Getting VacSeen - ated: Open Data for Improved Vaccine Information Systems in Benin

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Motivation

Vaccine coverage in Benin is incomplete...

- The coverage rates range from about 60% to 80%\(^1\)

- The proportion of unvaccinated children increased between 2006 and 2012 from 7% to 10%\(^1\)

- 100% coverage is critical for disease eradication

- The last mile and population segment is the hardest to immunize\(^2\)

...and prone to deviation from adherence to schedule

Clinic Performance by Recipient Age and Vaccine Type

Source: VaxTrac
Results
Record Classification

We discovered that the collected data has high degree of incompleteness and error.
We also discovered that recipients are mobile across clinics...

CAVEAT: Interim results; potential errors resulting from recently discovered issues in source data.
Network Analysis (2/4)

...and clinics with high dose volumes also have highest mobility

CAVEAT: Interim results; potential errors resulting from recently discovered issues in source data
Upon studying the mobility patterns across clinics...

CAVEAT: Interim results; potential errors resulting from recently discovered issues in source data
...we discovered varied degrees of coupling between clinics

CAVEAT: Interim results; potential errors resulting from recently discovered issues in source data
Proposed Work

We will link proprietary and open data to enable follow-up with vaccine recipients with sub-optimal adherence to immunization schedule and profile the risk in logistics performance.

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**Knowledge Representation**
- Refinement of ontology for profiling recipients, follow up action, and logistics risk
- Open Data Used: Vaccine ontologies

**Data Analysis - Phase 1**
- Application of ontology to updated data for actionable insight generation

**Open Data Review**
- Identification of datasets for profiling vaccine logistics performance

**Data Analysis - Phase 2**
- Risk profiling of clinics
- Open Data Used: Benin’s regional infrastructure, socio-economic indicators, weather

**Implementation**
- VaxTrac to use the model to follow up with recipients and enhance clinic performance
- VaxTrac to approach Ministry to advice on supply chain
Appendix
Prior Work - VacSeen

Mobile-based barcode scans on the field are retrospectively validated using a data lake formed from logistical and health information systems.

DATA COLLECTION  MODELING AND ANALYSIS  VISUALIZATION

- Scan Operator
- Scan Device
- Scan Location
- Scan Date/Time

- Product Name
- Manufacturer
- Batch number
- Expiry date

- Healthcare worker information
- Healthcare device information

Source: Bhattacharjee, Partha S., et al. "VacSeen: A Linked Data-Based Information Architecture to Track Vaccines Using Barcode Scan Authentication.", In proceedings of SWAT4LS 2015.
We expect the project to have both on-field and academic impact

**Project Impact**

**On-Field Implementation**
- VaxTrac will use the platform for decision-making.
- It will also use it for advocating supply chain improvements with Ministry

**Linked Data Publishing**
- Open Source code on GitHub.
- Linked data publishing under CC 3.0.

**Academic Publication**
- Planned paper in *Vaccines* journal.