalola & Fatusi, 2009*) did not find any significant relationship between birth order and utilisation of maternal services as well. However, studies from Madhya Pradesh (*Jat et al, 2011*), Turkey (*Celik & Hotchkiss, 2000*), Peru (*Elo I.T., 1992*), Jordan (*Obermeyer & Potter, 1991*), Thailand (*Raghupathy & Shobana, 1996*), South India (*Raghupathy & Shobana, 1996*), and Karnataka (*Bhatia & Cleland, 1995*) witnessed birth order display a substantial negative relationship with maternal healthcare. Women are more likely to seek maternal healthcare services at their first pregnancy than for higher-order births.

The age of the mother at the first pregnancy (*Obermeyer & Potter, 1991*) has appeared to have a negative relationship with the usage of maternal health services only in Jordan (*Obermeyer & Potter, 1991*) and Thailand (*Raghupathy & Shobana, 1996*). Nigeria (*Babalola & Fatusi, 2009*) found a curvilinear relationship between age and usage of maternal services while countries like Turkey (*Celik & Hotchkiss, 2000*) and Bangladesh (*Chakraborty, N, 2003*) did not find any significance between the two.

Just like the age of the mother at first pregnancy, Nigeria (*Babalola & Fatusi, 2009*) and Peru (*Elo I.T., 1992*), did not find any significant relationship between religion/ethnicity and maternal health services. However, studies done in countries like Thailand (*Raghupathy & Shobana, 1996*) and Turkey (*Celik & Hotchkiss, 2000*) established a significant relationship between religion and the utilisation of healthcare. Similarly, studies done in South India (*Raghupathy & Shobana, 1996*), Karnataka (*Bhatia & Cleland, 1995*), and Madhya Pradesh (*Jat et al, 2011*) found religion and caste play a significant role in the consumption of maternal healthcare. The study in South India (*Raghupathy & Shobana, 1996*) found that being a part of the SC/ST community reduced the likelihood of using maternal health services.

Lastly, there has been quite a deliberation on the role of urban residence in the existing literature. Most studies found the urban residence to embody an increased likelihood of utilisation of maternal health. Studies done in India, in regions such as Madhya Pradesh (*Jat et al, 2011*) and Karnataka (*Bhatia & Cleland, 1995*), mirrored a similar result, while a study from South India (*Raghupathy & Shobana, 1996*) saw rural women have a greater likelihood of availing maternal healthcare.

In summary, the key inference from this literature review underscores the variance in the role of determinants from one geographic and social setting to another. This means that individual and household factors that affect maternal healthcare utilisation in one region or culture may not have the same impact in the other. It changes with geographical location, period, sampling design, etc.



## Objectives

1. Investigate factors that influence the use of maternal health services in Karnataka by using the data from NFHS-Round 5.
2. Compare the utilisation of maternal health services across the four administrative divisions and explore the primary factors influencing service use in each division.

## Methodology

### Data Source

This paper uses data from Round 5 of the National Family Health Survey (NFHS -5). This survey was conducted in 2019-2021. NFHS provides estimates of all key indicators at the district, state and national levels. The total sample size of NFHS-5 is approximately 6,10,000 households. The method of sample collection was distinct for rural and urban areas. In rural areas, the villages acted as the Primary Sampling Unit which was selected through Probability Proportional-to-Size method and then 22 households were selected through random sampling. For urban areas, Census Enumeration Blocks were chosen at the first stage and then 22 households were selected in each CEB through random sampling. Since this paper is based on the impact of socioeconomic determinants on the utilisation of maternal healthcare, we used the Birth Recode. The Birth Recode contains information on the full birth history of all the women interviewed, including information on pregnancy, and postnatal along with immunization, health and nutrition data for each child ever born to a mother in the last 5 years. There are a total of 1,274,250 births documented in the dataset. However, since we are just focusing on the state of Karnataka, we restricted our sample to a total of 49,252 births documented in this state. Moreover, to use of some variables that were not a part of the Birth Recode dataset, we merged this dataset with the household dataset, owing to which we lost around 305 observations. This leads to a sample size of 48,947 births in Karnataka.

### Empirical Strategy

Using the above dataset and variables, the estimated strategy employed is a Logistic Regression Model. This model has been set up using the equation below to understand the impact of socioeconomic factors on the utilisation of maternal healthcare.

The analysis is presented in two parts. In the first part, we use Logistic Regression Model to analyse the impact of socioeconomic factors on utilisation of maternal healthcare in Karnataka, India.

In the second part of the empirical framework, we focus on the four administrative divisions of Karnataka separately. For each of the administrative divisions, we run a logistic regression with antenatal care being the dependent variable.

### Empirical framework for Karnataka:

$$\text{Antenatal Visit} = \beta_0 + \beta_1 \text{Wealth Index} + \beta_2 \text{Caste} + \beta_3 \text{Religion} + \beta_4 \text{Education} + \beta_5 \text{Birth Order} + \beta_6 \text{Age at first pregnancy} + \beta_7 \text{Place of Residence} + u_i$$

$$\text{Postnatal Visit} = \beta_0 + \beta_1 \text{Wealth Index} + \beta_2 \text{Caste} + \beta_3 \text{Religion} + \beta_4 \text{Education} + \beta_5 \text{Birth Order} + \beta_6 \text{Age at first pregnancy} + \beta_7 \text{Place of Residence} + u_i$$

$$\text{Institutional Delivery} = \beta_0 + \beta_1 \text{Wealth Index} + \beta_2 \text{Caste} + \beta_3 \text{Religion} + \beta_4 \text{Education} + \beta_5 \text{Birth Order} + \beta_6 \text{Age at first pregnancy} + \beta_7 \text{Place of Residence} + u_i$$

**Empirical framework for each administrative division:**

$$\text{Antenatal Visit}_i = \beta_0 + \beta_1 \text{Wealth Index} + \beta_2 \text{Caste} + \beta_3 \text{Religion} + \beta_4 \text{Education} + \beta_5 \text{Birth Order} + \beta_6 \text{Age at first pregnancy} + \beta_7 \text{Place of Residence} + u_i$$

where i: Bangalore, Belgaum, Kalaburagi and Mysore

## Descriptive Statistics

**Measurement of dependent variables:**

**Antenatal visits:**

There is a variable in the National Family Health Survey (NFHS -5) dataset that has data on the total number of antenatal visits made by the respondents during their pregnancy. This variable ranges from 0 antenatal visits to 55 antenatal visits. As per WHO guidelines, a minimum of four antenatal visits should be received by the respondents during their pregnancy. Hence, we created a new binary variable that took the value 1 if the number of antenatal visits was more than or equal to 4 during pregnancy and took the value 0 otherwise.

