Prospective Time Periodic Geographical Covid-19 Surveillance in Ethiopia Using a Space-time Scan Statistics: Detecting and Evaluating Emerging Clusters

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Abstract

Background: On December 31, 2019, multiple pneumonia cases, subsequently identified as coronavirus disease 2019 (COVID-19), was reported for the first time in Wuhan, the capital city of Hubei province in China. At that time, the Wuhan Municipal Health Commission had report 27 cases, of which seven are severely ill, and the remaining cases are stable and controllable. Since, then, the spread of COVID-19 has already taken on pandemic proportions, affecting over 100 countries in a matter of weeks. As of September 07, 2020, there had been more than 27 million confirmed cases and 889,000 total deaths, with an average mortality of about 3.3%, globally. In Ethiopia, 58,672 confirmed cases and 918 deaths and this number are likely to increase exponentially. It is critical to detect clusters of COVID-19 to better allocate resources and improve decision-making as the pandemics continue to grow.

Methods: We have collected the individual-level information on patients with laboratory-confirmed COVID-19 on daily bases from the official reports of the Ethiopian Federal Ministry of Health (FMOH), regional, and city government of Addis Ababa and Dire Dawa health bureaus. Using the daily case data, we conducted a prospective space-time analysis with SaTScan version 9.6. We detect statistically significant space-time clusters of COVID-19 at the woreda and sub-city level in Ethiopia between March 13th-June 6th, 2020, and March 13th-June 24th, 2020.

Results: The prospective space-time scan statistic detected “alive” and emerging clusters that are present at the end of our study periods; notably, nine more clusters were detected when adding the updated case data.

Conclusions: These results can notify public health officials and decision-makers about where to improve the allocation of resources, testing areas; also, where to implement necessary isolation measures and travel bans. As more confirmed cases become available, the statistic can be rerun to support timely surveillance of COVID-19, demonstrated here. In Ethiopia, our research is the first geographic study that utilizes space-time statistics to monitor COVID-19.

Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the manuscript can be downloaded and accessed as a PDF.

