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The Efficiency of Secondary-level Hospitals in Hard-to-reach and non-hard-to-reach Areas in Bangladesh: A Data Envelopment Analysis Approach

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Title. Comparing the Efficiency of Secondary-level Hospitals in Hard-to-reach and non-hard-to-reach Areas in Bangladesh: A Data Envelopment Analysis Approach

Abstract

Background: Efficiency in healthcare delivery is crucial for maximizing resource utilization and achieving broader health system objectives, particularly in resource-constrained settings like hard-to-reach (HTR) areas in Bangladesh. Despite people in these areas facing barriers in accessing health services, health facilities have not undergone comparative efficiency evaluations with facilities in non-hard-to-reach (non-HTR) areas.

Objectives: The study's aim was to assess the association between HTR area characteristics and the technical efficiency of secondary-level hospitals.

Methods: Data envelopment analysis was performed with output orientation to calculate the efficiency scores of 62 secondary-level hospitals using both constant and variable returns to scale assumptions. We used the number of physicians, nurses and beds available in the hospitals as the inputs for service production. The number of different types of services provided by the hospitals, namely, antenatal care, normal deliveries, postnatal care, outdoor department visits, and hospital admission, were included as the output variables. These input and output data for each hospital were extracted from the Local Health Bulletin-2022 of the Directorate General of Health Services in Bangladesh. Using the Water and Sanitation Program report published by the World Bank in 2012, geographic locations with specific characteristics, such as beel/wetland, coastal, offshore island, saline, and hilly areas, were categorized as HTR areas. We conducted descriptive analysis and performed a Mann-Whitney two-sample statistic test to test the mean difference of efficiency scores between the HTR and non-HTR areas. Finally, multiple Tobit regression models were employed to determine the association between HTR area characteristics and hospital efficiency while adjusting for bed occupancy ratio, average length of stay and administrative division.

Results: The findings revealed that, on average, hospitals were 73% and 80% efficient using constant and variable returns to scale assumptions, respectively. Hospitals located in HTR areas were relatively less technically efficient (efficiency score = 0.76) than those in non-HTR areas (efficiency score = 0.84), and the differences were statistically significant (p-value = 0.08) when the variable returns to scale assumption were used. Similar significant differences in efficiency scores (p-value = 0.06) were observed between these two groups of hospitals when constant returns to scale assumptions were

used. The regression analysis results showed that hospitals in HTR areas experience lower efficiency scores (coefficient = 0.258; p-value < 0.05) than hospitals in non-HTR regions. Additionally, the bed occupancy ratio and average length of stay were significantly associated with the efficiency scores of secondary-level hospitals.

Conclusion: Hospitals in HTR regions are found to be less technically efficient than non-HTR regions in Bangladesh. Policymakers should address the underlying causes of inefficiencies and implement targeted interventions such as improving healthcare access for vulnerable HTR area populations, optimizing bed occupancy rates and length of stay with proper referral systems and discharge planning in these particular areas. This indicates that further research on health systems in climate-vulnerable areas in Bangladesh should be prioritized to address these challenges effectively.