

Evaluating Health Service Accessibility and Adequacy through UPHCs in Slum Areas of Kurnool under NUHM: An Empirical Analysis

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Abstract

This study empirically examines the effectiveness of the National Urban Health Mission (NUHM) in improving healthcare accessibility and adequacy through Urban Primary Health Centers (UPHCs) in slum areas of Kurnool District. Using comprehensive primary data from 400 beneficiaries, healthcare providers, ASHA workers, ANMs, and administrative staff analyzed in SPSS, the study tests three key hypotheses linking UPHC awareness, socio-economic factors, and service adequacy to healthcare outcomes. Results reveal robust positive associations: UPHC awareness strongly predicts service utilization ($\chi^2=24.623$, $p<0.001$), socio-economic factors influence access equity ($\chi^2=21.752$, $p=0.001$), and service adequacy correlates with beneficiary satisfaction ($\chi^2=35.933$, $p<0.001$). Healthcare provider analysis confirms that infrastructure quality and staffing adequacy are interconnected ($\chi^2=100.000$, $p<0.001$), while effective coordination reduces operational challenges ($\chi^2=73.510$, $p<0.001$). Association measures reveal strong relationships: Gamma=0.612 for awareness-utilization, Lambda=0.425 for income-awareness, and Cramér's V=0.378 for service adequacy-satisfaction. The findings highlight NUHM's positive impact on urban slum healthcare delivery, offering actionable insights for policymakers enhancing urban health programs and healthcare administrators optimizing service delivery. This study contributes to emerging-market healthcare literature by quantifying NUHM's effectiveness with robust empirical evidence from India's urban health landscape.

Keywords: National Urban Health Mission, Urban Primary Health Centers, healthcare accessibility, equity, slum healthcare, Kurnool, India

Introduction

The incorporation of comprehensive healthcare services into urban slum populations has become increasingly significant for emerging economies. In India, the National Urban Health Mission (NUHM), launched in 2013 as part of the National Health Mission, has positioned urban healthcare delivery at the center of public health policy. The mission mandates Urban Primary Health Centers (UPHCs) to serve as primary service delivery points for urban slum populations, reflecting the

increasing significance of accessible healthcare in rapidly urbanizing areas. Yet, the effectiveness and quality of NUHM implementation differ considerably between regions and cities. This requires critical questions regarding the drivers of successful healthcare delivery through UPHCs. Recognizing these drivers is vital for healthcare administrators, policymakers, and public health professionals interested in fostering equitable health outcomes.

This research targets the slum areas of Kurnool District, which represent typical challenges faced by urban health programs in emerging Indian cities. Kurnool's urban slums are suitable for analysis of NUHM effectiveness since they encompass diverse socio-economic populations under varying levels of healthcare infrastructure development. The study analyzes three important relationships: the impact of UPHC awareness on healthcare service utilization, the influence of socio-economic factors on access equity, and the effect of service adequacy on beneficiary satisfaction. The analysis is based on comprehensive data from 400 beneficiaries, healthcare providers, ASHA workers, ANMs, and administrative staff across multiple UPHCs in Kurnool's slum areas. Statistical testing was carried out using SPSS with Chi-square tests, association measures (Gamma, Lambda, Cramér's V), and descriptive analysis to establish robust results. The study analyzes three precise hypotheses concerning the associations between NUHM interventions and healthcare outcomes.

UPHC Awareness and Healthcare Service Utilization

Previous research suggests that community awareness of available healthcare services is fundamental to improving utilization patterns in resource-constrained settings. Health behavior theory explains this relationship by arguing that awareness creates the necessary conditions for healthcare-seeking behavior, leading to increased service utilization (Vohra & Thakur, 2022). The health belief model also supports this view, suggesting that informed communities are better positioned to recognize health needs and seek appropriate care.

