The Interaction of Emergency Management Information in Stages of Covid-19 Based on Big Data, in Chaina

Xianglan Gao*, Fuangfa Amponstira**
Ph.D. Candidate, Management, School of Management, Shinawatra University*
Ph.D., Management, School of Management, Shinawatra University**
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Abstract

With an unknown cause had been diagnosed as the novel coronavirus pneumonia, covid-19 presented more uncertainty and new symptoms that were difficult to detect. The evolution and interaction of information from medical institutions, the governments, the public and the media in emergencies are worthy of attention and research. Therefore, this article aims to construct an information analysis framework of COVID-19 from five dimensions, including the epidemic itself and the medical, governmental, public, and media responses by using big data to track and focus on the process and mechanism of how the development of epidemic information, medical treatment and public health protection, the governmental response, public concern and participation, and media communication have evolved and interacted with each other in different stages of covid-19. Data visualization and Text analysis were employed to filter subfactors and factors. From regression analysis of Hypotheses test, the author conducted line regression model with multiple variables to explore the interactions of one factor of the five dimensions to the other four factors of the five dimensions of emergency management information. also covid19 new cases in the four stages of covid-19: prevention, preparation, response, recovery that the emergency management information was close connected with the stages of epidemic. Research result shows that the interaction of the five dimensions of emergency management information and covid19 new cases were linear related by stages of epidemic at the first time to explore, the foundlings of the study expressed the weakness of current emergency management information, which pointed out the what need to be improved.

Keywords: emergency, information, covid-19, big data

Introduction

COVID-19 has caused great loss of population and extensive socio-economic impact in China and almost the whole world since December 2019.Worldometers world real time statistics announced, as of 07:46 on April 30, 2020, Beijing time, 3189017 cases had been confirmed globally, 227247 deaths had been confirmed, and 185 countries

and regions had been confirmed. With an unknown cause had been diagnosed as the novel coronavirus pneumonia, covid-19 presented more uncertainty and new symptoms that were difficult to detect. The evolution and interaction of information from medical institutions, the governments, the public and the media in emergencies are worthy of attention and research.

From Xiaoying Zhou (Xiaoying Zhou, 2020) The Chinese government's emergency response in the early stage of the incident has gone through four stages, and the emergency response measures determine the direction of the epidemic. From Hao Huang's concepts (Hao Huang, 2020), the emergency management information framework can be grouped as five dimensions: the epidemic, government response, public response, media response and medical response and analyzed the evolution, interaction and trends of five dimensions using big data within the period of observation For the four dimensions other than the media response, the level of information related to the epidemic and the medical response is relatively high, while the level of response by medical institutions and the governments are similar, and both are higher than the public response, and the media coverage of the epidemic remains at a high level of information. His research was covered the early stage of covid-19 epidemic from Nov 23 2019 to Feb 27 2020.

Previous researches showed that big data were used in emergency decision-making information management and the level of information related to the epidemic. There's a gap between the epidemic duration and previous research duration. This article aims to construct an information analysis framework of COVID-19 from five dimensions, including the epidemic itself and the medical, governmental, public, and media responses by using big data to track and focus on the process and mechanism of how the development of epidemic information, medical treatment and public health protection, the governmental response, public concern and participation, and media communication have evolved and interacted with each other in different stages of covid-19 as prevention stage, preparation stage, response stage, and recovery stage from Jan 10 2020 to Apr 7 2020.

Data visualization and Text analysis were employed to filter subfactors and factors, From regression analysis of Hypotheses test, the author conducted line regression model with multiple variables to explore the interactions of one factor of the five dimensions to the other four factors of the five dimensions of emergency management information, also covid19 new cases in the four stages of covid-19: prevention, preparation, response, recovery. that the emergency management information was close connected with the stages of epidemic. Research result shows that the interaction of the five dimensions of emergency management information and

covid19 new cases were linear related by stages of epidemic at the first time to explore, the foundlings of the study expressed the weakness of current emergency management information, which pointed out the what need to be improved. From regression analysis, one of the five dimension factors were influenced by other four dimension factors and covid19 new cases through the four stages of epidemic. It showed that:

(1) Government response and medical response was influenced by other factors in all four stages of the covid19 epidemic: prevention, spread, control and clear, which expressed that government response and medical response were foreseeable by measuring epidemic response, public response, media response and covid19 new cases.

