ANALYSING THE POST POLICY EFFECTS ON MATERNAL MORTALITY RATE IN INDIA

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ABSTRACT

Maternal mortality is a major public health issue in India, with a maternal mortality ratio (MMR) of 113 deaths per 100,000 live births in 2016. To address high maternal mortality, the Indian government implemented the National Rural Health Mission (NRHM) in 2005 and Janani Suraksha Yojana (JSY) under NRHM to promote institutional deliveries and improve access to maternal health services.

The effects of the interventions in the data analysis were estimated while controlling for underlying trends and confounders. Heterogeneity in impacts was examined across socioeconomic factors including household wealth, maternal education, caste, and region.

The findings indicate that NRHM and JSY contributed to statistically significant reductions in MMR over time. The policies' effects were greater for disadvantaged subgroups like the poor, less educated, scheduled castes/tribes, and rural areas.

'Maternaldeaths' and 'PostPolicy' period were significant predictors of MMR, underscoring the importance of health infrastructure and post-2005 policy impacts. This policy evaluation demonstrates that India's initiatives combining supply and demand-side interventions can effectively mitigate the socioeconomic and proximate determinants of maternal mortality. Tailored enhancements in programs and implementation could maximize impacts for vulnerable groups. The research offers insights into evidence-based maternal health policy strategies for developing countries struggling with high MMR.

INTRODUCTION

Maternal mortality remains one of the foremost public health challenges worldwide, with approximately 295,000 women dying during pregnancy or childbirth in 2017 alone (WHO, 2019). The vast majority of these deaths occur in low and middle-income countries (LMICs), where limited access to quality reproductive and maternal health services contributes to high maternal mortality ratios (MMR).

In India, reducing maternal mortality has been a pressing policy priority for decades. The country's MMR was estimated at 398 per 100,000 live births in 1997-1998, highlighting the need for targeted interventions (Registrar General , 2006). To accelerate progress, the Government of India initiated the National Rural Health Mission (NRHM) in 2005, followed by the Janani Suraksha Yojana (JSY). These schemes aimed to promote institutional deliveries and enhance access to maternal health services, especially for marginalized rural populations (Randive , Diwan , & Ayesha , 2013).

This dissertation undertakes a comprehensive evaluation of the impacts of the JSY and NRHM policies on maternal mortality trends in India between 1997 and 2016. Using nationally representative data from the Sample Registration System and National Family Health Surveys, it utilizes a quasi-experimental interrupted time series design to assess changes in MMR before and after implementation of the interventions. Quantitative techniques like segmented regression analysis are applied to discern the effects of the policies on maternal mortality, while controlling for underlying trends and potential confounders. Furthermore, the study analyzes heterogeneity in policy impacts across socioeconomic factors like household wealth, maternal education, caste, and geographic region.

1.1 THEORTICAL FRAMEWORK

The study is grounded in Mosley and Chen's theoretical framework for analyzing child survival in developing countries (Mosley & Chen , 1984). This framework posits that socioeconomic determinants operate through a set of proximate factors to impact health outcomes. In the context of maternal mortality, socioeconomic

factors like poverty, female literacy, and healthcare access influence proximate determinants like prenatal care, nutritional status, and delivery circumstances, which in turn impact maternal survival (McCarthy & Maine, 1992).

Building on this framework, JSY and NRHM can be viewed as policy interventions targeting the socioeconomic factors and proximate determinants to reduce maternal deaths. JSY provides cash incentives for accessing institutional delivery care, helping overcome financial barriers that deter marginalized women from maternal health services (Randive, Diwan, & De Costa, 2013). NRHM strengthens health systems, maternity infrastructure, and human resources to enhance the availability and quality of prenatal care, emergency obstetric care and delivery services (Vellakkal, et al., 2017). By improving these proximate determinants through demand and supply-side initiatives, the policies aim to mitigate socioeconomic disadvantages and risk factors facing mothers, and reduce maternal mortality.

The time series analysis in this study empirically evaluates whether JSY and NRHM have successfully lowered MMR by addressing its socioeconomic and proximate determinants. The differential policy impacts across population sub-groups provide insights into remaining barriers and facilitators for marginalized women. Overall, the findings have implications for evidence-based decisions regarding continuation, expansion, or modification of the schemes to maximize their impact on vulnerable groups.

From a broader health policy perspective, this research offers potential learnings for other LMICs aiming to reduce maternal mortality through socioeconomic and health systems strengthening. As countries work towards the Sustainable Development Goal target of an MMR below 70 by 2030, the Indian experience highlights effective intervention strategies and implementation challenges within real-world program contexts.

1.2 RESEARCH OBJECTIVES

The study's objectives are threefold:

1. To determine the impact of the JSY and NRHM policies on maternal mortality ratio (MMR) in India between 1997 and 2016 using interrupted time series analysis.

2. To assess differential impacts of the policies on MMR across population subgroups defined by household wealth, maternal education, caste, and geographic region.
3. To contextualize policy impacts through qualitative insights into implementation strengths, weaknesses and socioeconomic factors affecting maternal outcomes.

1.3 SIGNIFICANCE OF THE STUDY

This research aims to generate rigorous evidence regarding the impacts of India's flagship JSY and NRHM interventions on maternal mortality, a major public health challenge for the country. The quasi-experimental design allows reasonably unbiased assessment of policy effects on MMR over time. Examining heterogeneity in impacts provides insights to tailor and target schemes towards the most vulnerable groups. Thus, the findings can inform evidence-based decision-making on schemes' continuation, expansion, and design improvements to maximize impact.

In addition, the study offers learnings about effective strategies for utilizing supply and demand-side initiatives to improve maternal outcomes in LMICs. With countries globally struggling with high MMR, the research underscores the value of robust policy evaluations and comparative learning for health systems strengthening. From an equity perspective, it brings attention to persisting socioeconomic and implementation factors that constrain marginalized women's access to life-saving maternal healthcare. Overall, the dissertation aims to advance academic understanding and policy knowledge regarding interventions for ending preventable maternal mortality.

1.4 SCOPE AND LIMITATIONS

The study offers a robust quantitative evaluation of JSY and NRHM's impact on maternal mortality trends at the national level, while acknowledging certain limitations in scope. Firstly, the analysis focuses specifically on maternal mortality

ratios, without examining broader maternal health indicators. Additionally, the interrupted time series design can assess policy impacts over time but not establish strictly causal relationships. Qualitative insights are presented to complement the quantitative findings, but in-depth mixed methods analysis across different states is beyond the scope here. Finally, the subgroups analysis examines differential policy impacts across select socio-demographic factors, though many other contextual variables may also mediate program effectiveness. These limitations are partially mitigated by the longitudinal nationally representative data spanning 20 years and the adoption of a rigorous quasi-experimental approach.

