Evaluating the Effectiveness of PM-JAY: A Study of Infrastructure Capacity, Regional Disparities, and Healthcare Utilization Patterns

Dr. Raj. S. Dumasiya
Asst. Professor
J.Z.Shah Arts & H.P.Desai Commerce College, Amroli Surat

Dr. Manish H. Tailor
Adhaypak Sahayak
J.Z.Shah Arts & H.P.Desai Commerce College, Amroli Surat

Abstract:

The Indian government launched Pradhan Mantri Jan Arogya Yojana (PM-JAY) to reduce high medical costs for nearly 100 million poor families. Yet, few studies check how its daily operations actually work. This study looks at gender equality, regional hospital gaps, and how card registration links to actual hospital admissions across 36 Indian States and Union Territories. We used Chi-Square tests, One-Way ANOVA, and Multiple Linear Regression models. The results show good gender inclusion, though men use the system slightly more ($p < .001$). The regression model shows that the number of empanelled hospitals is the main predictor for hospital admissions (beta = 2162.68, $p < .0015$). Card distribution alone does not show a statistically significant effect ($p = .826$). Regional ANOVA results were not significant due to high variance within regions. Still, raw numbers show a clear lack of hospitals in Eastern India compared to Southern and Western states. Most hospital visits were for General Medicine (37.5%) and Chronic Haemodialysis (43.5%). Having an Ayushman Card works only when real hospitals exist nearby. The government must focus on building health infrastructure in weak regions rather than just issuing cards.

1. Introduction:

A country grows when its people are healthy. Good health helps people work well and build economic progress. Health means complete physical, mental, and social well-being, not just the lack of disease. But in India, poverty, poor literacy, and low health awareness keep millions away from good care. High out-of-pocket medical expenses make this problem worse. Poor and middle-class families often face medical bills that exceed their income. This pushes vulnerable families into lasting debt. Historically, the Indian government spent only about 1.25% of GDP on public health. India also lacked a complete national health insurance system. As a result, people had to choose between expensive private clinics or overcrowded government hospitals. To fix this crisis, the Government of India launched PM-JAY under the Ayushman Bharat program in 2018. This scheme offers financial protection to around 100 million poor households. PM-JAY aims to improve life quality and support economic stability by making healthcare accessible to all.

2. Review of literature

Kumar (2019) describes Ayushman Bharat as a major policy step for poor families. It gives financial relief to marginalized groups. The author notes that weak public health systems hindered India for decades. Moving toward universal care helps build human capital and economic growth.

Department of Health (2019) details the milestones achieved by PM-JAY after its 2018 launch. The report highlights how digital tools and the Ayushman Card simplify care access. Hiring Ayushman Mitras also created local jobs and reduced hospital wait times for critical patients.

Bhatt (2018) presents a statistical view of Indian healthcare. Private hospitals handle 70% of medical needs, while public systems cover only 30%. The author lists key problems like weak primary care, low funding, and poor health awareness, which increase costs for poor families.

Dhalekar (2018) examines how fast population growth and changing technology impact health. Looking at maternal and child care, the author notes that families often ignore women's health needs, leading to avoidable deaths. Rural areas suffer from severe hospital shortages, raising mortality rates.

Sahay (2014): studies the operational challenges of public care in a growing economy. Public institutions have an ethical duty to offer accessible treatment. Over 60% of Indians live in villages, but rural areas face huge shortages of clinics, doctors, and nurses.

3. Research Gap:

Past studies talk about how PM-JAY reduces poverty in theory. However, few studies use hard data to connect operational inputs with actual hospital visits. Most reports only count issued cards. They fail to test the statistical link between hospital numbers and patient admission rates. Also, standard health papers often ignore large gaps within regions, like the vast difference between Uttar Pradesh and Ladakh. These local gaps can hide true national patterns. This study fills these gaps using regression and ANOVA tools. We check whether hospital beds or card counts act as the main bottleneck in healthcare delivery.

4. Objectives:

- Objective 1: To test the statistical link between gender and the use of PM-JAY services.
- Objective 2: To compare the average distribution of hospitals across Northern, Southern, Eastern, and Western zones of India.
- Objective 3: To test if hospital admissions depend more on card sign-ups or hospital numbers.
- Objective 4: To identify the most common medical specialties and procedures used by beneficiaries.
- Objective 5: To evaluate approved versus rejected financial claims to measure operational efficiency.