**Postnatal visits:**

In the NFHS dataset, there is a binary variable that takes the value 1 if the respondent received any postnatal care and takes the value 0 otherwise.

**Institutional delivery:**

The dataset contains a variable that has information on the place of delivery of the respondent during pregnancy. The categories range from home to various health centres. A new binary variable was created that took the value 1 if the respondent delivered in any health centre and took the value 0 otherwise.

**Table 1: Descriptive Statistics – Part 1**

Variable	Obs	Mean	Std. Dev.	Min	Max
<b><u>DEPENDENT VARIABLES</u></b>					
Minimum four antenatal visit.	6334	.711	.453	0	1
Post Natal Visits	6182	.451	.498	0	1
Institutional Delivery	8299	.969	.172	0	1
<b><u>INDEPENDENT VARIABLES</u></b>					
<b>Wealth</b>	.	.	.	.	.
Poorest	48947	.093	.29	0	1
Poorer	48947	.225	.417	0	1
Middle	48947	.321	.467	0	1
Richer	48947	.25	.433	0	1
Richest	48947	.112	.315	0	1
<b>Caste</b>	.	.	.	.	.
Upper Caste	47130	.068	.252	0	1
SC	47130	.227	.419	0	1
ST	47130	.122	.328	0	1
OBC	47130	.582	.493	0	1
<b>Religion</b>	.	.	.	.	.
Hindu	48914	.852	.355	0	1
Muslim	48914	.134	.341	0	1
Christian	48914	.011	.102	0	1
Other	48914	.003	.059	0	1
<b>Education</b>	.	.	.	.	.
No Education	48947	.325	.468	0	1
Primary	48947	.141	.348	0	1
Secondary	48947	.474	.499	0	1
Higher	48947	.061	.239	0	1
<b>Birth Order</b>	48947	1.893	1.031	1	9
<b>Age of the mother at first pregnancy</b>	48947	19.902	3.856	8	47
<b>Residence</b>					
Urban	48947	0.274	0.446	0	1
Rural	48947	0.725	0.446	0	1

## Measurement of Independent Variables

### Wealth Index:

The Wealth Index is a compact measure of the socioeconomic status or living standard of the household and is integral in determining the health expenditure and expense on nutritional food. Using the principal component analysis, the data on selected household assets, house construction material, access to water and sanitation has been combined by the data providers to compute a single index which classifies the household under 5 categories - poorest, poorer, middle, richer, and the richest. Nearly 9.3 per cent of the mothers in Karnataka fall in the "Poorest Class", followed by 22.5 per cent in

“Poorer Class”, 32.1 per cent in “Richer class” and remaining 11.2 per cent in the “the Richest Class”. This variable is used as a proxy for the Wealth Index of the mother as well.

### **Education:**

Education is an important predictor of the utilisation of maternal health services. We expect to see a positive relationship between maternal education and the utilisation of maternal health care because an educated mother would be aware of the importance of going for antenatal checkups and postnatal checkups and would also understand the perils of denying an institutional delivery. Moreover, an educated mother would have a higher degree of autonomy in the household and would majorly rely on herself for decisions regarding her health (Acharya *et al*, 2010), (Jayne *et al*, 1997). In our sample, the variable education has been categorised into four groups – mothers with no education, primary education, secondary education, and higher secondary education. Around 47% of the births are to mothers with a secondary education followed by around 32.50% of births to mothers without formal education.

### **Religion:**

Religion influences the beliefs and practices of individuals to access healthcare services. A country like India hosts several religions with different beliefs and practices. Owing to these beliefs, some religious groups might discourage/encourage the consumption of maternal healthcare or assistance during childbirth. Some religions might have strict rules about modesty and gender segregation which, in turn, can act as a barrier for women to access healthcare services or feel comfortable interacting with healthcare providers. Hence, we predict that religion will create a differential in the utilisation of maternal health services. In our sample of Karnataka, there are mainly four categories of religions: Hindus accounting for 85.2 per cent, Muslims accounting for 13.4, Christians accounting for 1.1 per cent and other religions accounting for 0.3 per cent. This variable also serves as a proxy for the mother’s religion.

### **Caste:**

The caste system in India is the driving force in perpetuating severe disparity in the provision of health services across different communities (Adams *et al*, 2018). The caste system primarily operates through the mechanisms of social exclusion, marginalisation, and discriminatory practices, particularly untouchability, which consequently creates obstacles to equitable access to healthcare. (Krieger, 2012) Furthermore, compounding the resulting disadvantage are additional factors such as genetics, early environment, and opportunities associated with social mobility, exacerbate the prevailing disparities between various caste groups. (Mackenbach, 2010), Therefore, we wanted to look at the effect of caste on the utilisation of maternal healthcare in a region like Karnataka. In this sample, 6.8 per cent of the births are to women from the upper caste, 22.7 per cent are to women from the Schedule Caste, 12.2 per cent are to women from the Schedule Tribe, and the remaining 58.2 per cent are to women from Other Backward Castes. This variable also serves as a proxy for the mother’s caste.

**Birth Order:**

We predict that with an increase in birth order, the consumption of maternal health services would decrease. Women tend to engage in all routine check-ups mostly during their first pregnancy due to the perceived risk associated with first pregnancy (Ayele *et al*, 2014). Women with higher parity tend to have greater confidence and cumulative experience (Srivastava *et al*, 2014), which in turn reduces their inclination towards utilising the required maternal health services. Moreover, women with a higher number of children face several constraints concerning time and resources that tend to limit their utilisation of the services as well. (Chamileke, 2017). In this sample, the birth order ranges from 1 to 9 and the mean number of births per mother is 1.8

**Age of the mother at first pregnancy:**

As the age of the mother increases, the risks associated with pregnancy rises as well. Risks such as preeclampsia are seen to be very common among pregnancies beyond the age of 40. Along with that, other risks such as miscarriage, stillbirth and multiple pregnancies are common as women grow older. Consequently, we expect to see a positive association between age of the birth at first birth and uptake of maternal health services. In this sample, mothers have experienced their first pregnancy from the age of 8 to 40, with the mean age being 19 years.