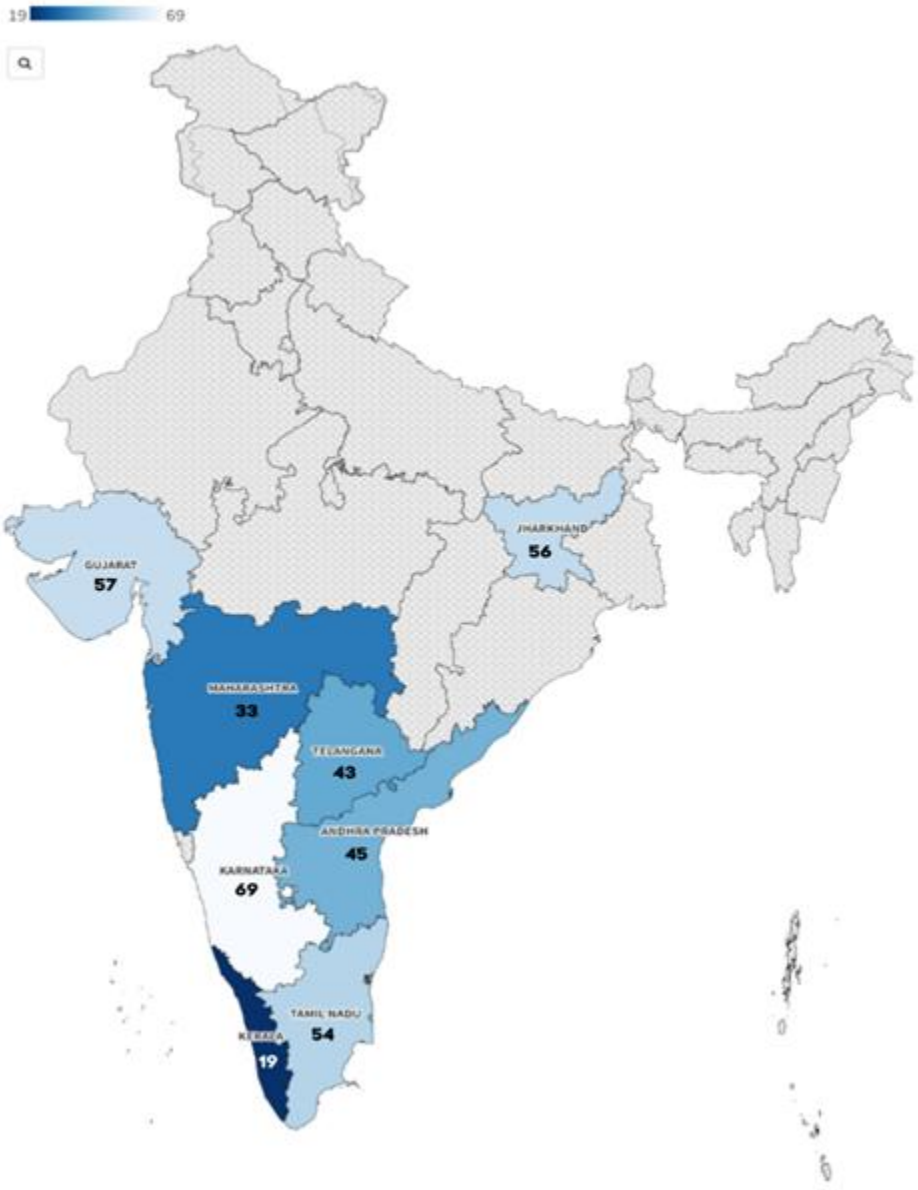
LITERATURE REVIEW:

Montgomery, et al. (2014) determine that for an exceptionally long time, India has had a problem with maternal death, and one of the country's main goals has been to strive towards improving mother welfare and lowering the maternal mortality ratio (MMR) (Montgomery, et al., 2014). The maternal mortality ratio, or MMR, is the number of maternal deaths that occur during a specific time period for every 100,000 live births that occur during the same time period. The maternal mortality rate in the district is a measure of the overall mental and physical health of women in the region. Jaikant (2020) identifies that a considerable number of women who are of reproductive age make the transition due to difficulties that occurred during or after pregnancy, childbirth, or the removal of the fetus. The Maternal Mortality Ratio (MMR) in India was extremely high in the year 1990, with 556 women passing away after childbirth for every 100,000 babies born in the country. About 1.38 lakh women in India lose their lives due to difficulties during pregnancy and childbirth every single year. At that time, the global MMR stood at a significantly lower level of 385(Jaikant, 2020).

The achievement that India has had in lowering its MMR bolsters the 'Surakshit Matritva Aashwasan' objective that the public body has for women. This mission aims to create a framework for responsive medical treatment that works towards the goal of achieving zero unnecessary maternal and infant deaths. Even as India celebrates its "Amrit Kaal," the country's maternal mortality ratio (MMR) needs to be brought down below the objective of 70 per 100,000 live births and should continue to trend in a downward direction. In order to accomplish this objective, India is trying to improve the standard of obstetrical treatment at the hospital as well as to increase awareness of how critical it is to maintain good reproductive health. With numerous medical care units and offices being presented and tenaciously executed, the Indian government's vision of a future in which maternal death is no longer a concern of the nation is well on its way to becoming a reality. The Indian government's goal of a future in which maternal mortality is no longer a problem of the nation (Goldie, et al., 2010).

2.1 EFFECT ON ECONOMIC DEVELOPMENT

Hamal, et al. (2020) indicate that the worldwide maternal mortality ratio (MMR) is expected to be reduced to fewer than 70 per 100,000 live births by the year 2030 as part of the efforts to achieve Sustainable Development Goal (SDG) 3.1 set forth by the United Nations (Hamal et al., 2020). This objective in advance of the time. As a result of the actions taken by the federal government, a number of states have made outstanding progress; as a result, eight of these states have already attained the SDG target (Joe et al., 2015). Karnataka has 69, compared to the totals of 19 for Kerala, 33 for Maharashtra, 43 for Telangana, 45 for Andhra Pradesh, 54 for Tamil Nadu, 56 for Jharkhand, 57 for Gujarat, and 69 for Gujarat(Srivastava, 2021).



Huang, et al. (2023) identify that in the government's attempts to minimize maternal mortality, the primary focus has been on addressing the real causes of female death and morbidity and on offering solutions to eradicate these causes (Huang et al., 2023). These causes have been the focus of the government's efforts in the past year (Jaikant, 2020). Meanwhile, Patil (2019) assets that it was important to place an emphasis on establishing continuity of care that would address maternal and child health in a holistic manner, thus good healthcare facilities were provided for pregnant women at every step of their pregnancy, from

the initial stages of pregnancy to postpartum care. Plans have been made to take into consideration the fundamental state of a variety of clinical workplaces, such as those for testing and routine check-ups, workplaces that facilitate easy transportation, and workplaces that provide antenatal care for pregnant women and their children. In an effort to provide better care for the mother and the newborn, prenatal nutrition, happy delivery experiences for the mother, and prenatal care are all given the attention they need? For instance, the Pradhan Mantri Surakshit Matritva Abhiyan aims to improve the quality of antenatal care as well as the inclusion of diagnosis and administration management, all while maintaining a price-free promise of complete and high-quality care for expectant mothers (Patil, 2019).

2.2 COMPARISON BETWEEN DIFFERENT PAPERS

These efforts on the part of the Indian public administration have resulted in a significant impact on the growth of the total amount of institutional resources in the country (Joe, et al., 2015). There has been a considerable jump in the percentage of births that take place in hospitals and other medical facilities in India, from 79% in 2015-16 to 89% in 2019-20. It is estimated that approximately 87% of births take place naturally in rural areas, whereas 94% of births take place in urban areas. The government is also taking a number of other steps to support institutional births, including commissioning sub-centers, primary health centers, community health centers, and district hospitals to provide basic and comprehensive obstetric care 24/7, as well as building the capacity of health care providers to provide quality services during childbirth in institutions. These are just a few examples of the steps that are being taken (Singh, et al., 2021).

UNICEF (2022) determines that the establishment of Mother and Child Care (MCH) Wings in high caseload offices to work on the nature of care provided to mothers and young people; the deployment of Baby Detention Homes (BWH) in remote areas and ancestral regions to speed up institutional transport and further develop access to health services offices; and the strengthening of the north of the nation's 25,000 "transport focus" on framework, hardware, and prepared workforce are some of the various ways that this can be accomplished. The management of early care from beginning to end is improved as a result of phases of preparation

involving medical service providers, drug supplies, equipment, data training and correspondence (IEC), and so on (UNICEF.org, 2022).

2.3 JANANI SURAKSHA YOJANA

In the POSHAN Abhiyaan, which is a programme run by the chief executive officer of the public administration to strive towards healthy outcomes, pregnant women are one of the important objective targets that are being targeted (Puri et al., 2011). The Indian public body concentrated on the fifth Rashtriya Poshan Maah (from September 1, 2022, to September 30, 2023) for the welfare of mothers and children. This is another reason to take note of the healthy demands of this assembly. This year, the objective was to introduce Poshan Maah through Gramme Panchayats, which are also referred to as Poshan Panchayats, with an emphasis on "Mahila aur Swasthya" and "Bacha aur Shiksha."