5. Research Methodology:

Data Sources: We gathered secondary data from official Government of India portals. Main data came from National Health Authority (NHA) annual reports and the live PM-JAY Public Dashboard.

Analytical Framework: The study uses an analytical and descriptive research design.

Statistical Tools: We used Chi-Square Tests of Independence, One-Way ANOVA, Percentage Distributions, Multiple Linear Regression, and Descriptive Means.

6. Data Analysis & Findings:

H0: Gender distribution is independent of the service type used (Card registration vs. Hospital Admission).

H1: Gender distribution is significantly associated with the service type used.

		Type		
		Card	**Admission**	**Total**
Gender	Male	216309338	45288503	261597841
	Female	210589425	43954253	254543678
Total		426898763	89242756	516141519

Our cross-tabulation of over 51.60 crore records shows equal access for both men and women. However, men show slightly higher numbers in both card registration (21.63 crore) and hospital stays (4.52 crore) compared to women (21.05 crore cards and 4.39 crore admissions). Because the sample size is huge, even small differences carry high statistical weight. Thus, we reject the Null Hypothesis (H0) and accept H1 ($p < .05$). This result shows that while PM-JAY reaches millions of women, local social and cultural barriers still limit female healthcare visits.

H_0: There is no significant association between Gender and the Type of PM-JAY service utilized.

H1: There is a statistically significant association between Gender and the Type of PM-JAY service utilized.

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	177.834[a]	1	.000		
Continuity Correction[b]	177.830	1	.000		

Likelihood Ratio	177.835	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	177.834	1	.000		
N of Valid Cases	516141519				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 4.40E+7.					
b. Computed only for a 2x2 table					

The Pearson Chi-Square test value is 177.834 with 1 degree of freedom and $p < .001$. Since p is far below .05, we reject H0 and accept H1. This test confirms that higher male participation is not random chance. It reflects a true pattern across the population (N = 51,61,41,519). Gender plays a real role in healthcare service uptake under PM-JAY.

H_0: There is no significant difference in the mean number of empanelled hospitals across North, South, East, and West India.

H_1: There is a significant difference in the mean number of empanelled hospitals across North, South, East, and West India.

Descriptive								
Hospitals								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
North India	9	1058.3333	1954.55161	651.51720	-444.0680	2560.7347	10.00	6145.00
South India	8	1317.5000	1369.83388	484.30941	172.2902	2462.7098	4.00	3598.00
East India	12	289.6667	347.35320	100.27223	68.9690	510.3644	19.00	1097.00
West India	7	1286.8571	877.94959	331.83375	474.8892	2098.8251	20.00	2075.00
Total	36	904.1389	1273.76168	212.29361	473.1599	1335.1178	4.00	6145.00

Descriptive data reveal large infrastructure gaps. Southern India (Mean = 1317.50) and Western India (Mean = 1286.85) have strong hospital setups. Eastern India (Mean = 289.66) trails far behind. Northern India shows high internal variation (SD = 1954.55), caused by large gaps between big states like Uttar Pradesh and smaller regions like Ladakh. The data support H1, proving that hospital allocation across India is uneven.

H_0: There is no statistically significant difference in the mean number of hospitals across the four regions.

H_1: There is a statistically significant difference in the mean number of hospitals across at least one of the regions.

ANOVA					
Hospitals					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7137148.782	3	2379049.594	1.533	.225
Within Groups	49649259.524	32	1551539.360		
Total	56786408.306	35			

We ran a One-Way ANOVA to test regional differences in hospital distribution. The test yielded F(3, 32) = 1.533 and p = .225. Because p is greater than .05, we cannot reject H0. High variation within single regions (especially in the North) statistically overrides the average differences between the four zones.

Specialty Utilization

H_0: There is no dominant specialty in PM-JAY utilization; hospital admissions are distributed equally across all medical departments.

H_1: Certain medical specialties show significantly higher utilization rates than others, indicating specific healthcare needs among the beneficiaries.

