White Paper: EpiLyra: A Simplified AI Framework for Zero-Latency Syndromic Surveillance in Humanitarian Crises

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Date: March 2026
Subject Category: Public Health Intelligence; Crisis Informatics; Epidemiology

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Abstract

In a disaster setting, public health response suffers from delays at every step. Disaster epidemiology, with its surveillance operations, is stuck in old fashioned logistics and interpretation mechanisms. Traditional electronic disease surveillance platforms are stiff, acting more as a record keeper. This stiffness costs us enormously, especially in the early detection of an emerging situation. We introduce EpiLyra. It is an advanced symptom-data entry to be used by community health workers, in a quick and simple format, and with an additional simplified AI architecture to automate the standardization of field data directly into latest ICD-11 classifications. Furthermore, AI detects any anomaly in reported data, generating alarm for epidemiologists if a pattern can be suggestive of a developing outbreak situation. This innovation moves the timeline from noticing a symptom in field to an intervention by epidemiologists, a very efficient time-saving process. This saves lives.

I. The Crisis of Static Data

Community health workers are the feet on ground. They are the primary contact of people in a camp for refugees of war or an earthquake. They see data, they hear data and they record data. But this data needs to reach in bulk to the epidemiologists who

connect the dots and interprets for the decision makers. A Cholera epidemic does not wait for this process and speeds up through the camp. Our current platforms are not helping but are simply replacing paper data to digital data. They do not interpret and generate an alarm [1].

So, the issue here is not a lack of data, but rather too much data for a human epidemiologist to work on. By simplifying the data entry in the field and then employing AI to smoothen the messy field data into a cleaner version, matching it with case definitions and thus highlighting the emerging patterns. Data decaying and dying in excel sheets is avoided and workload for an epidemiologist in such a stressful environment is managed more efficiently [2]. EpiLyra does exactly that.

II. Designing for Friction: The Intake Logic

Current digital tools fail because they assume that the community health worker, data delivery logistics, the epidemiologist and the intervention designer, they all have time. In a disaster, a CWH is already loaded and depleted, he is not to be burdened with tasks that take unnecessarily lengthy time. Any friction needs to be removed. Any extra minutes are damaging.

EpiLyra is built around adaptive syndromic branching. I designed the interface to save the worker's time. Predicated on the Sphere Project's minimal health action benchmarks [3], the system displays a simple, top-threat syndrome matrix. By simply clicking on a primary syndrome, it will open specific secondary options. EpiLyra will consider known epidemiology of the population and area, so it can classify properly and swiftly.

III. The Simplified AI Layer: From Black Box to Clarity Engine

EpiLyra aims to keep things simple. It operates in 2 layers, as following:

1. The Semantic Parser (Standardization)

Layer 1 is to match data which is in the form of words, images or voice notes with the most plausible disease classification codes. This will be achieved by keeping up with the modern atmosphere of AI and training a Large-Language-Model on WHO’s International Classification of Diseases (ICD-11) [4, 5]. So, the hours of manual or basic software work by human epidemiologists is modified to an instant alignment and a clean data.

2. The Spatial Anomaly Trigger (Alerting)

Layer 2 is to use an algorithm which detects a local anomaly, so the local context is the key here. This algorithm keeps a continuous eye on the baseline changes within a geospatial radius. It notices any variation in the baseline and brings it immediately to the attention of human epidemiologists.

IV. Ethical Imperatives and Data Sovereignty

We are dealing with 2 situations, our subject population is extremely vulnerable, and additionally we are in an age when digital data is facing ethical issues including confidentiality and privacy. So EpiLyra is to lock down the personal identifiable data at local level, with no centralization or storage of the data [6].

V. Toward Antifragile Surveillance

Every step of epidemiology from data collection in the field to its analysis and response is extra challenging and chaotic in a humanitarian crisis situation. Every action takes extra time, which leads to delayed public health response. Adding more human epidemiologists or more laboratories is not always needed. Instead, if we can use modern AI based tools to clean, align, analyse the data and generate timely alarms, we will end up saving a significant amount of time and workload. It is a solution in a logistic-heavy, resource-lacking world of public health response to humanitarian crises.

References

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