International research has reported favorable correlations between healthcare awareness campaigns and service utilization. Programs with robust awareness components have been observed to have higher utilization rates and more consistent healthcare-seeking patterns (Venkatesh et al., 2024). In India, it has been observed that NUHM's community outreach initiatives have been linked to enhanced primary healthcare utilization in urban areas.

The SPSS results present robust evidence for the first hypothesis that UPHC awareness strongly predicts healthcare service utilization levels. The relationship between awareness of UPHCs and frequency of visits is extremely strong ($\chi^2=24.623$, $df=3$, $p<0.001$), showing a highly significant association. The Gamma coefficient indicates that the ordinal association between awareness and visit frequency is substantial (Gamma=0.612, $p<0.001$), demonstrating a strong positive relationship that persists across different levels of awareness.

These results strongly affirm prior literature and theory. The high Chi-square value (24.623) is more profound than numerous prior studies have discovered, implying that awareness campaigns might be especially effective for healthcare utilization in urban slum contexts (Snehashish Raichowdhury et al., 2023). This could be due to the selectivity of the community engagement approach adopted by NUHM through its effective awareness programs, so that communities can navigate the available healthcare services better.

The results establish that recipients having high levels of awareness of the available services, facilities, and treatment at UPHC are highly likely to use healthcare facilities on a regular basis. This implies that awareness campaigns form an appropriate basis in terms of successful healthcare provision and sustainable use trends (Sivanandan et al., 2020).

Socio-Economic Factors and Access Equity

The socio-economic status is also very significant in healthcare access, as there are disparities in access given the prevailing barriers, resources, and opportunities that individuals in different income groups have access to. It is proven that income levels significantly influence healthcare-seeking behavior because higher-income households tend to have better health literacy and fewer financial barriers to care (Player, 2019). Economic constraints may limit healthcare access, whereas higher socio-economic status facilitates better health outcomes through multiple pathways.

The research largely confirms the connection between socio-economic factors and healthcare access equity, where income groups show significant associations with UPHC awareness ($\chi^2=21.752$, $df=5$, $p=0.001$). The Lambda coefficient (Lambda=0.425, $p=0.001$) supports the relationship between income levels and awareness patterns. This research expands previous studies by demonstrating that while NUHM has made progress toward equity, socio-economic factors continue to influence access patterns.

The significant Chi-square statistic implies that healthcare programs must address socio-economic disparities through targeted interventions rather than universal approaches alone (Park et al., 2022). The rates of awareness and accessibility in different income groups vary, which means that the equity goals should be targeted by paying specific attention to the economically deprived groups.

The Lambda that is 0.425 indicates that, along with being significant, the income and awareness relationship is also practically interpretable. This supposes that initiatives aimed at addressing the issue of healthcare disparity should pay special attention to the income-related disparities and devise relevant outreach guidelines that will assist low-income populations (National Health Systems Resource Centre, 2023).

Service Adequacy and Beneficiary Satisfaction

A holistic method of examining the quality of healthcare services is to evaluate the correlation that exists between the types of services (given) and the level of satisfaction among the beneficiaries. The service adequacy includes the extent of services and their qualities according to the opinions of users (Kumar et al., 2023). Studies depict that programs covering a wide and high-quality amount of services provided in healthcare programs are more satisfied and more accepted by the community.

The research findings have shown that service adequacy guarantees proper fulfilment of the healthcare needs, and the beneficiaries get care fitting their health needs. Proper coverage is also sufficient in ensuring health programs can counter divergent health challenges in society (Jaya, 2016).

Strong evidence proves the third hypothesis concerning the enhancement of the level of service adequacy on the satisfaction of beneficiaries. Different types of services utilized show significant associations with satisfaction levels across beneficiaries. Both the descriptive analysis and Chi-square test ($\chi^2=35.933$, $df=12$, $p<0.001$) show substantial differences in satisfaction based on service types. The Cramér's V coefficient indicates that service adequacy results in meaningful satisfaction improvements (Cramér's $V=0.378$, $p<0.001$).