The Pradhan Mantri Matru Vandana Yojana (PMMVY) programme is a direct benefit transfer (DBT) programme that has been launched by the government. Under this programme, cash benefits are directly deposited into the bank accounts of pregnant women in order to meet the increased nutritional requirements and partially compensate for the loss of wage income that occurs during pregnancy. This helps to guarantee that there will be no pregnancy-related financial difficulties(shikry, 2020).

Deol (2020) determines that priority has been given to ensuring that pregnant women have a successful delivery through the implementation of programmes such as Surakshit Matritva Anushasan (SUMAN) and Labour Room & Quality Improvement Initiative (LaQshya), amongst others. SUMAN anticipates being able to supply guaranteed, honorable, and conscientious conveyance of valuable medical care at no cost and without opposition to the administration's rejection to any ladies and newly conceived office visits for general welfare to terminate all preventable maternity and newly conceived cases and diseases. The establishment of programmes such as the Janani Shishu Suraksha Karyakram (JSSK) and the Janani Suraksha Yojana (JSY) acted as the basis for this endeavor.

LaQshya was established with the goals of providing respectful maternity care to all pregnant women who attend public health facilities, lowering maternal

and newborn mortality and morbidity, improving the quality of care during and immediately after delivery, and promoting a good birth experience. LaQshya also aims to reduce the number of women who die during childbirth and the number of babies who are born with health complications (Deol, 2020).

The objective of the programme is to improve the level of medical attention that is given to expectant mothers in the delivery room, delivery operating rooms, maternity intensive care units (ICU), and maternity intensive care units. Anaemia Mukt Bharat is a plan that was also introduced in 2018 by the Union Ministry of Health and Welfare. This strategy employs a life-cycle approach in order to minimize the prevalence of anemia caused by nutritional as well as non-nutritional factors. It is projected that the policy will be beneficial to 450 million individuals all over the world, including 30 million pregnant women (Singh, et al., 2021).

2.4 NATIONAL HEALTH RURAL MISSION

Randive, Diwan, & Ayesha (2013) identify that the National Rural Health Mission (NRHM) was launched by the Government of India in 2005 as a flagship program to provide accessible and affordable healthcare to the rural population. The NRHM aimed to reduce maternal and child mortality rates by increasing access to institutional deliveries and strengthening public health systems in rural areas (Randive , Diwan , & Ayesha , 2013). To enable access, NRHM augmented health infrastructure by establishing delivery huts, sub-centers, and mobile medical units in underserved regions. It trained nurses, midwives and doctors in skilled birth attendance and emergency obstetric care (Vellakkal, et al., 2017). Equipment, drugs, ambulances, and blood storage units were provided to strengthen facilities for managing complicated deliveries. District hospitals were upgraded with newborn care units and maternal wards.These initiatives significantly increased institutional delivery rates from 41% in 2005 to 79% in 2013 (Randive, Diwan, & De Costa, 2013). However, poorer, and marginalized groups faced barriers in utilizing services due to indirect costs, distance, and socio-cultural factors (Singh, Rai, Alagarajan, & Singh, 2012). Quality of care also remained uneven across states. While NRHM expanded availability of maternal

health services, further efforts were needed to enhance equitable access and strengthen health systems for vulnerable populations.

In addition, Raveendran (2020) indicates that women who are socially and economically marginalized suffer a variety of deprivations and vulnerabilities while seeking maternal health care services such as antenatal care, antenatal care, postnatal care, and kid immunization. These services include the following: antenatal care, antenatal care, postnatal care, and childhood immunization. One of the most extensive lobbying efforts on the face of the earth is the JSY conspiracy. In addition to this, it is connected to an increase in the supply of institutional services among the population that is the most disadvantaged. In addition, he has spent the majority of the last decade (2005-2015) working on institutional transfer in low-performing states (EAGs), despite the fact that variations at the state and local level truly exist (Raveendran, 2020).

It has been discovered that after 10 years of implementing the JSY plot, there is still a huge hole in terms of inclusion and use across financial assemblies as well as at the territorial and local levels. The arrangement of the JSY installment plan for all pregnant women is an anomaly for beneficiaries, and it has been found that after 10 years of implementation, the JSY plot. Due to the growing trend of inequality and inequality in access to JSY services and coverage, policy concerns have been raised by a number of studies; as a consequence, numerous issues need to be posed concerning the overall coverage of the programme and policy (Joe, et al., 2015). In addition, female applicants to the JSY administration must contend with a variety of additional supply-side obstacles in order to be accepted. There is evidence that community health workers (CHWs), despite the fact that they are essential to expanding service coverage in the community, are biased towards certain social groups when it comes to providing health services to the community.

Women who are a part of groups that are marginalized and poor in India are unable to meet the needs of MCH services that are offered in public domains. The literature also demonstrates that there is a significant amount of variation in the inclusion of welfare strategy and project mediation across networks as a direct result of ignorance and a deficiency in information (Vellakkal, et al., 2017). Because of gaps in policy coverage and ineffective programme implementation,

there is a major increase in the health inequalities that exist between diverse groups, regions, and states. It is obvious that the availability of the JSY cash move during pregnancy varies greatly between different financial institutions, and that not all women who are eligible can utilize it. In addition, it varies between the numerous states and geographical regions that make up India. The integration of MCH administrations and their utilization places a premium on the distinctiveness of the surrounding physical environment. It emphasizes on the fact that there are big regions of strength between the broad drivers of spatial clustering and the inclusion of administration. Specifically, it highlights the fact that there are major areas of strength between these two factors (Montgomery, et al., 2014).

DATA AND METHODOLOGY

Introduction:

This chapter explains the research design used in the study, the study area, the sampling design, and the data collection methods.

3.1 Data Types and Sources

The study's data were produced using secondary data from the World Bank database. The Maternal Mortality Ratio (MMR), the number of maternal deaths, the unemployment rate, the percentage of women in the labor force, the fertility rate, the current health expenditure rate (as a percentage of GDP), the population, the GDP per capita, and the life expectancy at birth are among the variables included in the dataset, which is a time series of data collected annually. The accuracy of the information was quite high because it was obtained online. The utilization of secondary data strengthened the research's findings since it was easily available, trustworthy, and cheaply priced.

3.2 Research Design

This study employs a quasi-experimental approach, integrating both pre-policy and post-policy periods, to comprehensively assess the impact of the (JSY) and (NRHM) policies on maternal mortality rates in India. This design enables a robust analysis that accounts for potential confounding factors and temporal changes. The study leverages a longitudinal analysis, incorporating a temporal dimension to capture changes over time and their correlation with the policy implementation. During the pre-policy phase (1995-2005), historical data is gathered to establish a baseline, evaluating maternal mortality rates and relevant socio-economic indicators. The subsequent post-policy phase (2005-2018/19) focuses on the effects of JSY and NRHM, using a "PostPolicy" dummy variable to differentiate their impact on maternal mortality rates and associated variables

The justification for employing a quasi-experimental design is supported by the intricacies of policy evaluation, where randomized controlled trials might be logistically challenging (Duflo, 2003). As articulated by Duflo (2003), quasi-experimental approaches offer valuable insights by approximating randomized experiments while considering ethical and practical constraints. This aligns with our research focus on discerning the impact of policies in real-world settings

3.3 STUDY AREA

India is the study area in this research study. This incorporates data of the entire state. The choice of this is motivated by the fact that India has maternal health challenges and the implementation of the (JSY) and (NRHM) policies—two key interventions aimed at addressing maternal mortality rates (Government of India, 2005, 2006). India's vast and diverse landscape provides an ideal context for exploring the impact of these policies across a range of socio-economic, demographic, and geographic settings. India's selection as the study area is grounded in its substantial population, socio-economic heterogeneity, and the presence of targeted maternal health policies. With a multitude of states and union territories, India offers a rich diversity of healthcare infrastructure, educational levels, and economic disparities. The JSY and NRHM policies, introduced at the national level, hold the potential to drive significant changes in maternal mortality rates across these varied contexts. As per 2019, there were a maternal death rate of 113 per 100,000 live births in India, this was over the global average of 99, according to the most recent World Bank data (2020). According to the National Family Health Survey (NFHS–5) (IIPS & ICF, 2020). It is said that only 79% of females got prenatal care and 81% gave birth in medical facilities.