**Place of Residence:**

Geographical barriers often contribute to the existing urban-rural divergence in the consumption of maternal health services. These barriers primarily manifest themselves through reduced access to health facilities, access to trained medical professionals, unavailability of transportation etc. While there exist robust ambulance services in Karnataka, however, these services are limited to institutional deliveries. For routine check-ups, women often need to hire private vehicles to reach the nearest health facility, which often gets expensive for women coming from rural areas. However, the government of Karnataka has introduced the Shakti scheme for women's empowerment by providing a free bus service for women which is highly beneficial for accessing healthcare facilities. Additionally, the barriers to seeking transport and care worsens further at night as nobody is available at night to transport women to a health facility in the case of an emergency (Vidler *et al*, 2016). In this sample, 27.4 per cent of the population resides in urban Karnataka and the remaining 72.5 per cent in rural areas. This variable is used as a proxy for the mother's place of residence.

**Table 2: Descriptive Statistics: Karnataka Divisions – 2**

Variables	Kalaburgi		Mysore		Bangalore		Balagavi	
	Obs	Mean	Obs	Mean	Obs	Mean	Obs	Mean
<b><u>Dependent Variables</u></b>								
Minimum four Antenatal Visit	1442	.847	1606	.662	1640	.591	1450	.774
Postnatal Check-up	1435	.532	1561	.398	1545	.354	1447	.554
Institutional Delivery	1782	.995	2201	.966	2306	.931	1740	.996
<b><u>Independent Variables</u></b>								
<b>Wealth</b>								
Poorest	11253	.03	12889	.13	12488	.168	10869	.031
Poorer	11253	.12	12889	.27	12488	.344	10869	.144
Middle	11253	.315	12889	.31	12488	.277	10869	.384
Richer	11253	.361	12889	.206	12488	.146	10869	.302
Richest	11253	.174	12889	.083	12488	.065	10869	.14
<b>Caste</b>								
Upper Caste	10913	.053	12437	.065	11855	.065	10497	.085
SC	10913	.233	12437	.203	11855	.257	10497	.212
ST	10913	.131	12437	.069	11855	.195	10497	.09
OBC	10913	.583	12437	.663	11855	.483	10497	.613
<b>Religion</b>								
Hindu	11253	.859	12878	.86	12469	.844	10868	.832
Muslim	11253	.133	12878	.127	12469	.144	10868	.143
Christian	11253	.007	12878	.004	12469	.011	10868	.023
Other	11253	.001	12878	.009	12469	.001	10868	.002
<b>Education</b>								
No Education	11253	.236	12889	.317	12488	.521	10869	.211
Primary	11253	.13	12889	.17	12488	.111	10869	.144
Secondary	11253	.561	12889	.465	12488	.329	10869	.558
Higher	11253	.072	12889	.049	12488	.04	10869	.087
<b>Birth Order</b>	11253	1.723	12889	1.967	12488	2.156	10869	1.694
<b>Age of the mother at first pregnancy</b>	11253	20.167	12889	19.676	12488	19.209	10869	20.697
<b>Residence</b>								
Urban	11253	0.309	12889	0.234	12488	0.250	10869	0.250
Rural	11253	0.690	12889	0.716	12488	0.750	10869	0.750

**Bangalore:**

In the Bangalore administrative district, the largest proportion of births falls within the “Richer Class” category, comprising 36.1% of all births recorded. Conversely, only 3 per cent of the births are of women from the “Poorest Class” in this district. With respect to maternal education, 56.1% of births are by women with secondary school education, and only 7.2% of births are by women with a higher secondary degree. Notably, Bangalore witnesses more births occurring among women with no

education than those with primary education. As much as 23.6 % of the births are by uneducated women, and only 13 per cent of them are by women who have completed primary school. By caste, 58.3 per cent of the births are by women classified as OBC, accounting for the largest share, followed by 23.3% of women belonging to the Schedule Caste, 13.1% to Schedule Tribe and 5.3% to Upper Caste. Furthermore, 85.9 % of the births are by Hindu mothers and 13.3% are by Muslim mothers in this administrative division. Finally, 69% of the population resides in the rural part of the administrative division while the remaining 30.9 per cent resides in urban areas.

#### **Belgaum:**

Like the Bangalore administrative district, the largest proportion of births in the Belgaum administrative district falls within the "Richer class "comprising 20.6% of all births. Conversely, 8.3% of all births are from the "Richest class "category, marking it to be the income category with the lowest proportion of births. Regarding to mothers' education, 46.5% of all births are by women with secondary school education while only 4.9% are by mothers with a higher secondary degree. Like Bangalore, Belgaum also witnesses more births by uneducated mothers than those with primary education, representing 31.7% and 17% of births respectively. As per caste, 66.3 % of all births are by mothers classified as OBC, followed by 20.3% by SC, 6.9 % by ST and 6.5% by Upper Castes. Moreover, 86% of all births are by Hindu mothers and 12.7% by Muslim mothers. Finally, 71.6% of the births occur in rural areas of this administrative division, while the remaining 23.4% is in urban settings.

#### **Kalaburagi:**

Unlike Bangalore and Belgaum, most of births in the Kalaburagi administrative district occur within the "Poorest class," representing 27.7% of all births. Conversely, 6.5% of all births are from the "Richest Class" category. For maternal education, 32.9% of all births are to mothers with secondary education, compared to just 4% to those with higher secondary education. Notably, the highest percentage of births—52.1%—are to mothers without schooling, while the lowest percent—11.1%—are to mothers who have completed only elementary school. In terms of caste demographics, 48.3% of all births are to mothers from Other Backward Classes, followed by 25.7% to Scheduled Tribes, 19.5% to Scheduled Castes and 6.5% to Upper Caste Furthermore, mothers who identify as Hindus account for 84% of births, with Muslims making up the remaining 14.4%. to Upper Caste women. Furthermore, 84% of births are to Hindu mothers, while 14.4% are to Muslim mothers. Like the state-wide trend, 75% of these births occur in rural regions, with the remaining 25% taking place in cities.

#### **Mysore:**

The largest proportion of the births belong to women in the "Middle class "in Mysore administrative district, accounting for 36.1% of all births. Conversely, only 3.1% of the births are from "Poorest class ". For maternal education, 55.8% of all births are to mothers with secondary education and 8.7% are to mothers with a higher secondary degree. Like Bangalore and Belgaum, in Mysore, a larger proportion of births are to uneducated mothers (21%) than those with primary education (14.4%). As per caste, 61.3% of all births are by mothers from Other Backward Classes, accounting for the largest share,

followed by 21.2% by Schedule Caste, 9% by Schedule Tribe and only 8% by Upper Caste women. In addition to that, 83.2% of the births are by Hindu mothers and 14.3% are by Muslim mothers. Finally, 75 per cent of the births occur in rural part of the administrative district, while the remaining 25 per cent takes place in urban areas.

