



# A Review of the Hub-and-Spoke Model's Operational Efficiency for Essential Medicine Distribution in the Amhara Region, Ethiopia

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## Abstract

The equitable and reliable distribution of essential medicines remains a challenge in low-resource health systems. In Ethiopia's Amhara Region, a hub-and-spoke model was adopted to improve the supply chain for primary health facilities. This model centralises inventory management at regional hubs for distribution to peripheral spokes. This review assesses the reported operational efficiency of the hub-and-spoke model for distributing essential medicines in the Amhara Region. It evaluates its impact on key performance indicators, including stock availability, order fulfilment rates, and transportation costs. A structured literature review was conducted. Peer-reviewed articles, grey literature, and programme evaluations were systematically identified and analysed. Data were synthesised thematically to evaluate the model's efficiency against its stated objectives. The evidence on operational efficiency was mixed. While stock availability reportedly improved at hub levels, frequent stock-outs persisted at peripheral health centres. These were mainly attributed to logistical delays and forecasting inaccuracies. Some evidence indicated a reduction in average transportation costs for the central authority. The hub-and-spoke model offers a structured approach with potential efficiencies. However, its operational success in the region was inconsistent. Significant bottlenecks in 'last-mile' delivery to primary facilities undermined overall system effectiveness. Future implementations should integrate robust data capture and real-time monitoring at spoke facilities. Strengthening local logistics capacity and revising inventory forecasting methodologies are critical. Further operational research is needed to optimise routing and delivery schedules from hubs to spokes. health logistics, supply chain, essential medicines, hub-and-spoke, operational efficiency, Ethiopia, primary health care This review consolidates fragmented evidence on a key health system intervention, providing a synthesis for policymakers and practitioners considering similar distribution models in comparable settings.

**Keywords:** *Essential medicines, Hub-and-spoke model, Operational efficiency, Health systems, Sub-Saharan Africa, Supply chain management, Primary health care*



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