Figures

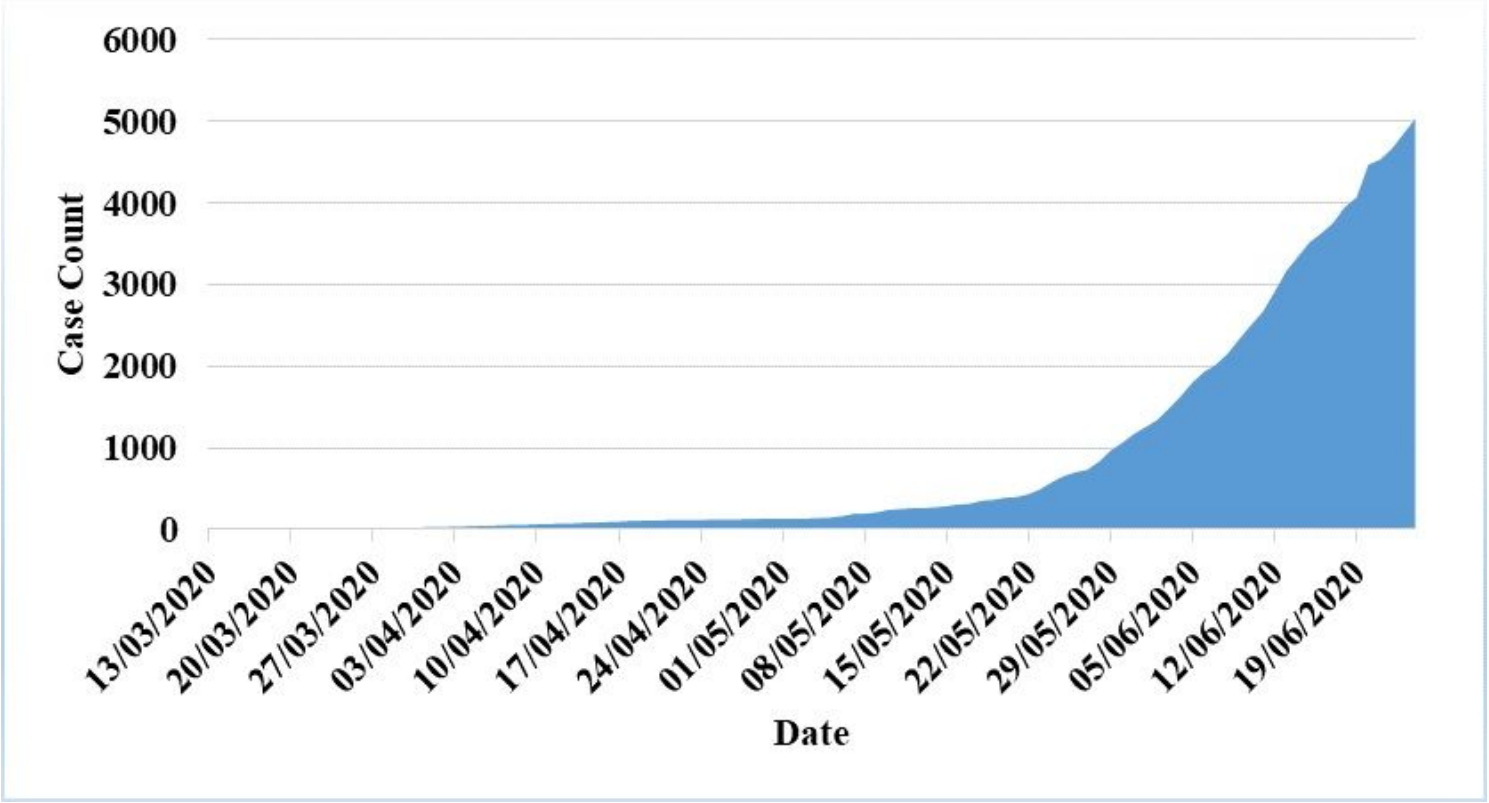

Figure 1

The cumulative number of COVID-19 cases in the contiguous Ethiopia between March 13th and June 24th, 2020.

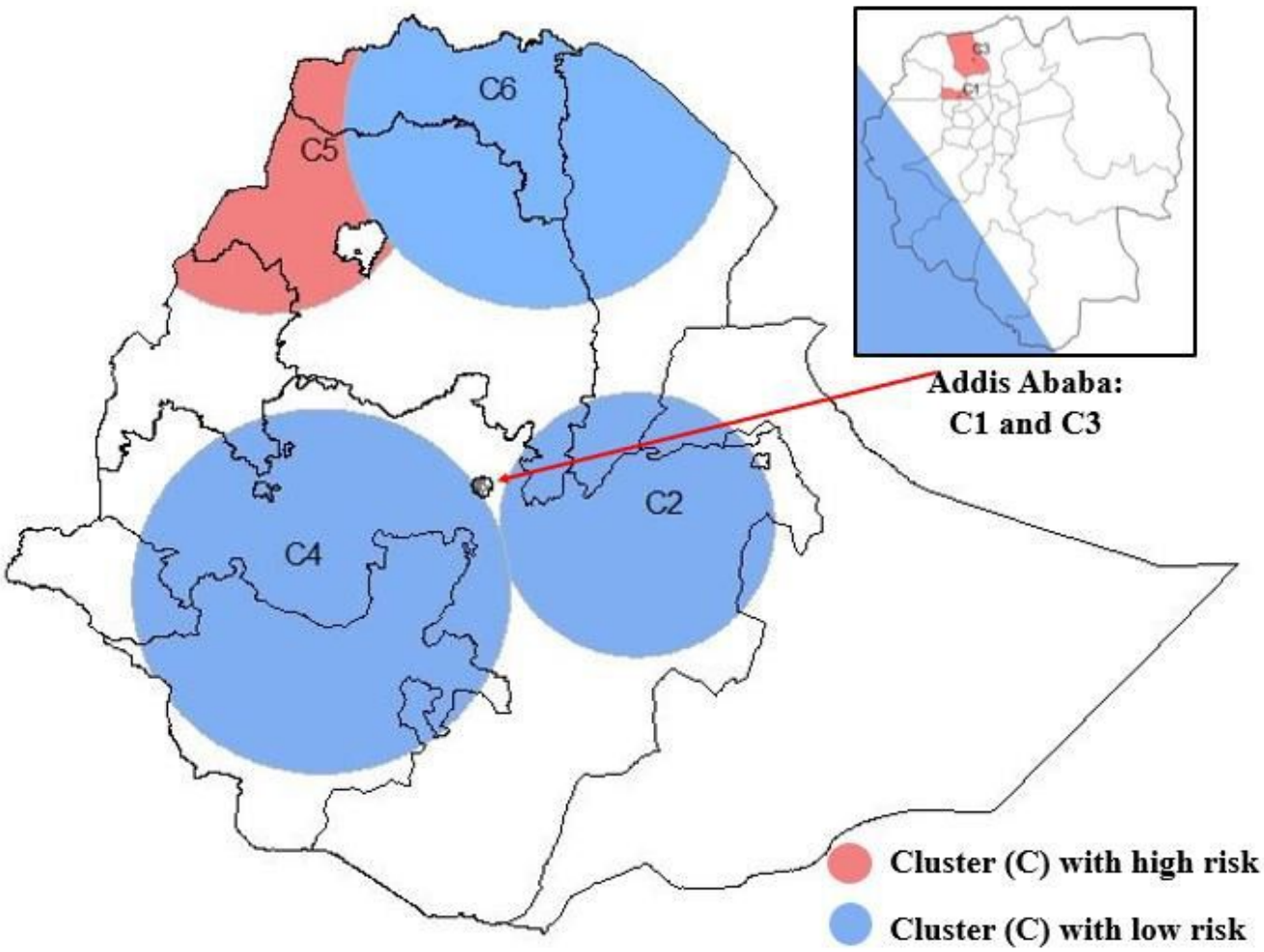

Figure 2

Spatial distribution of emerging space-time clusters of COVID-19 at the woreda/ sub-city level from March 13th – June 6th, 2020 Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

