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Dynamic Panel Surveillance of COVID-19 Transmission in the United States to Inform Health Policy: Observational Statistical Study – A Critical Review of Article

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Abstract

This is a critical appraisal of a manuscript outlining additional indicators used in the United States to augment traditional disease surveillance tools. The article went through the peer-review process. Therefore, it may be considered as objective and unbiased. The structure of the article is coherent, and it was published in a journal for digital medicine, health, and health care in the internet age. The article has contributed to the literature and provides a basis for strengthening existing surveillance systems to improve public health outcomes. However, it is suggested that whenever new indicators are being developed, their essential components must be fully defined.

Keywords*: Covid-19, Surveillance, United States.*

Introduction

This is a critical appraisal of an article entitled 'Dynamic Panel Surveillance of COVID-19 Transmission in the United States to Inform Health Policy: Observational Statistical Study – A Critical Review of Article' published in the 2020 issue of the Journal of Medical Internet Research. This manuscript will give an overview of the article, review of the article structure, and critique. The central theme of the article outlines additional indicators used in the United States of America (USA) to augment traditional disease surveillance tools. This review will give an overview of the article, a brief description of its structure, and critique.

Article Summary

The purpose of the article is to outline additional disease surveillance indicators that can be used to strengthen existing surveillance systems. These include surveillance metrics of speed, acceleration, jerk or change in acceleration, and 7-day lag in the speed of Corona Virus Disease of 2019 (COVID19) transmission [1]. The indicators (rates of transmission) have been derived to effectively describe the dynamic epidemiology of the pandemic as it continues to evolve. However, essential components of the new indicators (such as means of verification, guidelines to interpret and use data, etc.) have not been fully defined.

The study further attempts to attribute shifts in acceleration (positive, constant, or negative) to possible contributory factors such as natural progression of the pandemic and underlying model parameters that can be associated with viral mutation, implementation, or relaxation of suppression strategies (e.g., lockdowns), etc.

This will help to inform emergency response mechanisms (ERMs) by all the eight (8) pillars constituting the Epidemic Preparedness and Response (EPR) teams as they respond to adverse events and improve health outcomes. These EPR pillars include Coordination, Planning, and Monitoring; Risk communication and community engagement (RCCE); Surveillance, Rapid- Response Teams (RRTs), and Case Investigation; Points of Entry; Laboratories; Infection Prevention and Control (IPC); Case management; Operations support

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and Logistics [2]. In a number of countries, like Zimbabwe, the ninth pillar on Research and Security has been added [3]. Existing surveillance systems coupled with the novel dynamic metrics of transmission will inform health policy to effectively control the COVID-19 pandemic [4]. Panel data on COVID-19 infections has been collected at regular intervals from states that have been grouped by census regions 1 to 4 of America and analyzed through the Wald Chi-Squared Test in the context of regression. A generalized method of moments (GMM) estimator known as the Arellano–Bond estimator has been used to estimate dynamic models of panel data.

Article Structure

The structure of the article is coherent as the article contains the conventional information normally provided in such a study. These include an abstract, introduction, methodology, results, and discussion. The article was introduced with a comprehensive but brief abstract, which provided the stance or thesis developed by the article as well as a brief overview of additional surveillance mechanisms. However, the abstract conclusions does not address the following objectives of the article: 1) to create a proof-of-concept COVID-19 surveillance system using the United States as a prototype for a global system; and (2) to validate novel surveillance metrics or techniques including speed, acceleration, and jerk to better inform public health leaders how the pandemic is spreading or changing course.

There were four (4) body headings with subheadings and detailed information contained under each heading that allows the readers to easily articulate pertinent issues. The paragraphs in the body were short, and therefore the information in each paragraph was easy to access.

The dependent and independent variables have been clearly defined. The findings and conclusions were developed towards the end of the article.

The article included many links to the author, journal, subjects, citations, and references, which helped to make the information accessible. Linked headings and subheadings also allowed the reader to move through the paper more quickly.

Article Critique

Authority

The Journal of Medical Internet Research is a peer-reviewed scientific journal for digital medicine, health, and health care in the internet age. It focuses on emerging technologies, medical devices, apps, engineering, telehealth, and informatics applications for patient education, prevention, population health, and clinical care [5].

