

OCTOBER 2024

Evaluating the Diagnostic Yield and Cost-Effectiveness of a Hub-and-Spoke Telepathology Model for Cervical Cancer in Rural Zambia: A Methodological Study

M, u, l, e, n, g, a, M, w, a, n, g, o, ,, C, h, a, n, d, a, B, a, n, d, a, ,, M, w, a,
n, s, a, C, h, i, b, w, e, ,, N, c, h, i, m, u, n, y, a, M, w, i, l, a

DOI: <https://doi.org/10.5281/zenodo.18543756>

| Abstract

Cervical cancer is a leading cause of cancer-related mortality among women in Zambia. Diagnosis is hindered by a critical shortage of pathologists and histopathology services in rural areas. While telepathology offers a potential solution, robust methodological frameworks for evaluating its implementation in low-resource settings are lacking. This methodology article details the design of a study to evaluate the diagnostic yield and cost-effectiveness of a hub-and-spoke telepathology model for cervical cancer screening in rural Zambia. The primary objective is to establish a replicable methodological framework for such evaluations. The study employs a mixed-methods, observational design centred on a hub laboratory in Lusaka linked to remote spoke clinics. It outlines procedures for sample collection, digital slide preparation, telepathology review, and gold-standard verification. A micro-costing approach captures all relevant costs from the health system perspective. Key metrics include diagnostic concordance rates, proportion of adequate samples, and cost per conclusive diagnosis. As a methodology article, this paper presents no empirical results. Instead, it details a structured framework for future data collection and analysis. A key proposed outcome measure is the diagnostic yield, defined as the proportion of telepathology assessments yielding a conclusive, histopathologically confirmed result. The described methodology provides

a comprehensive and pragmatic framework for evaluating telepathology models in resource-constrained settings. Its application is intended to generate evidence on diagnostic performance and economic viability to inform policy on scaling up cervical cancer diagnostic services. Future studies applying this methodology should ensure strong community engagement and integrate training for healthcare workers at spoke sites. Policymakers should consider such frameworks when planning the rollout of digital pathology networks to ensure rigorous, comparable evaluation. telepathology, cervical cancer, diagnostic yield, cost-effectiveness, hub-and-spoke model, Zambia, methodology, rural health services. This article provides a detailed methodological protocol for assessing the diagnostic yield and cost-effectiveness of a hub-and-spoke telepathology model, addressing a gap in rigorous evaluation frameworks for low-resource settings.
