

## **Optimization of Laboratory Networks for Epidemic-Prone Diseases in Nigeria: A Geospatial Approach**

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### **Introduction**

Nigeria continues to experience recurring outbreaks of epidemic-prone diseases such as Lassa Fever, Yellow Fever, and Mpox. Despite investments to expand diagnostic access, challenges in geographic coverage and timeliness persist. This study uses a geospatial diagnostic network optimization (DNO) approach to systematically analyze Nigeria's laboratory network for epidemic-prone diseases and propose improvements for outbreak detection and response.

### **Methods**

A national-level geospatial analysis was conducted using ArcGIS Pro and OptiDx. Inputs included population density, disease burden, facility locations, and laboratory capacities. Optimization scenarios evaluated travel time reductions and strategic lab placements under varying disease probability assumptions.

### **Results**

The baseline analysis revealed laboratory coverage gaps and areas with long turnaround times. Optimization scenarios proposed relocation and addition of labs that significantly improved accessibility and reduced travel time, especially in high-risk zones.

### **Conclusion**

Geospatial DNO enables strategic planning for epidemic preparedness. Insights from this study support the NCDC's policy and investment decisions to improve surveillance and early response capacities.