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Improving Data Analytics during a Pandemic episode: A Review

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Abstract

By examination reporting methods to determine the effects of a pandemic on the health of the health of a nations' or geographic entity's' population. Is a serious undertaking. The goal is to explain how measurement (or Metrics) can tend to be misleading which may lead to less than optimal decision making by health professionals and similar people in change of health decisions.

Keywords: Decision statistics • Capabilities • EWMA • Multivariate Data and Pandemics

Introduction

The pandemic in America and other nations produced a panic in federal and state health institutions. The panic occurred because the federal and state health care and diagnostic institutions knew very little about the Covid-19 virus nor had the necessary equipment to maintain health standards in the face of the growing and spreading of the virus. Our purpose in this manuscript is not to analyze the politics of the care and diagnostics in the preparation, reaction and the execution of the health treatments execution of health agencies in the response to the spreading of the virus to the vulnerable communities across the United States. The goal is to consider better analytical data tool which could have very much improve the interpretation of data retrieval and interpretation to assist in the decisions and analysis to improve the methodology to assist health professionals in determining health care diagnosis and in turn health strategies in therapeutic care. If the real option the following trade-off arises: if information is timely, the therapeutic strategies decision can be based on better information to arrive a better decision making in the uncertain world of treating a pandemic virus. Incorrect and untimely information is the product of the misreporting of factual events associated with diagnostics and error associated with poorly utilized statistical analytics and eventual predications.

Diagnostics and Multivariate Tools

Today bio surveillance involves the monitoring of a significant number and wide range of data collected from independent random samples of diagnostic and pre-diagnostic numerical data for health professionals information to determine, detect, investigate and respond to evidence concerning disease and the outbreaks of epidemics and pandemics. A predominant method of analysis in this monitoring in classical bio surveillance is the movement of classical disease surveillance utilizing multivariate quality control methods original developed in industrial applications. Fricker RD [1] applied multivariate statistical quality control (MSQC) methods In addition, MSQC applications by Fricker RD et al. [2] continued earlier studies by focusing on direction all sensitive procedures in bio surveillance. Previously Ord, Koehler Snyder and Hyndman (2009), hereafter, (OKSH) studied the usefulness of monitoring social and economic processes is an excellent application of Statistical Quality Control, SQC. They created new ways to analyze data by exponentially weighted moving average (EWMA) control charts for residuals. This analysis was said to be very useful in the detection of shifts in variability. Furthermore, the newly improved methods by expanding the analysis to the case of multivariate methods. In turn, OKSH suggested examining the works of [3-6]. The multivariate form of the MEWMA control chart simultaneous monitors two or more related processes in an exponentially weighted moving-average (EWMA) control chart. Contains information from all the previous subgroups or observations.As an illustration, a MEWMA chart monitors temperature and pressure in a plastic injection molding process. Each observation (or point) contains information from all the previous subgroups or observations in combinations with a user defined weighting factor. Thus, MEWMA charts aid the analyst by detecting small process shifts faster than other forms of multivariate control charts including the well-known T^2 Chart. In addition, MEWMA charts are neither significantly influenced by changes having very large or very small values entering the calculation. Last, MEWMA charts have the ability to tailor detect any size shift in a process. Hence, they can be utilized to monitor in-control processes for detecting tiny shifts away from the target of goal of the process. MSQC monitors two or more data sets in combination. This is very important in health diagnostics which includes a large number of previous studies quality in multivariate quality monitoring literature [7-20]. All of these models employ the multivariate testing statistic entitled Hotelling T^2. As an alternative, I propose the using an alternative scheme developed by Pan (2005) which builds on the Hotelling model before the formation of the exponential weighted moving-average (EWMA). Lui (1996) presented a substantial improvement entitled MEWMA. Rungar and Prahu (1996) utilized Markov chain analysis to calculate the average return length (ARL) of MEWMA and they (1997) designed the new MEWMA under the assumption of serial independence. Again, Jarrett (2020) discussed the robustness of the MEWMA and indicated how to implement this method in monitoring health time series data where two or more data sets of health data have some serial correlation of value greater than zero and up to 0.60 p-values of correlation [21]. Utilizing the criterion of ARL, MEWMA in bio surveillance in the age of a Pandemic having cross-correlated variables provide a better analytical framework than simple using seven day moving-average daily statistics where the velocity and variation in change have proven to be unpredictable and often providing insufficient forecasts and prediction for data driven decision making.

Summary and Conclusions

To conclude and sum up, the use of diagnostic analysis will not easily

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prevent and cure Covid-19. In particular, the uses of a seven period moving average a simple but very restrictive statistic in its use and interpretation. Thorough use of sophisticated analyses such as MEWMA utilizing often quality analysis of two or more cross correlated diagnostic and health metrics variables coupled continuous improvement will enable a better future for controlling the environment of the Covid-19 Pandemic that we are attempting to survive and live through. The methodology promulgated in this document suggests better use of medical strategies to solve the problems of the current Pandemic. The response by the current administration in preparing the nation for the Pandemic is noticeably insufficient. Last, this document aims at promoting better analytical methods for interpreting the collected data by health professionals in performing their professional tasks to end the Pandemic. Another solution that may have promise is in Makridakis, Spiliotis and Assimakopoulos (2018).

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