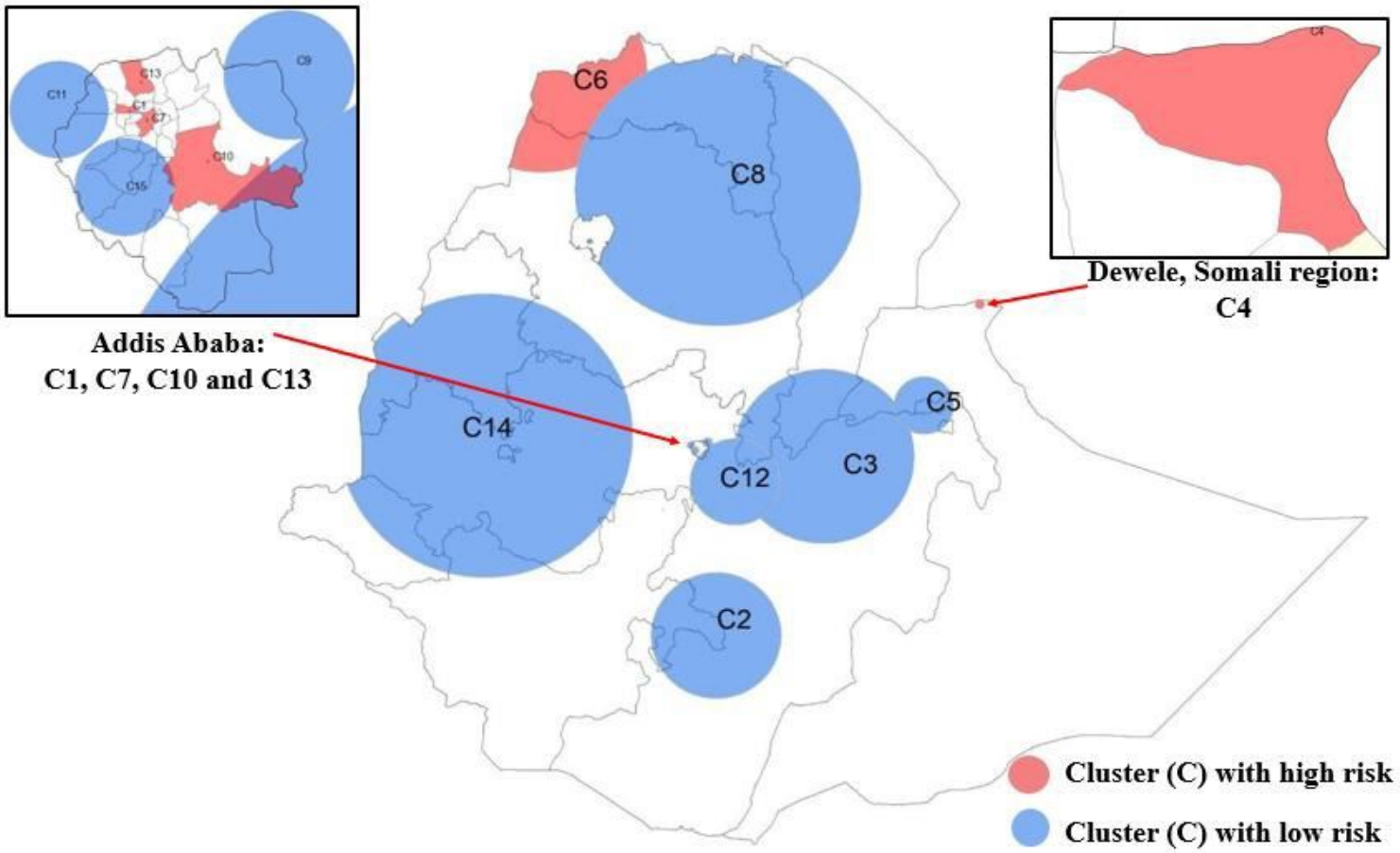

Figure 3

Spatial distribution of emerging space-time clusters of COVID-19 at the woreda/ sub-city level from March 13th – June 24th, 2020 Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.