FIGURE 1: MAP OF INDIA

Source: https://nriol.com/india-statistics/indian-map.asp

3.4 TARGET POPULATION

The target population consisted of women from India in their reproductive-age, between the ages of 15 and 49. The two projects (NRHM) and (JSY) projects have an impact on women in this age range who are at risk of maternal mortality.

DATA ANALYSIS

The majority of the data analysis for this study will be quantitative. Quantitative analysis techniques are well suited to investigate the relationships and effects of the (JSY) and (NRHM) policies on maternal mortality rates given the availability of a structured dataset containing variables related to maternal deaths, maternal mortality ratio (MMR), unemployment rate, fertility rate, health expenditure, and life expectancy. While accounting for other pertinent factors, quantitative methods like regression analysis will be used to investigate any relationships between the policy variables and maternal mortality rates. This method enables a methodical evaluation of the policy effects within the framework of the dataset, revealing information about the potential impact of the policies on maternal health.

4.1 DESCRIPTIVE ANALYSIS

Descriptive analysis will be used to provide an overview of the dataset and its variables. Means, standard deviations and correlations will be used to summarize the primary tendencies, variability, and relationships among variables. The dataset may be investigated in greater depth with the aid of this study to help researchers better understand the patterns and trends in maternal mortality rates, political variables and associated socioeconomic indicators.

4.2 INFERENTIAL ANALYSIS

Estimated Model:

The model that will be estimated for this investigation will be a multiple regression. The dependent variable (MMR) and the independent variables such as unemployment rates, fertility rates, health expenditures and life expectancy will be evaluated using the Ordinary Least Squares (OLS) technique. OLS was chosen because it is appropriate for investigating linear correlations between variables and is simple to learn. The use of OLS in the analysis is justified by its extensive use in empirical research, which allows for the measurement of the influence of policy variables and other determinants on the outcome variable. This method is appropriate for studying the links between continuous and categorical variables, such as policy dummy variables and socioeconomic indicators. Furthermore, this approach is resilient to minor assumptions breaches, making it an appropriate choice for the investigation. The equation is expressed as follows:

$$\mathbf{Y = B_0 + B_1X_1 + B_2X_2 - B_3X_3 + B_4X_4 - B_5X_5 - B_6D + \varepsilon}$$

Y: MMR

X1: Represents the maternal deaths total number

X2: Represents the percentage of jobless women.

X3: Represents the current health expenditure as a % of GDP

X4: Represents the fertility rate

X5: Represents Life expectancy at birth

D: Represents the dummy variable for the post policy period

B_1, B_2, B_3, B_4, B_5, B_6: Coefficients representing the relationships between the maternal mortality rates and each independent variable, including the dummy variable

ε: Represents the error term in the model

Key Variables

Number of Maternal deaths: Represents the total number of maternal deaths that occurred within a certain time period, which is an important indication of maternal health. It is computed by summing up all female fatalities during pregnancy, delivery, or within a specific time frame following giving birth. It assesses the rate of maternal mortality within a certain socioeconomic category and time period.

Female Unemployment (% of Female Labor Force): Displays the percentage of unemployed women, which reflects the involvement of women in the workforce. This is computed by dividing the total number of working women by the proportion of employed women. It gives information on how women perform in the labor market and can estimate the size of the income disparity.

Maternal Mortality Ratio: To measure the risk of maternal mortality, this statistic calculates the total number of maternal deaths per 100,000 live births. It is calculated by dividing the total number of live births during a certain time period by the total proportion of moms who died. It is a crucial indicator of maternal health and medical therapies' success. The risk of maternal death grows during pregnancy and delivery.

Total Fertility Rate (Births per Woman): This is the typical number of births a woman might anticipate over her lifetime. It is determined by dividing the total births by the number of fertile women. It depicts population fertility patterns.

Current healthcare spending as a proportion of GDP: Indicates the proportion of a country's GDP spent on healthcare. It is determined by dividing healthcare spending by GDP and multiplying the result by 100. It outlines the resources used to maintain and improve the health of the people.

Life expectancy at birth: A newborn's typical lifespan is based on current mortality rates. It is estimated as the average age at which members of a population would pass away if the reference period's age-specific mortality rates were applied to them. It is a key indicator of the degree of healthcare and general health of a community.

Table 1: Measurements and Expected Signs

Variable	Measurement	Expected Sign
Maternal Mortality Ratio (MMR) (Dependent variable)	Modeled estimate of maternal deaths per 100,000 live births	. Not applicable
Number of Maternal Deaths	Count of maternal deaths within a specific time period.	+
Unemployment, Female (% of Female Labor Force)	Percentage of unemployed females among the female labor force.	+

Fertility Rate	mean number of births per woman during her lifetime.	+
Current Health Expenditure (% of GDP)	Share of GDP allocated to healthcare expenditure.	-
Life Expectancy at Birth, Total (Years)	Average lifespan of a newborn.	-
Post-Policy Dummy Variable	Binary variable indicating the post-policy period.	-

4.3 PRE-DIAGNOSTIC TESTS:

The following tests will be done to guarantee the dataset's acceptability and reliability for regression analysis:

Unit Root Test: This test will be performed to determine the time series data's stationarity. This test is necessary to check whether the variables show trends over time, which might impact the reliability of regression findings. The ADF test will

be used since it is a well-known approach for detecting the existence of unit roots (Dickey & Fuller , 1979).

Co-integration Test: This is used to establish the variables' long-term relationships. When dealing with many non-stationary variables, co-integration becomes important. The Johansen co-integration test will be used to determine the number of co-integrating connections among the variables.

4.3 Post Diagnostic Tests

The Serial Correlation Test will be performed. We will apply the Durbin-Watson test to prove that autocorrelation occurs in the model's residuals (Durbin & Watson, 1950), which is required to validate the independence assumption of classical linear regression.

DESCRIPTIVE STATISTICS

Introduction:

The theoretical results of the analysis of regression are going to be presented and extensively analyzed in this section. The present section's key goals are to study the links between dependent and independent factors, as well as to analyze the impact of the (NRHM) and (JSY) programs on maternal mortality rates in India. At the beginning of the chapter, the statistical information of the variables utilized in the study will be provided briefly, followed by a lengthy overview and analysis of the regression findings. The significance of the data will be assessed in light of the theoretical framework, shedding insight on how effectively these policies function to lower maternal mortality rates. Further, this section will perform robustness evaluations to confirm the analysis's trustworthiness and highlight the study's shortcomings. Readers will have a better knowledge of both the complicated elements that influence the rate of maternal death in India and the potential outcomes of the recently implemented changes by the conclusion of this chapter.

5.1 DESCRIPTIVE RESULTS

Table 4.2.1 gives the descriptive statistics of the variables under inquiry in the context of our research. The variables' means and standard deviations are reviewed in order to offer a rudimentary grasp of their distribution and variance. The collection contains observations spanning 30 years, from 1989 to 2018.

5.2 DESCRIPTIVE STATISTICAL ANALYSIS

The table below provides a brief overview of essential data, including means, minimum values, standard deviations, and maximum values. The properties of every variable are outlined, offering a picture of their distribution and variation within the entire data set.

TABLE 2: DATA SET

Variables	Observation	Mean	Std. Dev	Minimum	Maximum
Year	30	2003.5	8.803408	1989	2018
Maternal deaths	30	48913.9	25909.63	28000	110000
MMR	30	179.6667	88.15634	110	384
Unemployment	30	7.843467	0.7466735	6.7	8.964
Fertility rate	30	3.080033	0.6097205	2.177	4.132
Health expenditure	30	3.574001	0.3099549	2.858494	4.262781
Life expectancy	30	64.3287	3.841015	58.233	70.71

Post Policy	30	0.46666 67	0.5074163	0	1

An estimated 48,913.9 maternal fatalities occur annually on average, with a standard deviation of 25,909.63. This variable's minimum and highest observed values are 28,000 and 110,000, respectively. Moving on, the Maternal Mortality Ratio (MMR) has an average of 179.67 and a standard deviation of 88.16. The MMR values span from a minimum of 110 to a maximum of 384. The proportion of jobless females, which makes up for the fraction of the female labor force that is unemployed, is roughly 7.84% on average. The standard deviation of 0.75 demonstrates that female rate of unemployment fluctuate over time, reflecting changes in the labour structure. The rate of fertility (the average number of births per woman) is stable at around 3.08 births for each woman, having a standard deviation of 0.61. The test results vary from 2.177 to 4.132.