Currency

The manuscript is current as it was published on 29 June 2020. It describes current research, and the references cited in the body of the text range from 1982 to 2020. Ninety-four percent (94%) of the references are up to date (ranging from 2010-2020).

Relevance

The COVID-19 pandemic has caused unprecedented public health concerns, triggering an escalated burden to health systems worldwide [6]. Therefore, this article is relevant as it outlines new recommendations for action aligned with recent technical guidance to improve health outcomes. These aim to strengthen surveillance pillar response activities to the COVID-19 pandemic by providing a prototype to augment traditional disease surveillance tools. The proposed indicators can be adopted and adapted by high, medium, and low-income countries to strengthen the capacity of their health systems to respond to adverse events.

Objectivity

The information was objectively developed, well supported with a current research base, and

with all evidence acknowledged and referenced. The authors supported their research decisions with references from appropriate and relevant literature. The findings are relevant and can be generalized globally.

Stability

The article was published in a peer-reviewed academic journal and is stable.

Analysis of Tables

One (1) graph and four (4) tables were used to compare and describe study findings reported by census regions 1 to 4 of the USA. These are comprehensive, clear, and adequately labeled.

Recent Advances to the Topic

Both the role and concept of public health surveillance continue to evolve as the scope of surveillance broadens and as increasingly sophisticated methods are applied [7].

Surveillance is largely dependent on intensive data collection efforts conducted through the ongoing integration of Indicator based (IBS), Event-based (EBS), Community based (CBS), and Environmental Based (EnvBS) Surveillance activities. Surveillance data can be used to estimate the magnitude of specific problems, determine the distribution of illness, portray the natural history of a disease, generate hypotheses, stimulate research, evaluate control measures, monitor changes, and facilitate planning [8]. It can also be used both to determine the need for public health action and to assess the effectiveness of programs [9].

The COVID-19 pandemic is a major global health concern as it has spread with alarming speed and severity, infecting millions in a short space of time [10]. To prepare for and deal with the COVID-19 pandemic, a robust and responsive surveillance system should be in place [11]. The rapidly evolving COVID-19 pandemic requires novel dynamic surveillance metrics in addition to static metrics to effectively analyze the pandemic trajectory and control spread [12]. Intensified surveillance metrics for SARS-CoV-2 transmission that account for weekly shifts in the pandemic, including speed, acceleration, jerk, and persistence, are important in enhancing understanding of the risk of explosive growth in each country and describing whether countries are managing the pandemic successfully [13]. Speed is best used in conjunction with acceleration and jerk to contextualize static metrics and provide a view of potential pandemic trajectory changes over time [14]. This enhances insight to enable potential anticipation of how the pandemic will evolve.

In the article, the essential components of the new indicators were not fully defined. When new indicators are being developed, they must be fully defined [15]. Essential components of an indicator must be clear and concrete [16, 17].

These include the title, definition, purpose, rationale, means of verification, method of measurement, numerator, denominator, calculation, data collection method, data collection tools, data collection frequency, data disaggregation: guidelines to interpret and use data, strengths, and weaknesses, challenges [17].

Panel data on COVID-19 infections has been collected at regular intervals and analyzed. Numerous experimental studies use a panel approach to analyze repeated experiments involving a large number of periods [18].

Panel data is a term used to describe longitudinal data collected from the same set of cases at regular intervals [19]. It contains observations about different cross-sections across time. A significant advantage of the panel data approach is that it can provide statistically valid quantifications of shifts in a fairly short period of time, e.g., 7 days [20]. This statistical technique can be derived through the Arellano–Bond estimator, which allows for the control of a variety of possible deficiencies in the existing data [1]. The Generalized Method of Moments (GMM) estimator of dynamic panel data models

transformed by the forward orthogonal deviation tends to perform better than that transformed by the first difference [21].

Conclusion

This was a critical review of [1] article 'Dynamic Panel Surveillance of COVID-19 Transmission in the United States to Inform Health Policy: Observational Statistical Study'. The content, structure, strengths, and limitations of the article were analyzed and critiqued. The article has contributed to literature and provides a basis for strengthening existing surveillance systems to improve public health outcomes. It also outlines areas for further development of the knowledge base of health systems research. However, it is suggested that whenever new indicators are being developed, their essential components must be fully defined.

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Conflict of Interest

The Author(s) declare that they have no conflict of interest.

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