(2) Public response was influenced by other factors in covid19 stages of prevention, control and clear, without stage spread, which may express that the public response had separated from other factors in stage spread.

(3) Media response was influenced by other factors in covid 19 stages of prevention and spread while not in covid19 stages of control and clear, which may express that the media response was not synchronized with the emergency event status. Also, the media was not influenced by public and epidemic response.

(4) Epidemic response and covid19 new cases were influenced by other factors in covid19 stage prevention, which showed that the epidemic response was synchronized with covid19 new cases in stage prevention. Epidemic response was influenced by public response and government response in stage control, which expressed that government and public work together in epidemic response.

Based on the five dimensions of emergency management information framework, the researcher intends to study the trend of each dimension in stages of the epidemic and the interaction of the five dimensions, which lead to policy suggestions on how to improve emergency management information mechanism.

Research Objectives

To construct an information analysis framework of COVID-19 from five dimensions, including the epidemic itself and the medical, governmental, public, and media responses by using big data.

Research Methodology

4. Results and Discussion

4.1 Compare Five Dimension Factors With Covid-19 Trend

Figure 4.2 showed Five dimension factors of emergency management information vs covid-19 trend.

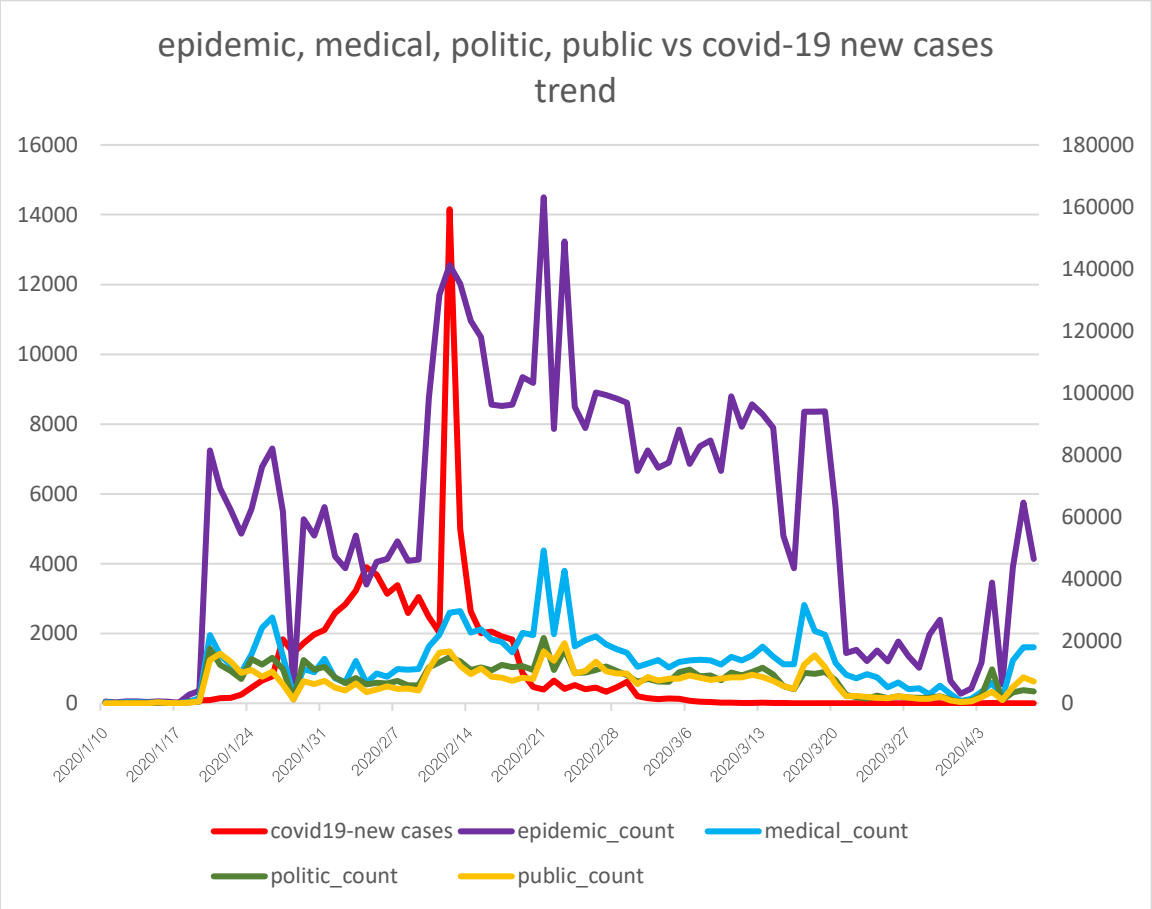

Figure 2 Five dimension factors of emergency management information vs covid-19 trend

As can be seen from the figure, depicting the covid-19 trend, the public response, medical response, epidemic response and government response went to similar figures during the timeline. Comparing to other three responses, the epidemic response was four to five times of the range, which expressing the epidemic text messages were transferred more widely than public response, medical response and government response. The public and government responses figures were at the bottom of medical and epidemic responses, which expressing they were not the main topics during the covid-19 period.

4.2 Regression Analysis