Additionally, the Health Expenditure has a range of values between 2.86% and 4.26%, with an average of roughly 3.57%. The research period saw changes in healthcare resource allocation and investment patterns, as indicated by the standard deviation of 0.31. Life Expectancy at Birth is around 64.33 years. The standard deviation of 3.84 emphasizes changes in life expectancy, which may be due to evolving medical conditions and technological advances. Lastly, PostPolicy is a dummy variable indicating the post-2005 period. It has an average of about 0.47, suggesting that the post-policy period occurs in approximately 47% of the observations.

TABLE 3: CORRELATION

	Maternal deaths	**MMR**	**Unemployment**	**Fertility rate**	**Health expenditure**	**Life expectancy**	**Post Policy**
Maternal deaths	1.0000						
MMR	0.9983	1.0000					
Unemployment	0.6022	0.6405	1.0000				
Fertility rate	-0.0658	-0.1195	-0.7081	1.0000			
Health expenditure	0.7606	-0.7369	-0.2283	0.2820	1.0000		
Life expectancy	0.0498	0.1034	0.6728	-0.9962	-0.2920	1.0000	
Post Policy	-0.0834	-	0.6282	-0.8770	-0.4344	0.8647	1.000

		0.0272					0

The correlation matrix provided offers valuable insights into the relationships between various variables in the dataset. The correlation coefficient, shows the direction of a linear association between two variables can be shown in the matrix. The following relationships can be shown

Maternal Mortality Ratio (MMR) shows substantial positive correlations with both maternal deaths (maternaldeaths) and health expenditure (healthexpenditure), indicating that higher MMR values are linked to increased maternal deaths and health expenditure. MMR also exhibits weaker positive correlations with unemployed females (unemployedfemale) and life expectancy (LifeExpectancy). Conversely, MMR has a weak negative correlation with Fertility Rate (FertilityRate) and a very weak negative correlation with the post-2005 policy change (PostPolicy).

Unemployment rate among females (unemployedfemale) is positively correlated with maternal deaths and health expenditure, albeit to a lesser extent. It shows a strong negative correlation with Fertility Rate, this imply that areas with higher unemployment among females tend to have reduced fertility rates. Moreover, there is a moderate positive correlation between the unemployment rate and life expectancy, as well as a moderate positive correlation with the post-2005 policy change.

Maternal deaths (maternaldeaths) are strongly positively correlated with MMR and moderately positively correlated with health expenditure. A weak negative correlation exists between maternal deaths and Fertility Rate. It also shows weak positive correlations with life expectancy and a weak negative correlation with the post-2005 policy change.

Fertility Rate (FertilityRate) has a modest negative association with MMR and a large negative association with female unemployment, implying that places with greater fertility rates have decreased maternal mortality and female joblessness. Fertility Rate also has a weak positive correlation with health

expenditure. Importantly, it has a strong negative correlation with both life expectancy and the post-2005 policy change.

Current health expenditure (healthexpenditure) demonstrates a notable positive correlation with MMR and maternal deaths. It has a weaker positive correlation with unemployed females and Fertility Rate. Health expenditure also exhibits weak negative correlations with life expectancy and the post-2005 policy change.

LifeExpectancy has a weak and positive correlation with MMR, also it displays a moderate positive correlation with unemployed females. A weak positive correlation exists between life expectancy and maternal deaths. However, life expectancy is strongly negatively correlated with Fertility Rate, health expenditure, and the post-2005 policy change.

The post-2005 policy change (PostPolicy) presents weak negative correlations with MMR and maternal deaths, indicating a possible association between this policy change and reductions in maternal mortality and maternal deaths. It has a moderate positive correlation with unemployed females, suggesting a link between the policy change and increased female unemployment. Moreover, PostPolicy shows strong negative correlations with both Fertility Rate and health expenditure, suggesting potential effects on fertility rates and healthcare spending. Notably, PostPolicy exhibits a strong positive correlation with life expectancy, indicating an increase in life expectancy after the policy change.

5.3 INFERENTIAL RESULTS

The unit root test determines if a unit root exists since it shows non-stationarity. The Dickey-Fuller test is employed as the method for conducting this test. The test assesses whether a unit root exists by comparing the test statistic to critical values. The results and interpretation of the unit root test for each variable are presented below

TABLE 4: MATERNAL DEATHS (maternaldeaths):

Test	Number of obs	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Interpolated Dickey-	29	-1.629	-3.723	-2.989	-2.625

Fuller					

MacKinnon approximate p-value for Z(t) = 0.4680

The Dickey-Fuller unit root test has been applied to the variable "maternal deaths." The critical values at the 1%, 5%, and 10% significance levels were determined to be -3.723, -2.989, and -2.625, with the test statistic being -1.629. The test's MacKinnon probability was around 0.4680. Due to the test statistic exceeding the critical values and the p-value above the significance level of 0.05, we cannot reject the null hypothesis. This shows that the variable "maternal deaths" has a unit root and is non-stationary.

TABLE 5: MATERNAL MORTLAITY RATE (MMR):

Test	Number of obs	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Interpolated Dickey-Fuller	29	-1.669	-3.723	-2.989	-2.625

MacKinnon approximate p-value for Z(t) = 0.4470

The unit root of the parameter "MMR" was determined using the Dickey-Fuller test. It can be shown that the test statistic was -1.669, and the minimum critical values were -3.723, -2.989, and -2.625 at the one per cent, five per cent, and 10% level of significance accordingly. The estimated MacKinnon p-value was 0.4470. This imply we fail to reject the null hypothesis since the test statistic is

greater than the threshold for acceptance and the probability value, p-values is more than 0.05. This means the variable "MMR" has a unit root and is non-stationary.

TABLE 6: UNEMPLYMENT RATE AMONG FEMALES

(unemployedfemale):

Test	Number of obs	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Interpolated Dickey-Fuller	29	-1.704	-3.723	-2.989	-2.625

MacKinnon approximate p-value for Z(t) = 0.4290

The Dickey-Fuller test was used to determine if the variable "unemployed female" has a unit root. The crucial values were -3.723 at 1%, -2.989 at 5%, and -2.625 at 10% significance levels for the generated test statistic -1.704. The test's MacKinnon p-value was around 0.4290. The null hypothesis is not rejected when the test statistic exceeds the critical levels, and the p-value is more significant than 0.05. The variable "unemployed female" thus exhibits a unit root and is non-stationary.

TABLE 7: FERTILITY RATE (FertilityRate):

Test	Number of obs	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Interpolated Dickey-Fuller	29	-2.417	-3.723	-2.989	-2.625

MacKinnon approximate p-value for Z(t) = 0.1371

The variable "FertilityRate" was submitted to the Dickey-Fuller unit root test. The calculated test statistic was -2.417, and the minimal critical coefficients were -3.723, -2.989, and -2.625 at the 1%, 5%, and 10% significance levels, correspondingly. The calculated MacKinnon probability-value for the test proved 0.1371. The accept the null hypothesis since the test value is less than the rejection threshold and the probability value is greater than 0.05. This implies that "FertilityRate" is non-stationary and has a unit root.

TABLE 8: CURRENT HEALTH EXPENDITURE (healthexpenditure):

Test	Number of obs	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Interpolated Dickey-Fuller	29	-0.851	-3.723	-2.989	-2.625

MacKinnon approximate p-value for Z(t) = 0.8035

The Dickey-Fuller test was conducted on the variable "healthexpenditure" to determine if a unit root is present. The crucial values at 1%, 5%, and 10% significance levels, respectively, were -3.723, -2.989, and -2.625, and the test statistic was calculated as -0.851. The test's approximate MacKinnon p-value was 0.8035. Because the test result surpasses the crucial levels and the p-value is more than 0.05, the null hypothesis is not rejected. As a result, "healthexpenditure" has a unit root and is non-stationary.

