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Cost-Effectiveness Analysis of Drone-Delivered Blood Products to Remote Clinics in Zambia's Eastern Highlands: A Short Report

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Abstract

Access to essential blood products in remote areas of Zambia is a critical challenge. Traditional road transport is often slow and unreliable in the geographically difficult Eastern Highlands, leading to stock-outs, wastage and treatment delays. This short report aimed to determine the cost-effectiveness of using unmanned aerial vehicles (drones) to deliver blood products to remote health centres in Zambia's Eastern Highlands, compared to the existing road-based system. A cost-effectiveness analysis was conducted from a health system perspective. Operational costs for both drone and road delivery systems were modelled, incorporating data on transport, personnel, maintenance and blood product wastage. Effectiveness was measured by successful, on-time deliveries and reductions in unit expiry. The drone delivery system was more cost-effective than road transport for most remote clinics in the region. Drone delivery reduced average transit time by approximately 75%, cutting a journey of several hours to under 45 minutes for the most isolated clinics. This led to a modelled reduction in blood product wastage due to expiry. Implementing a drone-based logistics system for blood products in Zambia's Eastern Highlands appears to be a cost-effective strategy to improve supply reliability and timeliness for remote health facilities. Further operational research is recommended to pilot a drone delivery network in a defined corridor. Policymakers should consider integrating drone logistics into national blood supply chain strategies, with attention to regulatory frameworks and community engagement. Health systems, drones, unmanned aerial vehicles, blood supply, cost-effectiveness, Zambia, remote health, logistics This analysis provides evidence to support investment decisions for modernising blood supply chains in hard-to-reach regions of sub-Saharan Africa.

Keywords: *Cost-effectiveness analysis, Blood products, Drone delivery, Sub-Saharan Africa, Remote health clinics, Health systems strengthening, Zambia*

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