This study is a quantitative research, thus, the author uses graphical tools to analyses the trend of the epidemic, media response, medical response, public response and government response in stages of the epidemic. In order to find out the correlation between the factors, the author employed correlations analysis at significant level .01. The author employed inferential statistics Linear regression model to help determine where the other four dimensions have impact on the specified one dimension respectively, and test hypothesis at significant level .05.

4.2.1 How the other four dimension factors impact on the epidemic response in different stages of the epidemic

In this section, the author conducted linear regression (method enter) to explore how the other four demension of factors as public response, medical response, media response, and government response impact on the epidemic response in different stages of epidemic, which are marked as prevention, spread, control, and clear.

(1) Stage Prevention

The outputs of the regresssion model were as below:

a. Dependent Variable: epidemic_count

b. Models are based only on cases for which stage = prevention

c. All requested variables entered.

Table 1 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	stage = prevention (Selected)			
1	.994a	.987	.984	3863.688

a. Predictors: (Constant) , covid19_newcases, public_count, medical_count, media_count, politic_count

Table 2 ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24491501570.845	5	4898300314.169	328.127	.000c
	Residual	313489763.155	21	14928083.960		
	Total	24804991334.000	26			

a. Dependent Variable: epidemic_count

b. Selecting only cases for which stage = prevention

c. Predictors: (Constant), covid19_newcases, public_count, medical_count, media_count, politic_count

Table 3 Coefficients[a,b]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-45.510	1210.009		-.038	.970
medical_count	1.230	.274	.326	4.496	.000
politic_count	1.886	.472	.358	3.997	.001
public_count	1.831	.409	.293	4.474	.000
media_count	4.864	14.770	.022	.329	.745
covid19_newcases	3.387	1.438	.141	2.355	.028

a. Dependent Variable: epidemic_count

b. Selecting only cases for which stage = prevention

Table 1, table 2, and table 3 showed howed that the regression model meaningful in stage prevention from ANOVA test at significant level 0.01, and coefficients expressed that medical response and government response impacted on epidemic response at significant level 0.01 in epidemic stage prevention, while public response and covid19 new cases had some imfluence at a weaker level, but media response seemed had no impact on epidemic response.

(2) Stage Spread

The outputs of the regresssion model were as below:

a. Dependent Variable: epidemic_count

b. Models are based only on cases for which stage = spread

c. All requested variables entered.