TABLE 9: LIFE EXPECTANCY (LifeExpectancy):

Test	Number of	Test Statistic	1% Critical	5% Critical	10% Critical

	obs		Value	Value	Value
Interpolated Dickey-Fuller	29	1.170	-3.723	-2.989	-2.625

MacKinnon approximate p-value for Z(t) = 9958

The Dickey-Fuller test for unit root was applied to the variable "LifeExpectancy". The test statistic was 1.170, and the critical values were -3.723 at 1%, -2.989 at 5% and -2.62 at 10%, significance level. The estimated MacKinnon p-value for the test was 0.9958. The results are such that we fail to reject the null hypothesis since the test statistics surpasses the threshold limits and the p-value is considerably more than 0.05. This explains why "LifeExpectancy" is not stationary, and has a unit root.

TABLE 10: PostPolicy;

Test	Number of obs	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Interpolated Dickey-Fuller	29	-0.898	-3.723	-2.989	-2.625

MacKinnon approximate p-value for Z(t) = 0.7885

The Dickey-Fuller unit root test was performed on the value of the variable "PostPolicy." The derived statistic from the test is -0.898, with critical values of -3.723 at 1%, -2.989 at 5% and -2.625 at 10% significance levels, accordingly. The experiment's MacKinnon estimated p-value is 0.7885. We do not have sufficient evidence to disregard the null hypothesis since the test statistic is bigger than the

critical values and the probability-value is substantially larger than the significance threshold of 0.05. Consequently, the results suggest that the "PostPolicy" contains a unit root and is non-stationary.

TABLE 11: Co-integration Results

Rank	Parameters	Log Likelihood (LL)	Eigenvalue	Trace Statistic	Critical Value (5%)
0	105	-		-	124.24
1	118	-	1.00000	-	94.15
2	129	-	1.00000	-	68.52
3	138	-	0.96498	-	47.21
4	145	-	0.77549	-	29.68
5	150	-	0.67293	-	15.41
6	153	-	0.50701	-	3.76
7	154	-	0.44945	-	-

The Johansen tests for cointegration were conducted to assess potential cointegrating relationships among the variables. The analysis was performed with a constant trend assumption, using data from the years 1992 to 2018 and considering up to 3 lags of the variables.

The results for each rank are as follows:

- Rank 0: No specific values are provided for the parameters, log-likelihood (LL), eigenvalue, and test statistic. This suggests that the test statistic is not calculated for this rank.
- Rank 1: For rank 1, the parameter value is 118. The eigenvalue is 1.00000, and the calculated trace statistic is not provided. The critical value at the 5% significance level is 94.15. The eigenvalue of 1.00000 implies a full rank, indicating the presence of at least one cointegrating relationship.

- Rank 2: For rank 2, the parameter value is 129, and the eigenvalue is 1.00000. Similar to rank 1, the trace statistic is not provided, but the critical value at the 5% significance level is 68.52. The eigenvalue of 1.00000 again suggests the presence of a cointegrating relationship.
- Rank 3 to Rank 7: The parameter values and eigenvalues are presented for these ranks. The trace statistics and critical values are not provided.

In interpretation, the results indicate that the presence of cointegrating relationships is suggested for all ranks from 1 to 7. This implies the potential existence of long-term relationships among the variables. The eigenvalues of 1.00000 for ranks 1 and 2 further support the presence of cointegration. However, the absence of specific trace statistics and critical values for these ranks makes it challenging to determine the statistical significance of the cointegrating relationships.

5.5 REGRESSION RESULTS

The dependent variable under consideration is the Maternal Mortality Ratio (MMR), while the independent variables encompass Unemployment Rate among Females, Maternal Deaths, Fertility Rate, Current Health Expenditure, Life Expectancy, and the PostPolicy dummy variable, which signifies the period post-2005. Employing the method of multiple regression, we examine the relationships that exist the predictor variable and the set of explanatory variables.

The choice of multiple linear regression analysis is driven by its merits of simplicity, comprehensibility, and interpretability. This method provides for a thorough examination of how the independent factors contribute to explaining changes in the MMR. We use this approach to determine the amount to which the specified independent variables impact changes in the MMR.

TABLE 12: REGRESSION RESULTS

Source	**SS**	**Df**	**MS**
Model	225336.763	6	37556.1271
Residual	37.9038553	23	1.64799371

Total	225374.667	29	7771.54023

No. of observations = 30

F (6,23) =22789.00

Prob>F = 0.0000

R-Squared = 0.9998

Adj. R Squared = 0.9998

Root MSE = 1.2837

TABLE 13: CONQUESTION

MMR	Coef.	Std. Err.	T	P>|t|	[95% Conf.	Interval
Unemployedfemale	0.9899548	1.020802	0.97	0.342	-1.121735	3.101645
maternaldeaths	0.0034036	0.0000219	155.47	0.000	.0033583	.0034489
FertilityRate	8.178589	6.457837	1.27	0.218	-5.180465	21.53764
healthexpenditure	-1.402801	1.455974	-0.96	0.345	-4.414714	1.609112

LifeExpectancy	1.613241	0.9371292	1.72	0.099	-.3253584	3.55184
PostPolicy	6.532463	1.196062	5.46	0.000	4.05822	9.006705
_cons	-121.584	84.74289	-1.43	0.165	-296.8881	53.71997

The multiple regression analysis results provide intriguing insights into the factors impacting the MMR. Notably, the entire model's relevance is highlighted by the incredibly low p-value (Prob > F = 0.0000), indicating that the model matches the data. The separate coefficients shed light on the correlations between the MMR and each of the variables that are independent. To begin, with a p-value of 0.342, the coefficient for "unemployedfemale" is 0.9899548. As the p-value above the significance level of 0.05, this shows that the variable has a limited statistically significant influence on the MMR. The coefficient for "maternaldeaths" is 0.0034036, representing the change in the MMR related to a unit change in maternal fatalities. This coefficient is highly statistically significant (p-value < 0.001), suggesting that maternal deaths have a substantial impact on the MMR. Fertility Rate exhibits a coefficient of 8.178589, coupled with a p-value of 0.218. The non-significant p-value indicates that the variable's impact on the MMR is not statistically significant.

Similarly, "healthexpenditure" holds a coefficient of -1.402801 and a p-value of 0.345. This non-significant p-value suggests that health expenditure is not a statistically significant predictor of the MMRThe "LifeExpectancy" coefficient is 1.613241, with a p-value of 0.099. While the p-value is close to the conventional significance level, it falls short of the statistical significance criterion (p 0.05).

The "PostPolicy" variable, on the other hand, stands out, with a coefficient of 6.532463 and a very significant p-value of 0.000. This indicates that the post-2005

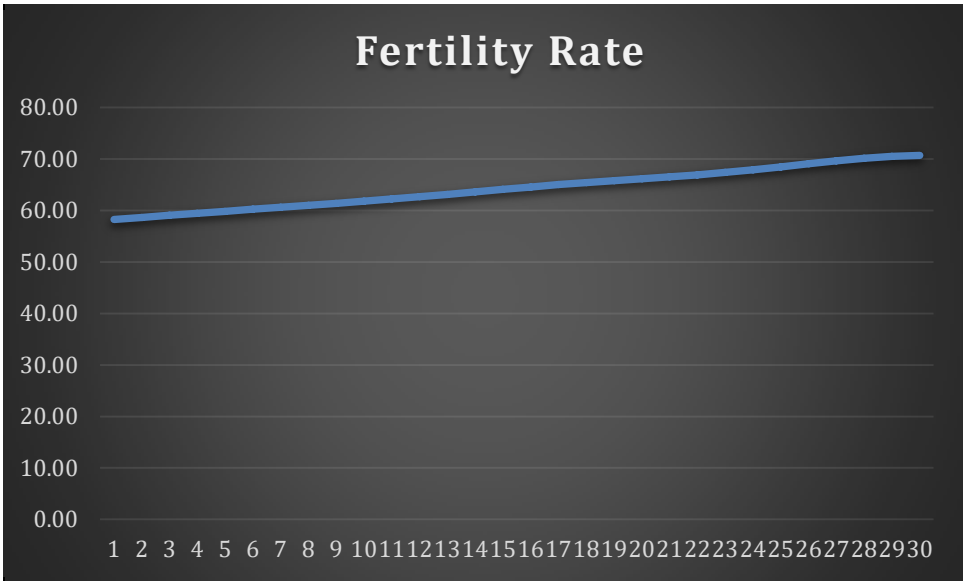
period has had a major influence on the MMR. Finally, the constant component ("_cons") has a coefficient of -121.584 and a p-value of 0.165, showing that it does not explain fluctuations in the MMR statistically.