## Results

**Table 3: Impact of Socioeconomic factors on utilisation of maternal healthcare in Karnataka**

	(1) Antenatal Visits (odds ratio)	(2) Postnatal Visit (odds ratio)	(3) Institutional Delivery (odds ratio)
<b>Wealth</b>			
Poorest	ref	ref	ref
Poorer	1.333*** (8.46)	1.153*** (4.08)	1.018 (0.32)
Middle	1.697*** (15.56)	1.350*** (8.75)	1.710*** (8.44)
Richer	2.182*** (21.47)	1.267*** (6.62)	4.743*** (15.19)
Richest	2.188*** (18.61)	1.049 (1.18)	1.930*** (5.48)
<b>Caste</b>			
Upper Caste	ref	ref	ref
SC	1.347*** (8.42)	0.965 (-1.08)	0.826** (-2.06)
ST	1.309*** (7.10)	0.849*** (-4.63)	0.951 (-0.51)
OBC	1.270*** (7.60)	0.897*** (-3.71)	1.186* (1.93)
<b>Religion</b>			
Hindu	ref	ref	ref
Muslim	1.083*** (2.90)	0.900*** (-4.19)	0.877* (-1.81)
Christian	0.925 (-0.83)	1.036 (0.42)	
Other	3.388*** (7.85)	0.512*** (-6.24)	
<b>Education</b>			
No Education	ref	ref	ref
Primary	1.191*** (4.61)	1.035 (0.91)	1.710*** (8.62)
Secondary	1.268*** (8.40)	1.096*** (3.26)	4.207*** (27.98)
Higher	1.250*** (6.06)	1.098*** (2.70)	5.834*** (13.93)



<b>Birth Order</b>	0.938*** (-6.90)	0.929*** (-8.41)	0.840*** (-9.54)
<b>Age of the mother at first pregnancy</b>	1.017*** (7.24)	1.011*** (5.18)	1.063*** (9.08)
<b>Residence</b>			
Urban	ref	ref	ref
Rural	1.195*** (8.96)	1.247*** (12.33)	0.652*** (-7.14)
Observations	6069	5924	7847
Mean of Dep. Variable	0.717	0.449	0.973
SD	0.451	0.497	0.162

Exponentiated coefficients; *t* statistics in parentheses, \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.0$

### Results from Table - 3:

Table 1 depicts odds ratio of logistic regression for the explanatory variables associated with utilisation of maternal health services.

#### Antenatal services:

In Karnataka, births from the Richest class have the highest odds of their mothers receiving antenatal services (aOR = 2.188,  $p < 0.01$ ), followed by births from the Richer class (aOR = 2.181,  $p < 0.001$ ), Middle class (aOR = 1.697,  $p < 0.001$ ), and Poorer classes (aOR = 1.334,  $p < 0.001$ ), compared to those from the Poorest class. Similarly, for births categorized as Muslim, the mothers of those births are associated with a higher likelihood of receiving antenatal services, with an odds ratio of 1.083 ( $p < 0.001$ ), which is 8.3% greater than for births categorised as Hindu. In the case of caste, for births categorised as Scheduled Caste reveal that their mothers have a 34.7% higher likelihood (aOR = 1.347,  $p < 0.01$ ) compared to births categorised under the Upper Caste. Moreover, mothers with secondary education have the highest odds of accessing antenatal services (aOR = 1.267,  $p < 0.01$ ). This is followed by mothers with higher secondary education (aOR = 1.249,  $p < 0.01$ ) and primary education (aOR = 1.19,  $p < 0.01$ ), compared to uneducated mothers. Additionally, the likelihood of a child's mother seeking antenatal services decreases with an increase in the birth order of the child. As the birth order of the child increases, the usage of the given service decreases by 6.2 per cent. Along with that, an increase in the age of the child's mother during her first pregnancy by a year increases the odds of her using antenatal services by 1.7%. Finally, births occurring in rural areas are associated with a 19.5% higher likelihood of mothers using antenatal services compared to those in urban areas.

#### Postnatal services:

Unlike antenatal services, births from the Middle class have the highest odds of their mothers using postnatal services (aOR = 1.349,  $p < 0.01$ ) and births from the Poorer class have lowest odds of their mothers using the given service (aOR = 1.1526,  $p < 0.01$ ), compared to the reference category. Contrary to antenatal services, for births categorized as Muslim, the mothers witness a 10% decrease in uptake of postnatal services, when compared to their Hindu counterparts. In the case of caste, for births categorised as Schedule Tribe and Other Backward Castes show that the likelihood of their mothers

seeking postnatal services decreases by 15 per cent and 10 per cent respectively, when compared to births categorised as Upper Caste. As per maternal education, mothers who have a higher secondary degree have the highest odds of availing postnatal services (aOR = 1.098,  $p < 0.01$ ), followed by infants with mothers having secondary education (aOR = 1.096,  $p < 0.01$ ). Just like antenatal services, an increase in birth order of the child, and the age of the mother at first pregnancy reduces the likelihood of the child's mother attending postnatal check-ups. The odds of consuming postnatal services for decreases by 7.1 per cent and with an increase in the age of the mother at her first pregnancy by a year, the odds of the child's mother going for the given services decreases by 1.1 per cent. Lastly, births occurring in rural areas are associated with a 24.7 per cent higher likelihood of the mothers using postnatal services than those in urban areas.

### **Institutional delivery:**

Births from the Richer Class have the highest odds of their mothers availing institutional delivery (aOR = 4.74,  $p < 0.01$ ), followed by the Richest class (aOR = 1.929,  $p < 0.01$ ) and Middle class (aOR = 1.71,  $p < 0.01$ ), when compared to the reference category. Just like postnatal services, for births categorized as Muslims the odds of their mother undergoing institutional delivery decreases by 12.3 % when compared to Hindus. Similarly, for births categorized as Scheduled Tribe, the odds of their mother delivering at a health facility are lower compared to the births categorized as Upper Caste (aOR = 0.826,  $p < 0.05$ ). Again, like postnatal visits, a mother with a higher secondary degree has the highest odds of delivering at an institution (aOR = 5.83,  $p < 0.01$ ) compared to ones with no education, followed by mothers with primary education (aOR = 1.71,  $p < 0.01$ ) and then secondary education (aOR = 1.437,  $p < 0.05$ ). Furthermore, the odds of a mother delivering at an institution decreases by 16 per cent with an increased birth order of the child. Along with that, as the age of the mother at her first pregnancy increases by a year, odds of the child's mother attaining the given service decreases by 7 per cent. Unlike antenatal services and postnatal visit, if the respondent resides in a rural area, the odds their mother delivering at a health institution decreases by 34.8 %.

