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Pandemic Management: Health Data and Public Health Surveillance

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Abstract. The inefficiency of the healthcare system in addressing pandemics is highlighted after COVID-19 which is mostly rooted in data availability and accuracy. As it is believed we might witness more pandemics in future, our research's main objective is to propose an integrated health system to support healthcare preparedness for future infectious outbreaks and pandemics. The system could support managers and authorities in healthcare and disaster management, and policymakers through data collection, sharing, and analysis.

Keywords. Digital health, pandemic management, disaster healthcare

1. Introduction

Pandemics are complex and evolving disasters that required more specific management methods [1]. In this research, our focus is on data availability, accuracy, and timeliness challenges. Among all types of required data for managing a pandemic, we focus on Human Health Data (HHD) which includes demographics, mortality rates, potential causes, general health records and immunization coverage levels. To further enhance the management process we can use human syndromic data (e.g., vital signs) [2]. Prevention and planning are more important in ensuring public health safety during pandemics [3] and neglecting them results in failing response actions. Issues related to data availability and quality to support the pandemic are highlighted in [4,5]. This research aims to present a framework to manage a pandemic.

2. Methods

A systematic literature review was conducted in PubMed, IEEEXplore, ScienceDirect, and PLOS databases. Among the 2617 retrieved articles, 262 met the inclusion criteria and were used for thematic and qualitative content analysis. The analysis has revealed the vital role of HHD and its significant impact on enhancing pandemic prevention and detection.

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3. Results

Early deceleration and interventions in a pandemic can lower the peak in demand for medical treatment [6]. For effective pandemic management close collaboration among many organizations is required that needs a well-defined procedure for data collection and sharing. Accordingly, we propose a solution to support pandemic management. This solution also considers the low cost of implementation, flexibility, using multiple data sources and data sharing among involved stakeholders.

To collect health data, smartphones are the central node where data from people's wearable devices converge before being uploaded to individuals' private cloud health data. Using different technologies smartphones or sensors in hospitals and public areas interact with each other which minimize human interactions while give individuals full control over their health data. The collected HDD can be used for generating health insights or recommendations for data owners or sharing insights with authorities to support early pandemic identification, classification, prioritisation, confirmation, and communication of important indicators [7]. For privacy and security, we incorporates mirror databases holding anonymized HHD to support real-time HHD. The involved party in pandemic management can use the provision of a platform where organizations can upload, train, test, and execute their data mining algorithms to extract the insights. This design choice is sensible as the involved agencies in pandemic management only need insights generated by the data not the patient data. Each of those organizations can also decide whom to share the generated insights.

4. Conclusions

HDD can guide and enhance many subtasks involved in the management process. However, the collection of these data faces considerable challenges that should be addressed.

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