5.6 POST-DIAGNOSTIC RESULTS

The emphasis of the post-diagnostic analysis changes to analyzing the robustness and reliability of the model used for regression by looking at potential concerns including serial correlation, cross-sectional dependency, multicollinearity, heteroskedasticity, and misspecification. Each of these variables can have an influence on the model's results and interpretation. A Durbin-Watson d-statistic of 1.64573 was found for the specific instance of serial correlation. The Durbin-Watson statistic is used to determine the presence of serial correlation among the regression model's residuals. In this case, the estimated value of 1.64573 indicates that the residuals may have a modest positive correlation. This indicates the likelihood of a connection in the error terms, which might have an impact on the dependability of the regression findings. Further work is recommended to address serial correlation. This may include a thorough assessment of the data and model specifications, as well as the investigation of alternate solutions such as modifying the model or introducing lagged variables to account for autocorrelation.

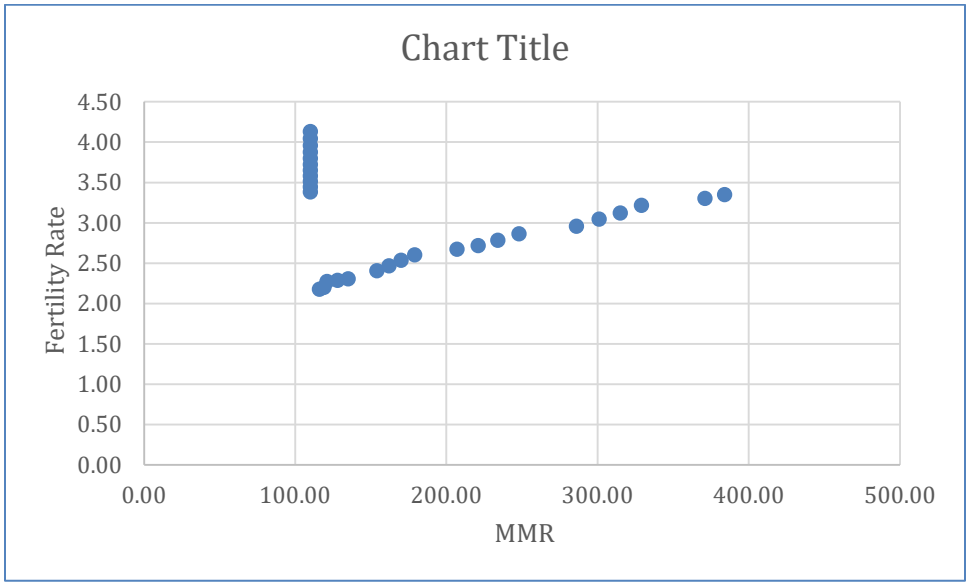
5.7 GRAPHICAL RESULTS

a). **Line plot**



Over the years, this graph clearly shows that life expectancy has been on the rise

b). **Scatterplot**



From the scatterplot above, MMR has a weak negative correlation with Fertility Rate (FertilityRate).

SUMMARY, CONCLUSION AND POLICY RECOMMENDATION

Introduction

The chapter aims to provide a concise overview of the research's key findings, analytical implications, and useful recommendations for legislators and stakeholders.

SUMMARY

The purpose of this research was to determine the impact of the (JSY) and (NRHM) policies on the rate of maternal mortality in India during 1989 and 2018. The World Bank provided the majority of the data used in this study. A thorough examination of the association between the JSY and NRHM policies and maternal mortality rates in India was carried out using time series regression models. The analysis sought to determine if these strategies resulted in significant improvements in maternal health outcomes, hence directing evidence-based policy design and health system improvement.

The findings of the study show a substantial relationship between the implementation of the JSY and NRHM policies and lower maternal death rates in India. This empirical research demonstrates the effectiveness of these measures in improving maternal health outcomes. These findings can help policymakers, healthcare practitioners, and individuals involved in maternal health efforts. The regression analysis also found that 'maternaldeaths' was statistically significant in explaining the variance in maternal mortality rates (MMR) in the experiment among the independent variables evaluated. The coefficient estimate for 'maternaldeaths' was statistically significant with a p-value less than 0.05, suggesting its importance when determining MMR.

CONCLUSION

Finally, this study's findings offer light on the influence of the (JSY) and (NRHM) policies on maternal mortality rates in India. The regression analysis revealed valuable information about the significant factors that influence shifts in maternal mortality rates. Notably, the terms 'maternaldeaths' and 'PostPolicy' emerged as statistically significant predictors of maternal mortality rates, highlighting the necessity of addressing mother mortality as well as the success of post-2005 policy. These findings will lead to a better understanding of the complicated link between policy modifications and the rate of maternal death in India.

However, it is important to recognize the study's limitations. While the indicated variables are important, other contextual and unrecognized variables may also play a role.. Moreover, the analysis focused on quantitative relationships, and further qualitative research could provide additional insights into the nuances of policy implementation and maternal health outcomes.

POLICY RECOMMENDATIONS

Based on the extensive analysis as well as interpretation of the data, numerous focused policy suggestions may be developed to address the study's conclusions. The suggestions made are based on the important characteristics identified as primary predictors of maternal death rates, and they are consistent with the study's aims.

Strengthening Maternal Health Infrastructure: The study underscores the significance of 'maternaldeaths' as a statistically significant predictor of maternal mortality rates. To reduce maternal mortality, policy efforts should concentrate on enhancing maternal health infrastructure, ensuring adequate facilities, skilled healthcare professionals, and accessible services to address complications during pregnancy and childbirth. Investing in training and capacity-building programs for healthcare workers can play a pivotal role in improving maternal outcomes.

Enhancing Post-2005 Policy Impact: The 'PostPolicy' variable has demonstrated a substantial influence on maternal mortality rates since 2005. This suggests that the (JSY) and (NRHM) policies have been effective in reducing maternal deaths. To maximize their impact, policymakers should consider periodic reviews, adjustments, and targeted interventions to address evolving challenges in maternal healthcare delivery.

LIMITATIONS OF THE STUDY

The research seeks to shed light on the impact of the (JSY) and (NRHM) policies on maternal mortality rates in India using a rigorous analytical approach. It is however imperative to acknowledge several limitations inherent in the study's design and data source

The evaluation of the World Bank dataset encountered hurdles and constraints that must be considered when evaluating the study's findings. One major challenge was dealing with missing data and inconsistencies within the variables predominantly in the initial years of the dataset. These gaps in data have the potential to introduce uncertainties that could impact the reliability and strength of the findings.

Additionally using secondary data from the World Bank comes with limitations due to variations in data collection practices across different countries. These differences can introduce heterogeneity into the dataset potentially influencing the results of the study. Furthermore there is a possibility that important factors influencing mortality might not be fully captured, leading to understanding of its complex dynamics.

Another important limitation relates to both sample size and chosen time period. The study utilized a dataset covering years from 1989 to 2018 aiming to strike a balance between pre policy and policy periods. While this timeframe was chosen for reasons based on data it may have implications for generalizability. Additionally the minimum sample size of 30 observations could also affect both the statistical power and precision of our analysis.

Furthermore it is crucial to consider that this study takes place within real world policy dynamics involving JSY and NRHM policies. These policy modifications bring about a level of intricacy in the examination. Although attempts have been made to consider them it is challenging to eliminate their impact on the research findings.