**Table 4: Impact of socioeconomic factors on consumption of antenatal services in all four administrative districts of Karnataka**

	(1) Bangalore (Odds Ratio)	(2) Belgaum (Odds Ratio)	(3) Kalaburagi (Odds Ratio)	(4) Mysore (Odds Ratio)
<b>WEALTH</b>				
Poorest	ref	ref	ref	ref
Poorer	1.895*** (5.52)	1.041 (0.73)	1.295*** (4.89)	1.968*** (3.99)
Middle	3.520*** (11.97)	1.290*** (4.53)	1.144** (2.40)	1.355* (1.89)
Richer	4.667*** (15.04)	1.495*** (6.46)	1.412*** (5.17)	1.490** (2.43)
Richest	3.470*** (11.50)	1.893*** (7.93)	1.457*** (4.44)	2.174*** (4.47)

<b>CASTE</b>				
Upper Caste	ref	ref	ref	ref
SC	2.282*** (10.18)	1.281*** (3.56)	1.903*** (8.66)	0.825** (-2.06)
ST	2.079*** (9.12)	1.645*** (5.88)	1.847*** (8.14)	0.510*** (-6.49)
OBC	0.985 (-0.23)	1.798** (9.17)	2.106*** (10.83)	0.853** (-1.98)
<b>RELIGION</b>				
Hindu	ref	ref	ref	ref
Muslim	1.262***	1.095*	1.443***	0.617***
Christian		0.413* (-1.94)	1.187 (0.72)	0.268*** (-10.32)
Other		1.847*** (3.66)		
<b>EDUCATION</b>				
No Education	ref	ref	ref	ref
Primary	1.979*** (4.88)	0.992 (-0.12)	1.249*** (3.70)	0.651*** (-2.62)
Secondary	0.621*** (-5.34)	1.617*** (9.13)	0.933 (-1.60)	0.795 (-1.63)
Higher	0.685*** (-3.87)	1.774*** (7.70)	0.941 (-0.84)	0.726** (-2.15)
Birth Order	1.336*** (10.40)	0.910*** (-5.93)	0.980 (-1.31)	0.976 (-0.83)
Age of the mother at first pregnancy	1.034*** (6.43)	0.977*** (-5.30)	1.011** (2.06)	0.996 (-0.76)
<b>RESIDENCE</b>				
Urban	ref	ref	ref	ref
Rural	1.882*** (14.41)	1.282*** (6.57)	1.260*** (5.69)	0.672*** (-7.36)
Observations	1375	1552	1548	1389
Mean of Dep. Variable	0.806	0.667	0.591	0.797
SD	0.396	0.471	0.492	0.402

Exponentiated coefficients; *t* statistics in parentheses, \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

#### Results from Table – 4:

Births from the “Richest class” have the highest odds of their mothers seeking antenatal care in administrative districts such as Belgaum (aOR = 1.89,  $p < 0.01$ ), Kalaburagi (aOR = 1.45,  $p < 0.01$ ) and Mysore (aOR = 2.17,  $p < 0.01$ ) whereas, the births from the Richer class have the highest likelihood of their mothers using antenatal services in Bengaluru, with an odds ratio of 4.67 ( $p < 0.01$ ).

Furthermore, for births categorised as Other Backward Classes, their mothers are the most likely to avail antenatal checkups compared to the Upper Caste counterparts in administrative divisions

such as Belgaum (aOR = 1.79,  $p < 0.01$ ) and Kalaburagi (aOR = 2.106,  $p < 0.01$ ). Similarly for administrative divisions like Bangalore, Belgaum and Kalaburagi, the births categorised as Schedule Caste and Schedule Tribe, the odds of their mothers seeking antenatal care increases by (128.2, 107.9), (28.1, 64.5), (90.3, 84.7 )% respectively, when compared to their counterparts from Upper Caste. On the other hand, for births categorised as Schedule Caste (aOR = 0.825,  $p < 0.05$ ), Schedule Tribe (aOR = 0.05,  $p < 0.01$ ) and OBC (aOR = 0.853,  $p < 0.05$ ) the odds of their mothers attending antenatal check-up is lower compared to births belonging to Upper Caste.

Additionally, by religion, for births categorised as Muslim, the odds of their mothers seeking antenatal care in Mysore decreases by 38.3% when compared to Hindus. Whereas, for births that are categorised as Muslim and are from Bangalore (aOR = 1.26,  $p < 0.01$ ), Belgaum (aOR = 1.09,  $p < 0.10$ ) and Kalaburagi (aOR = 1.44,  $p < 0.01$ ) have the highest odds of their mothers availing antenatal services.

When it comes to maternal education, women with primary education in Bangalore are more likely to avail antenatal checkups with an odds ratio of 1.977, while women with secondary (aOR = 1.609,  $p < 0.01$ ) and higher secondary (aOR = 1.459,  $p < 0.01$ ) education embody lesser likelihood of seeking antenatal care compared to women with no education. In Belgaum, women with higher secondary education have the highest odds of seeking antenatal care (aOR = 1.77,  $p < 0.01$ ), followed by women with secondary education (aOR = 1.61,  $p < 0.01$ ), when compared to women with no education. Much like Bangalore, women with primary education in Kalaburagi, have the highest odds of seeking antenatal care (aOR = 1.248,  $p < 0.01$  ). In Mysore, the odds of women with primary and higher secondary education attending antenatal services decreases by 34.9 per cent and 20.5 per cent respectively, when compared to women with no education.

Moreover, in Belgaum an increase in the birth order by one unit, decreases the odds of a mother availing the given service by 9.9 per cent whereas, in Bangalore it increases by 33.6 per cent. Similarly, as the age of the mother at first birth increases by one year, the odds of the mother using antenatal services increases by 3.37 per cent and 1.1 per cent in Bangalore and Kalaburagi, while it decreases by 2.3 per cent in Belgaum.

Finally, for births occurring in rural areas of Bangalore (aOR = 1.88,  $p < 0.01$ ), Belgaum (aOR = 1.28,  $p < 0.01$ ) and Kalaburagi (aOR = 1.26,  $p < 0.01$  ) witness the highest odds of their mothers attending antenatal checkups compared to their urban counterparts, whereas for the births occurring in rural areas of Mysuru, the odds of a mother seeking antenatal services decreases by 32.8 per cent.

## Discussion

Almost 85% of the times mothers in Bangalore division of the administrative districts received four or more antenatal services. Mothers in the Mysore division, on the other hand, used these services only 77% of the time. Regrettably, only 66% of the time in Belgaum and 59% of the time in Kalaburagi, mothers receive the same level of antenatal care.