Table 4 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	stage = spread (Selected)			
1	.957[a]	.917	.879	12303.115

a. Predictors: (Constant), covid19_newcases, medical_count, media_count, public_count, politic_count

Table 5 ANOVA[a,b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18294410447.437	5	3658882089.487	24.172	.000[c]
	Residual	1665033078.327	11	151366643.484		
	Total	19959443525.765	16			

a. Dependent Variable: epidemic_count

b. Selecting only cases for which stage = spread

c. Predictors: (Constant), covid19_newcases, medical_count, media_count, public_count, politic_count

Table 6 Coefficients[a,b]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3651.148	11561.633		.316	.758
medical_count	1.913	1.240	.515	1.542	.151
politic_count	.161	3.991	.017	.040	.969
public_count	2.664	1.459	.316	1.826	.095
media_count	81.474	42.969	.266	1.896	.085
covid19_newcases	-.087	1.125	-.008	-.077	.940

a. Dependent Variable: epidemic_count

b. Selecting only cases for which stage = spread

Table 4, table 5 and table 6 showed that though the regression model meaningful in stage spread from ANOVA test at significant level 0.01, but coefficients expressed that medical response, government response, public response, and media response had no impact on epidemic response at significant level 0.05 in epidemic stage spread, also the covid19 new cases.

(3) Stage Control

the regression model meaningful in stage control from ANOVA test at significant level 0. 01, and coefficients expressed that government response had impact on epidemic response at significant level 0.01 and public response had impact on epidemic response at significant level 0.05, while medical response, media response and covid19 new cases had no impact on epidemic response in epidemic stage control.

Discussion

The author Study on the interaction of emergency management information in stages of covid-19 based on big data, in China during Jan 10 2020 to Apr 8 2020. The emergency management information in this topic was composed with five dimensions: epidemic response, public response, medical response, media response and government response. They were interacting with each other and with covid19 new cases. Their functions to each other were varied with the different stages of covid19 epidemic as prevention, spread, control and clear.

Through the analysis, it showed that the five dimensions impact on each other in epidemic stages differently. From the trend of epidemic response, public response, government response, media response and medical response, it showed that:

(1) Five dimensional variables have obvious abnormal kurtosis in the early stage of the epidemic, which is an important signal juxtaposed with the early epidemic data

(2) In addition to media response, the other four-dimensional variables continue to have obvious abnormal kurtosis in the spread period of the epidemic, reflecting that the emergency information data is not disturbed by the media or the media is out of focus at this stage

(3) Medical response has been in a hot position in the four stages of the epidemic, reflecting that the epidemic is inseparable from the medical situation.

Through regression analysis, it showed that one of the five dimension factors were influenced by other four dimension factors and covid19 new cases through the four stages of epidemic. It showed that:

(5) Government response and medical response was influenced by other factors in all four stages of the covid19 epidemic: prevention, spread, control and clear, which expressed that government response and medical response were foreseeable by measuring epidemic response, public response, media response and covid19 new cases.

(6) Public response was influenced by other factors in covid19 stages of prevention, control and clear, without stage spread, which may express that the public response had separated from other factors in stage spread.

(7) Media response was influenced by other factors in covid 19 stages of prevention and spread while not in covid19 stages of control and clear, which may express that the media response was not synchronized with the emergency event status. Also, the media was not influenced by public and epidemic response.

(8) Epidemic response and covid19 new cases were influenced by other factors in covid19 stage prevention, which showed that the epidemic response was synchronized with covid19 new cases in stage prevention. Epidemic response was influenced by public

response and government response in stage control, which expressed that government and public work together in epidemic response.

Research Suggestion

Based on the analysis results, the author raises following policy suggestions as follows :

1. Emergency management organizations should take Internet big data monitoring as an important source of information in case of emergency.

2. The five-dimensional data can complement each other when an emergency occurs and can be used as reference information for emergency decision-making.

3. There is a certain synchronization between epidemic response and medical response when the epidemic occurs. The monitoring of epidemic response can be used as the reference data for the allocation of medical resources, which is better than the simple data of new cases of the epidemic.

4. The media response is influenced by the government reaction. Which raises the necessary to preserve the media's independence and focus on the public's concerns so as to better establish the authority of the official media.

5. The text analysis method applied in this study is another case of big data related study methodologies are applicable to emergency management research, which helps people to explore more and more valuable information and knowledge from big data in the further. For a study based on big data, the data would not be completed in any case because more data may lead to more foundlings. E.g. to count media response, the author collected information from the typical official media chin daily, and missed other medias.

6. Due to the time and space, this study only discussed the five dimension of emergency management information, which should not include all types of emergency information worthy of attention, which need to be studied further.

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