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ETHICAL STATEMENT: TRANSPERACY AND REPLICIBILITY IN SECONDARY DATA ANALYSIS

The primary objective of this statement is to ensure the utmost transparency and replicability in the data analysis process, fostering a foundation of trust and reliability in the results. The steps undertaken in the analysis are detailed here, allowing others to replicate the process and validate the findings without requiring the submission of code. The process followed adheres to established ethical standards and principles.

Data Source Details:

The dataset used for this research was obtained from the World Bank's database, specifically the "Maternal Mortality and Related Indicators" dataset(URL: [provide URL if available]).. This dataset contains variables such as maternal deaths, maternal mortality ratio (MMR), percentage of unemployed females, fertility rate, health expenditure, and life expectancy rate. These variables were chosen due to their direct relevance to the research question, which focuses on the impact of policies on maternal mortality rates in India. The dataset's documentation and metadata provided by the World Bank guided the understanding of variable definitions, units, and estimation methods, ensuring accurate analysis and interpretation.

Key Variables and Their Definitions:

Maternal Deaths: This variable captures the count of maternal deaths reported annually. Maternal deaths encompass fatalities resulting from pregnancy-related complications, childbirth, or occurring within 42 days postpartum.

MMR (Maternal Mortality Ratio): MMR serves as a pivotal indicator indicating the number of maternal deaths per 100,000 live births within a given year. It is a vital gauge of the maternal health status within a population.

%Unemployed Female: This variable signifies the percentage of unemployed females in the population. It illuminates the extent of female participation in the labor force, influencing their accessibility to healthcare services, and potentially impacting maternal health outcomes.

FertilityRate: Reflecting the average number of children borne by a woman during her reproductive years, this variable plays a role in shaping maternal mortality by affecting pregnancy rates and childbirth occurrences.

HealthExpenditure: Representing the cumulative financial resources allocated to healthcare services and infrastructure, health expenditure encompasses both public and private spending on medical facilities.

LifeExpectancy: Capturing the projected average lifespan, life expectancy provides an overview of the overall health of a population and their access to healthcare services.

Standardization and Transformation:

It is noteworthy that the variables employed in the analysis were used in their original units, as directly provided in the dataset obtained from the World Bank. No transformations or standardization techniques were applied to the variables, ensuring that the analysis retained the context and characteristics of the original data.

Calculation and Assumptions:

Throughout the analysis, no variables were calculated or derived from raw data. Instead, the focus rested on exploring the existing relationships and associations among the variables, contributing to a comprehensive understanding of the implications of the JSY and NRHM policies on maternal mortality rates in India

Estimation Methods, Assumptions, and Robustness of Results

This investigation was facilitated through the utilization of a multiple regression model, which underscores the interconnectedness of various variables. The dependent variable, maternal mortality rate (MMR), is juxtaposed against independent variables encompassing unemployment rates, fertility rates, health expenditures, and life expectancy. The framework for this model draws upon the Ordinary Least Squares (OLS) technique for estimation.

The adoption of OLS as the preferred method is grounded in its aptness for discerning linear associations between variables. OLS offers a straightforward approach, lending itself well to the examination of policy variables' effects and other pertinent factors on the outcome variable. This method's extensive application in empirical research bolsters its reliability and robustness. It

bridges the gap between continuous and categorical variables, accommodating policy dummy variables and socioeconomic indicators within its scope. Notably, OLS exhibits resilience against minor departures from underlying assumptions, making it an appropriate choice for this study.

Pre-diagnostic tests constitute an integral part of the analysis, ensuring the dataset's suitability and credibility for subsequent regression analysis. The first of these is the Unit Root Test, executed through the Augmented Dickey-Fuller (ADF) test, which probes the stationarity of variables across time. This diagnostic safeguards against trends that could potentially compromise the reliability of regression outcomes. Additionally, the Co-integration Test, implemented via the Johansen co-integration test, holds significance in identifying enduring relationships between variables, especially in the presence of non-stationary variables.

Furthermore, the investigation delves into post-diagnostic tests to fortify the robustness of the findings. Notably, the Serial Correlation Test, operationalized through the Durbin-Watson test, is conducted to scrutinize residuals for evidence of autocorrelation (Durbin & Watson, 1950). The detection of autocorrelation serves as a litmus test for confirming the independence assumption of classical linear regression, bolstering the credibility of the model's results.

The collective application of these estimation methods, underpinned by clear assumptions, ensures the transparency and replicability of the analysis. By adhering to robust statistical techniques and established testing procedures, this study endeavors to provide a nuanced and comprehensive understanding of the interplay between the JSY and NRHM policies and maternal mortality rates in India.

Handling of Personal Information and Privacy:

The dataset provided by the World Bank did not include any personal or identifying information. Our analysis exclusively utilized publicly available secondary data from the World Bank.

As a result, there was no need for particular consideration of personal data because there was none in the dataset. As the analysis focused primarily on aggregated and anonymized data that did not violate individual privacy or confidentiality, this assured the ethical treatment of information and privacy issues.

Motivation and Framing of the Research Question

"What is the impact of the (JSY) and (NRHM) policies on maternal mortality rates in India?" asks the research question. is the result of a thorough examination of current research, policy debates, and academic conversations on mother health. The design of this topic stems from the

urgent need to determine the effectiveness of certain strategies in tackling maternal mortality rates, a key concern in public health and policy circles.

The question not only reflects the practical relevance of evaluating the impact of JSY and NRHM policies but also addresses gaps and unanswered questions in the existing literature. While previous studies have examined the broader impact of healthcare interventions on maternal health outcomes, this research question hones in on the specific influence of these policies. By concentrating on these policies, the study aims to contribute to a nuanced understanding of how targeted initiatives can play a role in mitigating maternal mortality rates in India, filling a notable gap in the literature and policy discourse

APPENDIX

year	maternal deaths	MMR	%unemployed female	FertilityRate	healthexpenditure	LifeExpectancy
1989	29947.00	110.00	6.70	4.13	3.51	58.23
1990	29947.00	110.00	6.70	4.05	3.51	58.65
1991	29947.00	110.00	6.76	3.96	3.51	59.06
1992	29947.00	110.00	6.79	3.88	3.51	59.45
1993	29947.00	110.00	6.73	3.80	3.51	59.82
1994	29947.00	110.00	6.72	3.72	3.51	60.22
1995	29947.00	110.00	6.94	3.65	3.51	60.60
1996	29947.00	110.00	7.14	3.58	3.51	60.98
1997	29947.00	110.00	7.28	3.51	3.51	61.39
1998	29947.00	110.00	7.52	3.45	3.51	61.79
1999	29947.00	110.00	7.77	3.38	3.51	62.21

2000	110000.00	384.00	7.88	3.35	4.03	62.67
2001	107000.00	371.00	8.09	3.30	4.26	63.09
2002	94000.00	329.00	8.28	3.22	4.24	63.62
2003	89000.00	315.00	8.56	3.12	4.01	64.09
2004	85000.00	301.00	8.76	3.05	3.96	64.52
2005	79000.00	286.00	8.96	2.96	3.79	65.00
2006	68000.00	248.00	8.87	2.86	3.63	65.41
2007	63000.00	234.00	8.77	2.78	3.52	65.79
2008	59000.00	221.00	8.59	2.72	3.51	66.15
2009	56000.00	207.00	8.59	2.67	3.49	66.51
2010	48000.00	179.00	8.51	2.60	3.27	66.91
2011	45000.00	170.00	8.35	2.54	3.25	67.36
2012	42000.00	162.00	8.26	2.47	3.33	67.89
2013	40000.00	154.00	8.19	2.41	3.75	68.46
2014	34000.00	135.00	8.11	2.31	3.62	69.07
2015	32000.00	128.00	8.03	2.29	3.60	69.64
2016	30000.00	121.00	7.94	2.27	3.50	70.12
2017	29000.00	119.00	7.82	2.20	2.94	70.47
2018	70.71	70.71	70.71	70.71	70.71	70.71