These results offer firm empirical evidence of the importance of comprehensive service delivery approaches. The strong association (Cramér's $V=0.378$) suggests that service adequacy significantly impacts beneficiary satisfaction in practice, rather than merely statistically. This is consistent with healthcare quality literature but offers very strong evidence from the urban slum context in India (Gupta & Guin, 2015).

The findings from both parametric and descriptive analyses establish the consistency of the results. This indicates that comprehensive service offerings ensure the focused attention and expertise required to enhance healthcare outcomes and beneficiary satisfaction. Programs without adequate service diversity might not have the necessary scope to guarantee high-quality healthcare delivery (Das et al., 2020).

Healthcare Provider Infrastructure and Operational Effectiveness

The relationship between healthcare infrastructure and operational effectiveness has been widely researched with typically positive results. Infrastructure quality affects service delivery capacity, staff performance, and overall healthcare outcomes. The mechanisms by which infrastructure influences healthcare delivery include enhanced operational efficiency, improved service quality, better staff retention, and increased capacity to handle diverse health needs (Chaudhuri, 2012).

Research suggests that infrastructure improvements result in better resource management and service delivery over the long term, while inadequate infrastructure can constrain even well-designed healthcare programs.

The empirical results strongly support the relationship between infrastructure quality and operational effectiveness. Infrastructure quality has significant positive associations with staffing adequacy ($\chi^2=100.000$, $p<0.001$). The analysis comparing well-equipped and poorly-equipped facilities shows significant operational differences across all measures studied.

These findings present strong evidence for infrastructure investment in healthcare delivery systems. That infrastructure quality enhances staffing adequacy, resource availability, and coordination effectiveness indicates that infrastructure benefits are comprehensive rather than concentrated on specific operational aspects (Bhadoria et al., 2025).

The results are stronger than those of many earlier studies, which tend to identify moderate associations between infrastructure and operational outcomes. This may indicate that infrastructure improvements are especially beneficial in resource-constrained settings such as urban slums, where infrastructure investments might offer higher returns due to baseline deficits. The evidence indicates that programs investing in infrastructure improvements will experience enhancement in multiple operational dimensions simultaneously (Banerjee et al., 2012).

Coordination Mechanisms and Program Implementation

One of the factors that has become instrumental to successful healthcare delivery is effective coordination between different healthcare workers and administrative levels. Most successful healthcare programs have incorporated coordination mechanisms that facilitate communication, resource sharing, and collaborative service delivery between providers, field workers, and administrative staff (Balarajan et al., 2011).

It has been found that coordination mechanisms are essential for addressing complex healthcare challenges that require multi-level interventions. Coordination helps healthcare programs to build on the breadth of disparate expertise and resources, without duplicating services or leaving service gaps.

The effectiveness of coordination reduces the difficulty in program implementation based on the findings of the analysis, with the help of the healthcare provider data. The effectiveness of coordination and program difficulties are closely related ($2=73.510$, $p<0.001$), which is considered to be a great connection in the study. The review makes it clear that a well-coordinated mechanism can limit the strain that the operation involves and also the implementation challenges (Vohra & Thakur, 2022).

This finding implies that the elements of coordination may be regarded as factors that define success in the implementation of healthcare programs. The high coordination between health professionals, ASHA workers, ANMs and administrative staff helps the programs work better on issues as compared to their scattered working style.

The large Chi-square value represents the coordination effects as operationally significant in addition to being significant at the statistical level (Venkatesh et al., 2024). It means that the programs focused on the enhancement of implementation effectiveness should be more concerned with the coordination mechanisms and invest in systems that will help to establish the communication and multi-partite work across the levels of healthcare delivery.

Overall Discussion and Implications

The study establishes that a number of drivers linked with awareness, equity, efficacy of services and infrastructure and coordination are key factors that dictate the effectiveness of NUHM and improvement in healthcare delivery outcomes.

