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Evaluation of the risk model for Covid-19 using Geographical Information Systems

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Globally, the COVID-19 pandemic poses a threat to human life and has far-reaching consequences for socioeconomic systems. Governments worldwide are implementing various strategies to restore normalcy while effectively dealing with the ongoing pandemic. However, Sri Lanka, being a developing country, still faces challenges in returning to pre-pandemic conditions. However, the health sector is currently lacking the capability to monitor and assess risks using new technologies effectively. Additionally, the absence of data collection has led to the collapse of the entire information base. This study focuses on Sri Lanka and evaluates different COVID-19 risk scenarios based on hazard, vulnerability, and capacity factors three policy scenarios are established for this analysis based on the success of key social restriction policies: high-restriction, low-restriction, and no-restriction policies. The weights assigned to the criteria are as follows: affected people 0.27, settlement areas 0.18, public facilities 0.20, access roads and the mobility of people 0.16, and government policies 0.19. Both remote sensing and non-remote sensing data are utilized for analysis, and an Analytical Hierarchical Process (AHP) is employed to calculate the weights for each factor. The final Geographical Information Systems (GIS) based multi-criteria risk map is validated using district-level actual patient data, demonstrating significant accuracy. In both years, Sabaragamuwa Province exhibits high accuracy, with rates of 79% for 2021 and 95% for 2022. However, certain districts, such as the Eastern Province, North Province, and North Western Province, show lower values due to the low resolution of the data and the challenges associated with errors and misinterpretations in the non-spatial data collected by authorities. To improve provincial-level risk modeling, incorporating divisional secretarial data and local economic, geographical, and political factors could yield better results. The study highlights the importance of utilizing GIS effectively for risk assessment and management in various scenarios, including those beyond the current COVID-19 pandemic. However, this methodology can be adapted for studying and effectively replicating responses to future disasters, which may impact the country's well-being.

Keywords: Covid-19, GIS, Remote Sensing, AHP, Risk