**Wealth Index:** The Wealth Index shows a consistent and significant association with the usage of all three maternal health services, namely antenatal care, postnatal care, and institutional delivery. With

the increase in wealth, the likelihood of their mother availing all three maternal care services increases as well. This relationship is the same in Karnataka and all the administrative districts of Karnataka and is also consistent with the existing literature. All studies from Nigeria, Thailand, Turkey, Southern India, and Karnataka collectively attest to this finding.

**Education:** Education has exhibited a positive relationship with the usage of all three maternal health services in Karnataka, i.e, it is consistent with the studies done in the USA, Nigeria, Southern India, Karnataka, Madhya Pradesh, Bangladesh, Jordan, Peru, and Turkey. When we dig deeper and investigate the impact of socioeconomic factors on antenatal visits in the four administrative divisions of Karnataka, we found administrative divisions such as Belgaum and Kalaburagi's results are consistent with the association found in Karnataka. However, administrative districts such as Bangalore and Mysore do not demonstrate the same positive relationship. In Bangalore, mothers with primary education are more likely to go for antenatal visits compared to mothers with no education but mothers who have studied further than primary school are less likely to seek antenatal care. Similarly, Mysore demonstrates a negative linear relationship with seeking antenatal care. These results are aligned with a study done in Thailand (*Raghupathy & Shobana, 1996*). In Thailand, they found that the educational advantages of primary, secondary, and higher respondents are very subdued for TT inoculations. Women with higher education did not significantly differ from illiterate women in this measure. To investigate these results further, we have tested for the effects of interaction between education and current place of residence. This will enable us to see how the effects of schooling vary across rural and urban residences. The interaction between education and place of residence highlighted that in urban Bangalore, mothers with primary education are more likely to go for antenatal visits, and in rural Bangalore, there is a negative relationship between schooling and antenatal visits. In Mysore, the effect of schooling on antenatal visits is insignificant in urban areas and negative in rural areas. This implies that rural residence mars the positive effect of schooling on antenatal visits and it is the results from the urban residence that is driving the relationship seen on the state level.

**Caste:** In Karnataka, for births categorised as SC/ST, and OBC, the odds of their mothers seeking antenatal care is the highest but for postnatal and institutional services, it is the upper caste that takes the lead. Within administrative districts, births that belong to SC/ST and OBC, have the highest likelihood of their mothers seeking antenatal care in three of the four administrative divisions: Bangalore, Belgaum, and Kalaburagi. In Mysore on the other hand, mothers of births categorised as SC/ST and OBC, are least likely to avail antenatal services. Studies from South India (*Raghupathy & Shobana, 1996*) and Madhya Pradesh (*Jat et al, 2011*) attest to the finding in Mysore, wherein they found that women belonging to SC/ST community were less likely to receive maternal healthcare.

**Religion:** In Karnataka, mothers of births categorised as Muslim are more likely to avail of antenatal services but are less likely to deliver at an institution during pregnancy. Again, studies from Madhya Pradesh (*Jat et al, 2011*) and Karnataka (*Bhatia & Cleland, 1995*) had similar findings where women belonging to the Hindu religion were least likely to seek maternal health services. A plausible reason

quoted in a study in Karnataka is that upper-caste Hindus usually stay at home and Hindus belonging to lower castes are mostly engaged in agricultural labour and do not have the time to go for antenatal visits. Since the participation of Muslim women is relatively weaker, it is easier for them to seek antenatal care. These results maintain its direction in three out of the four administrative districts. Only in Mysore, for births categorised as Hindu, the odds of their mothers seeking antenatal services is higher than their counterparts in other religions.

**Birth order:** Birth order in most of the studies has been seen to be a significant predictor and showcases a negative relationship with the availing of maternal health services. As with other studies, even in Karnataka, an increase in birth order reduces the likelihood of using maternal health services. This remains the case in all the administrative districts except Bangalore. In Bangalore, women with a higher parity are most likely to seek antenatal services.

**Age of the mother at their first pregnancy:** Higher the age of the mother at their first pregnancy, the higher is the likelihood of them seeking medical care in Karnataka. This trend persists in administrative districts such as Belgaum and Kalaburagi. This relationship exists in a Peru (*Elo I.T., 1992*) study where older women seem more likely to seek maternal health care services than younger women. However, administrative districts such as Belgaum and Mysore showcase a negative relationship, much like the studies done in Madhya Pradesh (*Jat et al, 2011*), Thailand (*Raghupathy & Shobana, 1996*), and Jordan (*Obermeyer & Potter, 1991*)

**Place of residence:** In this study, for births occurring in rural areas of Karnataka, the odds of their mothers using antenatal and postnatal services are higher compared to their urban counterparts, but the trend reverses in the case of institutional delivery. Rural women are less likely to deliver in health institutions compared to urban women. Among the administrative districts, all three administrative districts except Mysore demonstrate a higher likelihood for mothers in rural areas to utilise antenatal services. This outcome is primarily driven by the multipurpose workers in rural India: ASHA workers and the mid-wives (Dai). To establish the prominence of the multipurpose workers contributing to the relationship between place of residence and consumption of maternal health care services, we have run a regression analysis wherein the dependent variable is restricted to the antenatal and postnatal check-ups done in a medical institution because the rest of the check-ups done at home or any other places are by the multipurpose workers. In this regression, mothers in urban areas emerged as the ones with a higher likelihood of seeking maternal health services. This underscores the role played by the multipurpose workers and their significance in ensuring that rural women are more likely to receive antenatal and postnatal services compared to their urban counterparts.

## Conclusion

This study has comprehensively analysed the disparities in the utilisation of antenatal services across different socioeconomic groups within Karnataka, using the robust dataset provided by NFHS-5. We found that wealth and maternal education are critical predictors of antenatal care access, with wealthier

and more educated mothers significantly more likely to utilise these services. Notably, the disparities are pronounced in rural areas and among populations belonging to lower caste groups, such as SC/ST and OBC, particularly in districts like Mysore and Kalaburagi.

Antenatal service uptake is highest in Bangalore among administrative divisions, which may be a sign of a stronger healthcare system or increased health consciousness in the area. On the other hand, the Wealth Index has shown itself to be a strong predictor in every category, highlighting the significant impact of financial standing on the ability to obtain maternity healthcare services.

