Harnessing the Potential of Digital Data for Infectious Disease Surveillance in sub-Saharan Africa

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Problem Statement

The growing digital infrastructure and global availability of digital data offer many opportunities for strengthening epidemiological surveillance and early outbreak detection[1], especially in countries with limited diagnostic capacity. While high income-regions are increasingly harnessing novel data sources to enhance spatiotemporal disease monitoring, the potential for surveillance practice in low- and middle-income countries (LMIC) such as in sub-Saharan Africa has been largely untapped:

? Which public health intelligence from digital/ open sources is available for LMIC settings?

? How can digital data streams be effectively prepared for use in surveillance practice?

? Which information can be drawn from it?

Methods and Concept Design

Using Tanzania as an example, a novel electronic surveillance framework has been designed that:

- includes zoonotic infectious diseases as a primary inter-/national public health concern
- enables the integration of real-time data
- provides access to extensive socioecological contextual data from open sources

The design has been informed by comprehensive literature and material reviews, incl. local and regional policy papers, and domain expert dialogues. The framework focuses on haemorrhagic fever diseases, particularly dengue (Fig. A), which is a growing public health challenge in East Africa[2].

Findings

Figure A.
Dengue eco-epidemiology

Common signs and symptoms[3]

- Fever
- Bleeding tendency
  Bleeding from nose/gums
  Vomiting with blood
  Black stool
  Petechiae present
- Fast/weak pulse
- Cold clammy extremities
- Abdominal pain
- Persistent vomiting
- Positive tourniquet test

Key socioecological disease drivers[4]

- Temperature
- (Relative) Humidity
- Precipitation
- Extreme weather events
- Seasonality/ENSO
- Urbanisation
- Landuse/cover
- Altitude
- Population density, housing density
- Artificial breeding sites
- Population immunity
- Access to healthcare
- …

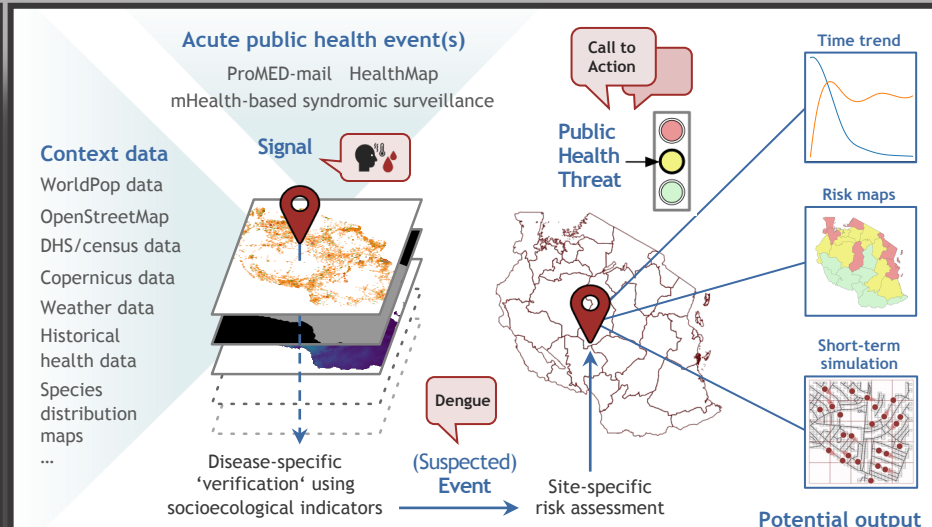
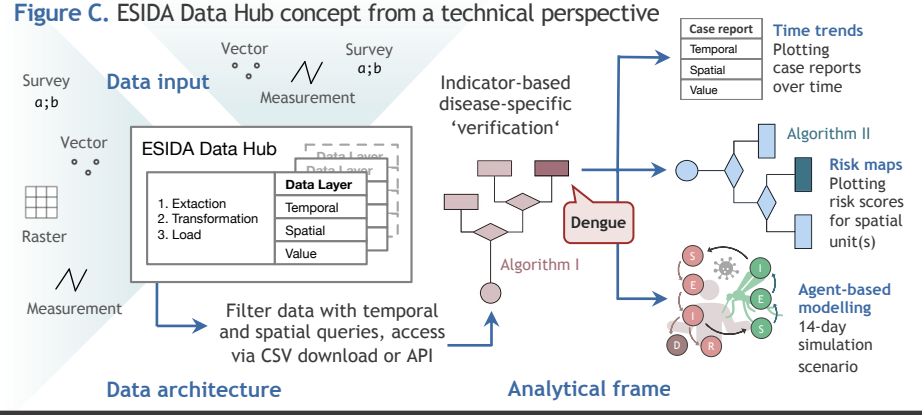


Figure B. ESIDA Data Hub concept from a domain expert perspective



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Summary and Outlook

Our findings reveal a wide range of digital and open data for Tanzania that can enhance surveillance:

! to support early detection of public health events using digital tools and data

! to more effectively anticipate outbreak risks and transmission trends

! to provide comprehensive intelligence for rapid risk assessment and outbreak response

We anticipate our concept (Fig. B/C) to be a starting point for a sophisticated public health intelligence hub tailored to the needs of local surveillance practices. Integrating data to make it easily accessible and usable is a key priority for which closer collaboration between life and computer sciences is critical.

References

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