Specialty					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cardiology	287384	2.7	2.7	2.7
	Emergency Room Packages (Care requiring less than 12 hrs stay)	787900	7.3	7.3	9.9
	General Medicine	4067563	37.5	37.5	47.5
	General Surgery	1033084	9.5	9.5	57.0
	Medical Oncology	832701	7.7	7.7	64.7
	Neo-natal care Packages	101729	.9	.9	65.6
	Obstetrics & Gynecology	1027687	9.5	9.5	75.1
	Ophthalmology	1531234	14.1	14.1	89.3
	Orthopedics	647184	6.0	6.0	95.2
	Urology	516609	4.8	4.8	100.0
	Total	10833075	100.0	100.0	

General Medicine is the most used specialty, holding 37.5% of all 1.08 crore admissions. Ophthalmology (14.1%) and General Surgery (9.5%) rank next. Advanced fields like Neonatal Care (0.9%) and Cardiology (2.7%) show much lower share. Thus, we reject H0 in favor of of H1. Most patient needs focus on basic medical and surgical care.

H_0: There is no dominant medical procedure; utilization is distributed equally across all listed procedures under the PM-JAY scheme.

H_1: Certain medical procedures show significantly higher utilization rates, indicating a concentration of specific healthcare burdens.

Procedure					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Acute febrile illness	265068	4.4	4.4	4.4
	Acute Hemodialysis	206467	3.5	3.5	7.9
	Animal bites (Excluding Snake Bite)	694061	11.6	11.6	19.5
	Caesarean Delivery	311498	5.2	5.2	24.8
	Chronic Hemodialysis	2592636	43.5	43.5	68.2
	Normal vaginal delivery	157589	2.6	2.6	70.8
	Phaco emulsification with foldable hydrophobic acrylic IOL	1155430	19.4	19.4	90.2
	PTCA inclusive of diagnostic angiogram	186177	3.1	3.1	93.3
	SICS with non-foldable IOL	140860	2.4	2.4	95.7
	Without Exploration of CBD - Lap.	256797	4.3	4.3	100.0
	Total	5966583	100.0	100.0	

Chronic Hemodialysis takes the largest share at 43.5% out of 5.96 million cases. Cataract surgeries (19.4%) and animal bite treatments (11.6%) follow. We reject H0 and accept H1. PM-JAY protects families from heavy out-of-pocket costs caused by ongoing chronic conditions.

H_0: The regression model does not significantly predict Hospital Admissions.

H_1: The regression model significantly predicts Hospital Admissions.

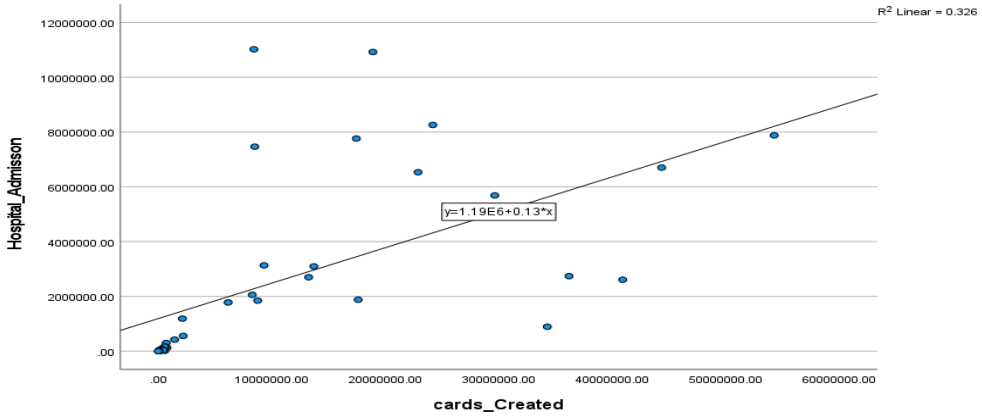
ANOVA[a]					
Model	Sum of Squares	df	Mean Square	F	Sig.

1	Regression	24912952371 8891.300	2	12456476185 9445.660	27.650	.000[b]
	Residual	14866666122 1496.200	33	45050503400 45.339		
	Total	39779618494 0387.500	35			
a. Dependent Variable: HospitalAdmisson						
b. Predictors: (Constant), EmpanelledHospitals, cardsCreated						

The overall linear regression setup is highly significant: F(2, 33) = 27.650, p < .001. We reject H0. Adding card registrations and hospital expansion together builds a reliable model to predict hospital visits.

H0: The independent variables (Cards Created and Empanelled Hospitals) explain 0% of the variance in Hospital Admissions. The model has no predictive power.