State wide, there is a positive correlation between education and the use of maternal healthcare services. However, in Bangalore, there is a noteworthy pattern wherein the use of these services is negatively impacted by education beyond primary school. This unexpected result raises the possibility that better health service utilisation is not always correlated with higher educational attainment, particularly when combined with rural residency. The otherwise beneficial effect of education on obtaining prenatal care is mitigated by the interaction between education level and rural location.

Fascinatingly, with the exception of Mysuru, rural areas in the state tend to use antenatal services more frequently than urban areas, mainly due to the efficient involvement of ASHA workers. These community health workers are essential in closing the gap in rural areas' access to healthcare. They are currently underpaid and overworked, though, which highlights a crucial area for government intervention. Access to maternal healthcare could be greatly improved by bolstering support for ASHA workers, especially in rural areas. Furthermore, since current transport schemes primarily concentrate on delivery services, addressing the lack of transport for prenatal and postnatal visits could further improve access to healthcare. Moreover, the government could create incentives to improve prenatal care availability across the country. The distribution of Madilu Kits for institutional deliveries is a noteworthy illustration of an effective incentive programme. According to qualitative surveys, health workers in rural facilities saw a notable decline in home deliveries due to the Madilu Kit's allure. They underlined how women are encouraged to choose institutional deliveries by the government's financial incentives and material benefits like the Madilu Kit (Vidlet, *et al*, 2016). This highlights the possibility of using comparable incentives to increase prenatal and postnatal service attendance, indicating a workable plan for government intervention.

In addition, the mother's age at her first pregnancy and the order of birth are important indicators of her ability to access healthcare. Proposals to lower the birth rate and raise the age of first pregnancy could be useful tools for enhancing health outcomes in Karnataka. We suggest that the government and pertinent parties step up their support for ASHA employees in light of these findings and increase the availability of transport services for all maternal health visits, not just deliveries. The government should pay special attention to specific difficulties associated with living in a rural area and must invest in devising innovative incentives for mothers to increase their uptake of maternal health services such as antenatal, postnatal and institutional deliveries.

## References

- Acharya, D R, Bell, J S, Simkhada, P, van Teijlingen, E R and Regmi, P R (2010). Women's Autonomy in Household Decision-making: A Demographic Study in Nepal. *Reproductive Health*, 7 (1), Article 15. <https://doi.org/10.1186/1742-4755-7-15>
- Adams, N L, Lawn, J E and Kirby, A E (2017). Socioeconomic Status and Infectious Intestinal Disease in the Community: A Longitudinal Study (IID2 Study). *European Journal of Public Health*, 28 (1): 134-38. Socioeconomic status and infectious intestinal disease in the community: a longitudinal study (IID2 study) | European Journal of Public Health | Oxford Academic
- American College of Obstetricians and Gynecologists (n.d.). Having a Baby After Age 35: How Aging Affects Fertility and Pregnancy. ACOG. <https://www.acog.org/womens-health/faqs/having-a-baby-after-age-35-how-aging-affects-fertility-and-pregnancy>
- Author not provided (2012). Economic Impact of Maternal Death on Households in Rural China: A Prospective Cohort Study. *Journal of Obstetrics and Gynaecology Canada*, 34 (10): 960-967. [https://doi.org/10.1016/s1701-2163\(16\)35450-7](https://doi.org/10.1016/s1701-2163(16)35450-7)
- Ayele, D Z, *et al* (2014). Factors Affecting Utilization of Maternal Health Care Services in Kombolcha District, Eastern Hararghe Zone, Oromia Regional State, Eastern Ethiopia. *International Scholarly Research Notices*, 1–7. <https://doi.org/10.1155/2014/917058>
- Babalola, S and Fatusi, A (2009). Determinants of Use of Maternal Health Services in Nigeria: Looking Beyond Individual and Household Factors. *BMC Pregnancy and Childbirth*, 9 (1): 43. <https://doi.org/10.1186/1471-2393-9-43>
- Bhatia, J C and Cleland, J (1995). Determinants of Maternal Care in a Region of South India. *Health Transition Review*, 5 (2): 127-42. Retrieved from <http://www.jstor.org/stable/40652193>
- Celik, Y and Hotchkiss, D R (2000). The Socio-economic Determinants of Maternal Health Care Utilisation in Turkey. *Social Science & Medicine*, 50 (12): 1797–1806. [https://doi.org/10.1016/s0277-9536\(99\)00418-9](https://doi.org/10.1016/s0277-9536(99)00418-9)
- Chakraborty, N (2003). Determinants of the Use of Maternal Health Services in Rural Bangladesh. *Health Promotion International*, 18 (4): 327-37. <https://doi.org/10.1093/heapro/dag414>
- Chamileke, N (2017). Socio Demographic Determinants of Maternal Health Service Utilisation among Women 15 to 49 years in Zambezi District in Northwestern Zambia. *Medical Journal of Zambia*, 44 (3): 149-56. <https://doi.org/10.55320/mjz.44.3.76>
- Dallolio, L, *et al* (2012). Socio-economic Factors Associated with Infant Mortality in Italy: An Ecological Study. *International Journal for Equity in Health*, 11 (1): 45. <https://doi.org/10.1186/1475-9276-11-45>
- Elo, I T (1992). Utilisation of Maternal Health-care Services in Peru: The Role of Women's Education. *Health Transition Review*, 2 (1): 49-69. Retrieved from <http://www.jstor.org/stable/40652032>
- Gazmararian, J A, *et al* (1996). Associations between Measures of Socioeconomic Status and Maternal Health Behaviour. *American Journal of Preventive Medicine*, 12 (2): 108-115. [https://doi.org/10.1016/s0749-3797\(18\)30353-2](https://doi.org/10.1016/s0749-3797(18)30353-2)



