Enhancing Immigration Health Assessment Data Analysis in Uganda Using Python

Background

Migration across Africa is on the rise, driven by a combination of socio-economic challenges, armed conflicts, and environmental factors. Sub-Saharan Africa currently hosts more than 26% of the world's refugee population, over 18 million people. Since 2010, intra-African migration has grown by nearly 44%. Conflicts, such as the civil wars in Ethiopia and Sudan, have contributed significantly to forced displacement. In addition, climate change has emerged as a growing catalyst, with the United Nations Intergovernmental Panel on Climate Change (IPCC) reporting that weather-related events led to 2.6 million and 3.4 million new displacements in sub-Saharan Africa in 2018 and 2019, respectively (Lokotola et al., 2024).

Immigration health assessments (IHAs) are essential for protecting public health at both national and regional levels. Countries like Kenya, Uganda, Tanzania, Rwanda, and Ethiopia act as key migration hubs, accommodating refugees, asylum seekers, labor migrants, and other travelers. In partnership with organizations such as the International Organization for Migration (IOM) and the World Health Organization (WHO), these countries carry out IHAs to detect and address health issues of public concern, including tuberculosis (TB), HIV, and diseases preventable by vaccines.

The Migration Health Assessment Centers (MHACs) are responsible for conducting pre-departure health evaluations for migrants in East Africa, particularly those being resettled or applying for visas to countries such as the U.S.A, Canada, Australia, and the United Kingdom. These evaluations involve reviewing medical histories, performing physical exams, conducting diagnostic tests like chest X-rays, blood work, and administering vaccinations. As a highly data-driven process, accurate reporting is essential to meet international health and immigration standards.

However, several data management challenges hinder the efficiency of these assessments. These include fragmented data systems, reliance on manual processes that increase the risk of errors, lack of real-time analytics that delays outbreak detection and response, and poor integration with national disease surveillance systems.

While digital health initiatives are advancing in countries such as Kenya and Uganda, health systems tailored specifically to migration remain limited in development. Utilizing Python-based data science and automation tools presents a cost-effective and scalable way to streamline the processing and analysis of health assessment data, enhancing data accuracy, accelerating response times, and supporting more informed policy decisions.

Problem Statement

Immigration health assessments play a vital role in public health oversight and border management throughout Africa. Yet, in many countries, the systems used to gather, manage, and interpret health data from immigrants and refugees remain fragmented, manual, or only partially automated. This results in frequent delays, data entry errors, underreporting of infectious diseases such as tuberculosis and HIV, and overall inefficiencies in decision-making. The absence of a scalable, automated system for analyzing and reporting this data, particularly in areas with limited infrastructure, further hampers timely and effective health responses.

Main Objective

To develop a scalable, automated data management and analysis system for immigration health assessments.

Specific Objectives

1. To design a Python-based data pipeline to efficiently collect, clean, and process immigration health assessment data.
2. To automate the reporting of health assessment outcomes to reduce delays and minimize human error in data entry and analysis.
3. To integrate the developed system with existing national health information systems to support broader disease surveillance and public health planning.

Significance of the project

Africa experiences high levels of both regional and international migration. To manage this, health authorities and international organizations carry out medical screenings to detect diseases, confirm vaccinations, and determine individuals' fitness for travel or resettlement. However, rising migration driven by conflict, economic hardship, and climate change is straining these health systems.

Introducing an automated, Python-based solution can significantly improve the efficiency, accuracy, and timeliness of immigration health data processing. Through real-time analytics, disease trend detection, and data visualization, such a system would strengthen public health monitoring and inform policy decisions.

In Uganda specifically, the project aims to fill critical gaps in immigration health assessment by using Python's data science and automation tools to support evidence-based planning, enhance disease response, and streamline operations at border and immigration health facilities.

Project Scope

The scope is limited to health assessment data from immigration centers, refugee camps, or immigration country missions within Uganda.

Reference

Lokotola, C. L., Mash, R., Sethlare, V., Shabani, J., Temitope, I., & Baldwin-Ragaven, L. (2024). Migration and primary healthcare in sub-Saharan Africa: A scoping review. *African Journal of Primary Health Care and Family Medicine*, *16*(1). https://doi.org/10.4102/PHCFM.V16I1.4507