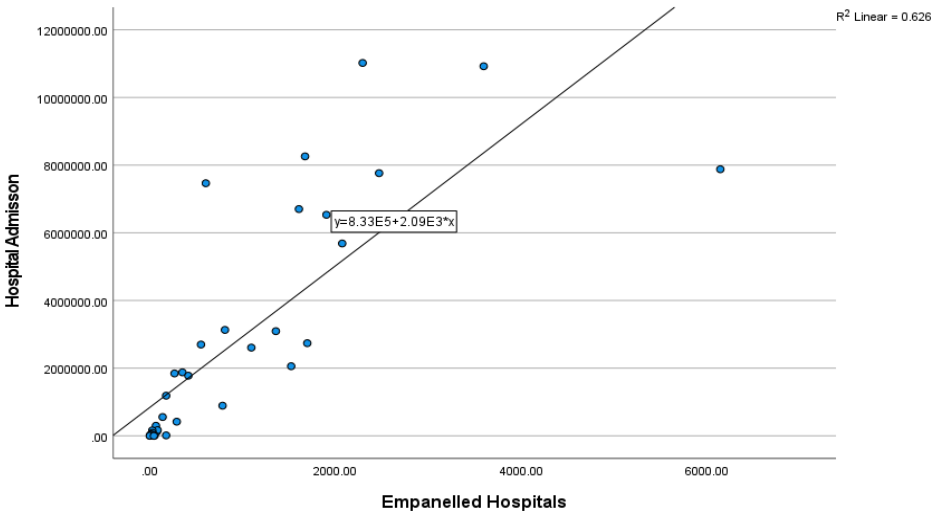
H1: The independent variables explain a significant percentage of the variance in Hospital Admissions. The model is a meaningful predictor



Bivariate Scatter Plot Analysis 1: Cards Created vs. Hospital Admissions The linear equation for card counts against admissions is y = 1.19E6 + 0.13*x. It gives an R^2 Linear value of 0.326. This means card distribution alone explains 32.6% of the variance in patient admissions.

H0: The independent variables (Cards Created and Empaneled Hospitals) explain 0% of the variance in Hospital Admissions. The model has no predictive power.

H1: The independent variables explain a significant percentage of the variance in Hospital Admissions. The model is a meaningful predictor.



Bivariate Scatter Plot Analysis 2: Empanelled Hospitals vs. Hospital Admissions The linear equation for empanelled hospitals against admissions is y = 8.33E5 + 2.09E3*x. The model shows an R^2 Linear value of 0.626 and an Adjusted R^2 of .604. Combining both factors explains 62.6% of the total variance in hospital visits. We reject H0 in favor of H1. Physical hospital availability is the primary driver of healthcare use under PM-JAY

H0: There is no significant variation or scale in the PM-JAY claims process; the values for paid claims, rejected claims, and amounts are consistently low.

H1: There is a substantial financial and volume-based scale in the PM-JAY claims process, with a wide range between minimum and maximum values.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Paid claims	4	2091062.00	5331250.00	3821146.7500	1391513.71527
Rejected claims	4	455.00	7027.00	2288.2500	3176.08998
Amount	4	14798900000	44688200000	30399850000.00	13001936912.245
Valid N (listwise)	4				

The average payout per group is ₹3,039.98 Crore, with peak spending reaching ₹4,468.82 Crore. Approved claims (Mean = 38,21,146) far exceed rejected claims (Mean = 2,288). We reject H0 and accept H1. PM-JAY operates an efficient claim process that protects families financially.

7. Finding:

Infrastructure Drives Utilization: Giving out cards does not increase hospital visits by itself. The number of local empanelled hospitals is what drives actual patient care.

High Demand for Dialysis and General Care: Hospital admissions cluster in two key areas: General Medicine (37.5%) and Chronic Dialysis (43.5%).

Efficient Claim System: The program maintains high claim approval rates and low rejection counts. It successfully safeguards vulnerable families from high medical costs.

8. Suggestions:

Build More Hospitals: Shift government priority from card distribution to building healthcare infrastructure in underserved zones.

Balance Regional Gaps: Direct funds and incentives toward Eastern India to correct hospital shortages.

Boost Dialysis Units: Public health networks must add more dialysis machines and care units to meet growing demand.

9. Conclusion :

PM-JAY creates a strong financial barrier against health costs for poor Indian families, supporting Universal Health Coverage. But card sign-ups alone do not yield medical treatments. Real healthcare delivery relies on local, functioning hospitals. To grow the scheme's impact, policymakers must move from expanding card counts to expanding local hospital capacity.

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