Hypothesis	Relationship Tested	Statistical Output	p-value	Interpretation
H1	UPHC Awareness → Service Utilization	$\chi^2=24.623$; Gamma=0.612	<0.001	Strong awareness campaigns are associated with significantly higher healthcare utilization rates.
H2	Socio-Economic Factors → Access Equity	$\chi^2=21.752$; Lambda=0.425	0.001	Income levels influence awareness patterns, indicating need for targeted equity interventions.
H3	Service Adequacy → Beneficiary Satisfaction	$\chi^2=35.933$; Cramér's V=0.378	<0.001	Comprehensive service offerings are associated with higher satisfaction levels across beneficiaries.

Statistical analysis provided a strong direction to all three hypotheses, as it was portrayed that NUHM interventions and healthcare outcomes had a significant correlation with each other. The strong correlations which were established (Chi-square values were above 20) show that these drivers are also equally important towards the delivery of healthcare in the urban area in the

conditions of an emerging market.

The findings illustrate straightforward guidelines for healthcare administrators with regard to the aspects of the program that contribute to effective healthcare delivery. It is recommended to focus on the intensive awareness-raising efforts of the program, the socio-economic inequalities improvement where the program should focus on the relevant interventions, the variety of services offered by the program and not appear as insufficient, the improvement of the infrastructure of the program, and finally, the proper sourcing of the program (Sivanandan et al., 2020). The connection of service adequacy with satisfaction makes a good argument in favour of all-embracing healthcare approaches.

Significantly, the findings for policymakers show that program awareness and the quality of infrastructure are good predictors of healthcare outcomes. Such insights will help policymakers develop programs that are effective in reaching target populations as well as sustainable delivery of the services and satisfaction of the representatives.

To program implementers, the results affirm the necessity to strengthen the mechanisms of coordination and the delivery of structured processes to resolve the operational issues (Player, 2019). The findings also suggest that the mobilisation of the community, or breaking down the socio-economic impediments, can initiate widespread success in the process of urban healthcare delivery.

Limitations and Future Research

The study focuses on urban slum areas in a single district, which may limit the generalizability of findings to different urban contexts with varying socio-economic conditions and healthcare infrastructure. Future research could examine whether these relationships hold across different districts and urban settings, and could use longitudinal data to better establish causal relationships between NUHM interventions and health outcomes.

Due to the cross-sectional nature of the study design, this research cannot confirm causality between variables. The reported associations, while robust, may be influenced by unmeasured factors such as local health conditions, community characteristics, or implementation variations. To better isolate causal effects, future research could employ experimental or quasi-experimental designs that leverage natural variation in program implementation.

The study also focuses primarily on process indicators and beneficiary perceptions rather than clinical health outcomes. Future research could incorporate health outcome measures such as morbidity rates, immunization coverage, and maternal health indicators to provide a more comprehensive evaluation of NUHM's health impact.

Conclusion

This study provides comprehensive evidence of strong positive relationships between NUHM interventions and healthcare delivery effectiveness in urban slum areas of Kurnool District. The findings demonstrate that UPHC awareness, service adequacy, infrastructure quality, and coordination mechanisms are significant drivers of healthcare utilization, access equity, and beneficiary satisfaction.

The research contributes important evidence to the growing literature on urban health programs and provides practical guidance for healthcare administrators, policymakers, and program implementers. The strong statistical relationships found across all hypotheses suggest that investing in comprehensive awareness campaigns, adequate service delivery, and robust coordination structures can deliver both improved healthcare access and enhanced community satisfaction.

As urban health challenges become increasingly central to public health policy and program implementation, understanding the drivers of effective healthcare delivery becomes crucial for sustainable health system strengthening. The findings support the view that programs with comprehensive approaches addressing awareness, equity, adequacy, infrastructure, and coordination are best positioned to succeed in the evolving landscape of urban healthcare delivery.

The evidence from Kurnool's experience demonstrates that NUHM can achieve meaningful improvements in healthcare accessibility and adequacy when implemented with attention to these critical success factors, providing a foundation for scaling similar approaches across India's rapidly growing urban areas.

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