- Government of India (2020). *Bulletin on Maternal Mortality in India* (pp. Census of India. Retrieved from [http://www.censusindia.gov.in/nada/index.php/catalog/44379/download/48052/SRS\\_MMR\\_Bulletin\\_2018\\_2020.pdf](http://www.censusindia.gov.in/nada/index.php/catalog/44379/download/48052/SRS_MMR_Bulletin_2018_2020.pdf)
- Hobcraft, J N, *et al* (1984). Socio-economic Factors in Infant and child mortality: A cross-national comparison. *Population Studies*, 38 (2): 193-223. Retrieved from <https://doi.org/10.2307/2174073>
- International Institute for Population Sciences (IIPS) & ICF (2020). National Family Health Survey (NFHS)-5, State and District Factsheets, Kerala. Mumbai: IIPS. Retrieved from [https://rchiips.org/nfhs/NFHS-5\\_FCTS/Kerala.pdf](https://rchiips.org/nfhs/NFHS-5_FCTS/Kerala.pdf)
- (2020). *National Family Health Survey (NFHS)-5, State and District Factsheets, Karnataka*. Mumbai: IIPS. Retrieved from [https://rchiips.org/nfhs/NFHS-5\\_FCTS/Karnataka.pdf](https://rchiips.org/nfhs/NFHS-5_FCTS/Karnataka.pdf)
- (2020). *National Family Health Survey (NFHS)-5, State and District Factsheets, Telangana*. Mumbai: IIPS. Retrieved from [https://rchiips.org/nfhs/NFHS-5\\_FCTS/Telangana.pdf](https://rchiips.org/nfhs/NFHS-5_FCTS/Telangana.pdf)
- (2020). *National Family Health Survey (NFHS)-5, State and District Factsheets, Andhra Pradesh*. Mumbai: IIPS. Retrieved from [https://rchiips.org/nfhs/NFHS-5\\_FCTS/Andhra\\_Pradesh.pdf](https://rchiips.org/nfhs/NFHS-5_FCTS/Andhra_Pradesh.pdf)
- Islam, M A and Biswas, B (2021). Socio-economic Factors Associated with Increased Neonatal Mortality: A Mixed-Method Study of Bangladesh and 20 Other Developing Countries Based on Demographic and Health Survey Data. *Clinical Epidemiology and Global Health*, 11: 100801. <https://doi.org/10.1016/j.cegh.2021.100801>
- Jat, T R *et al* (2011). Factors Affecting the Use of Maternal Health Services in Madhya Pradesh State of India: A Multilevel Analysis. *International Journal for Equity in Health*, 10 (1): 59. <https://doi.org/10.1186/1475-9276-10-59>
- Jayne, S and Jejeebhoy, S (1997). Women's Education, Autonomy and Reproductive Behaviour: Experience from Developing Countries. *Studies in Family Planning*, 28 (1): 72. <https://doi.org/10.2307/2137974>
- Jewell, R T, *et al* (2014). Infant Mortality in Uruguay: The Effect of Socioeconomic Status on Survival. *The Journal of Developing Areas*, 48 (2): 307-28. Retrieved from <http://www.jstor.org/stable/23723978>
- Khadka, K B, Lieberman, L S, Giedraitis, V *et al* (2015). The Socio-Economic Determinants of Infant Mortality in Nepal: Analysis of Nepal Demographic Health Survey, 2011. *BMC Pediatrics*, 15: 152. <https://doi.org/10.1186/s12887-015-0468-7>
- Krieger, N (2012). Methods for the Scientific Study of Discrimination and Health: An Ecosocial Approach. *American Journal of Public Health*, 102 (5): 936-44. <https://doi.org/10.2105/ajph.2011.300544>
- Kristanto, B (1983). Some Socio-Economic Factors Affecting Infant and Child Mortality with Special Reference to Indonesia. *Majalah Demografi Indones*, 10 (19): i-19-32. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/12266479/>
- Kumar, P, *et al* (2021). Does Socio-economic Inequality in Infant Mortality Still Exist in India? An Analysis Based on the National Family Health Survey 2005–06 and 2015–16. *Clinical Epidemiology and Global Health*, 9: 116-22. <https://doi.org/10.1016/j.cegh.2020.07.010>

- Mackenbach, J P (2010). New Trends in Health Inequalities Research: Now It's Personal. *The Lancet*, 376 (9744): 854-55. [https://doi.org/10.1016/s0140-6736\(10\)60313-3](https://doi.org/10.1016/s0140-6736(10)60313-3)
- Mahadevan, K, Murthy, M S, Reddy, P R, Reddy, P J, Gowri, V and Sivaraju, S (1985). Socio-Demographic Correlates of Infant and Childhood Mortality. *Rural Demography*, 12 (1-2): 21-40. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/12280830/>
- McCarthy, J and Maine, D (1992). A Framework for Analyzing the Determinants of Maternal Mortality. *Studies in Family Planning*, 23 (1): 23-41. <https://doi.org/10.2307/1966825>
- National Family Health Survey (NFHS-5) (n.d.). Retrieved July 5, 2023, from [http://rchiips.org/nfhs/factsheet\\_nfhs-5.shtml](http://rchiips.org/nfhs/factsheet_nfhs-5.shtml)
- Navaneetham, K and Dharmalingam, A (2002). Utilization of Maternal Health Care Services in Southern India. *Social Science & Medicine*, 55 (10): 1849-69. [https://doi.org/10.1016/s0277-9536\(01\)00313-6](https://doi.org/10.1016/s0277-9536(01)00313-6)
- Onarheim, K H, Iversen, J H and Bloom, D E (2016). Economic Benefits of Investing in Women's Health: A Systematic Review. *PLOS ONE*, 11 (3). <https://doi.org/10.1371/journal.pone.0150120>
- Raghupathy, S (1996). Education and the Use of Maternal Health Care in Thailand. *Social Science & Medicine*, 43 (4): 459-71. [https://doi.org/10.1016/0277-9536\(95\)00411-4](https://doi.org/10.1016/0277-9536(95)00411-4)
- Srivastava, A, Mahmood, S, Mishra, P and Shrotriya, V (2014). Correlates of Maternal Health Care Utilization in Rohilkhand Region, India. *Annals of Medical and Health Sciences Research*, 4 (3): 417. <https://doi.org/10.4103/2141-9248.133471>
- U S Joint Economic Committee (2022). *Improving Maternal Health Care Would Save Lives and Prevent Economic Losses, Especially for Women of Color*, November 17. United States Joint Economic Committee. Retrieved from <https://www.jec.senate.gov/public/index.cfm/democrats/issue-briefs?id=A305A7C7-C574-4D5B-B4DD-E1FFFD253C04>
- Vidler, M, Ramadurg, U, Charantimath, U, Katageri, G, Karadiguddi, C, Sawchuck, D, Qureshi, R, Dharamsi, S, Joshi, A, von Dadelszen, P, Derman, R, Bellad, M, Goudar, S and Mallapur, A (2016). Utilization of Maternal Health Care Services and Their Determinants in Karnataka State, India. *Reproductive Health*, 13 (Suppl 1), Article S1. <https://doi.org/10.1186/s12978-016-0138-8>
- World Health Organization (n.d.). Indicator Metadata Registry Details. Retrieved July 11, 2023, from <https://www.who.int/data/gho/indicator-metadata-registry/imr-details/80>
- (n.d.). Maternal Mortality. Retrieved July 1, 2023, from <https://www.who.int/news-room/fact-sheets/detail/maternal-mortality>

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