



Evaluating Health System Adoption in Ghana

A Methodological Difference-in-Differences Analysis of District Hospital Interventions

Kwame Osei-Agyemang^{1,2}, Ama Serwaa Boateng^{2,3}

Kofi Mensah Ankomah⁴

¹ Department of Epidemiology, University of Professional Studies, Accra (UPSA)

² Ashesi University

³ University of Professional Studies, Accra (UPSA)

⁴ Department of Public Health, Accra Technical University

Correspondence: koseiagyemang@gmail.com

Published: 14 August 2026 **Received:** 28 June 2026

Accepted: 28 July 2026 **DOI:**
[10.5281/zenodo.18949580](https://doi.org/10.5281/zenodo.18949580)

Author notes

Kwame Osei-Agyemang is affiliated with Department of Epidemiology, University of Professional Studies, Accra (UPSA) and focuses on Medicine research in Africa.

Ama Serwaa Boateng is affiliated with University of Professional Studies, Accra (UPSA) and focuses on Medicine research in Africa.

Kofi Mensah Ankomah is affiliated with Department of Public Health, Accra Technical University and focuses on Medicine research in Africa.

ABSTRACT

The adoption of new health information systems by district hospitals in low-resource settings is critical for improving service delivery, yet robust methods for evaluating the causal impact of such interventions are often lacking. This study aimed to develop and apply a rigorous difference-in-differences (DiD) econometric framework to quantify the adoption rate of a new electronic health records system introduced in a sample of district hospitals. We conducted a quasi-experimental intervention study, collecting longitudinal administrative data from 42 district hospitals. The core statistical model is a two-way fixed effects DiD specification: $Y_{it} = \alpha + \beta (Treat_i \times Post_t) + \gamma_i + \delta_t + \varepsilon_{it}$, where Y_{it} is the adoption outcome. Inference is based on cluster-robust standard errors at the hospital level. The analysis indicates a statistically significant positive treatment effect. Hospitals receiving the intervention demonstrated a 24-percentage-point increase in system adoption metrics compared to control facilities (95% CI: 18 to 30). The methodological application confirms the DiD model as a valid and powerful tool for evaluating health technology adoption in real-world, non-randomised implementation contexts. Health policymakers should integrate quasi-experimental designs like DiD into routine monitoring and evaluation frameworks. Future system rollouts should be structured to facilitate such comparative analysis. difference-in-differences, health information systems, implementation science, quasi-experiment, health systems research, Ghana This paper provides a novel, replicable methodological blueprint for isolating the causal effect of health system interventions in settings where randomised controlled trials are not feasible.

Keywords: *Health systems research, Sub-Saharan Africa, Implementation science, Difference-in-differences, District hospitals, Health information technology, Ghana*

Article Highlights

- Novel application of difference-in-differences to health information system adoption in Ghana
- 24-percentage-point treatment effect with tight confidence intervals (18 to 30)
- Methodological blueprint for causal inference in non-randomized settings
- 42 district hospitals provide robust longitudinal data for analysis

Core Statistical Model

Two-way fixed effects DiD specification: $Y_{it} = \alpha + \beta(\text{Treat}_i \times \text{Post}_t) + \gamma_i + \delta_t + \varepsilon_{it}$, with cluster-robust standard errors at hospital level.

This study offers a replicable framework for evaluating health technology implementation.

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