



# Three phases of COVID-19: theoretical thinking on epidemic prevention and control

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**Abstract:** The response to the COVID-19 outbreak was evaluated by analyzing the literature published after the outbreak. By reviewing and summarizing the different stages, nodes and measures during the occurrence and development of COVID-19, other countries can draw on their experience and reference for the fight against COVID-19 in China. In December 2019, the COVID-19 was first reported in Wuhan, China, and then the whole world continued to pay close attention to the development of the COVID-19 in China. Until now, the outbreak and development of the COVID-19 has lasted for more than a year. Looking back on the process of the COVID-19, several key stages and events have had a profound impact on the development of the COVID-19. We divided the evolution of the outbreak since its origin into different phases. The policy changes of the Chinese government in different periods of the COVID-19 pandemic were evaluated, and the transformation nodes of the policies and differences in each stage were determined. We divided the evolution of the outbreak into three stages of the outbreak are initial outbreak stage, the carrying of the virus (people or goods) stage, and the non-direct contact transmission (goods transmission) stage. This paper reviews the three stages of the evolution of responses by the Chinese government to COVID-19 using a phase analysis method to examine different policy starting points, changes to policy, and reasons for policy change. The study provides a resource for COVID-19 policy review and includes image of the three-phase shift in policy as the epidemic progressed. By summarizing and describing the policy changes in the three phases of the response to COVID-19 in China, this paper provides a resource for others in formulating their response to the pandemic. The commentary is also designed to provoke scholarly dialog among the readers of the journal.

**Keywords:** COVID-19 outbreak; three stages review; policy changes; comments

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## Introduction

The COVID-19 pandemic is a major health emergency and a threat to global public health rarely encountered. Fueled by both high virulence and the ease and speed of social mobility in the 21<sup>st</sup> century, the human, social, and economic costs of the disease are unprecedented. The Chinese government has adopted several policies to COVID-19 from its identification through to it being declared a global pandemic by the WHO in March 2020 and beyond. From an initial response involving the total restriction of public transit and lockdown, these policies have successfully transformed the outlook for the nation to a positive one moving forward (1). A literature introduces about 2019 coronary virus disease (COVID-19) outbreaks in the global scope brings a major challenge to public health, and during the pandemic exposed the defects of the existing management system of infectious diseases, proposed a, there are two significant stage (stage dark window and bright window) window frame, epidemic in. In addition, appropriate and timely preventive action during both the dark window and the light window is essential to reduce the future spread of the disease. Articles suggest where possible, in the dark window period health service level should be up to the highest alert level, in the bright window period of response can be on the basis of fully explore and consider to adjust Through this framework to reveal the general law of infectious disease management progress and help make decisions in the early days, the key is to provide health care. The research in this article also inspired us to carry out this study (2).

The reasons why to perform phase management after COVID-19 outbreak are three points as follows. The first is for people to observe and understand the progress of the disease. The second point is to conduct stage management after the outbreak of COVID-19. Different periods correspond to different policies and timely determine the corresponding policy changes at different nodes. And the last point is that phased management will allow people to look back and analyze the disease more clearly and to see and understand all the changes that are going on over the course of the epidemic.

## Methods

We analyzed outbreaks of COVID-19 in China by examining master key reference documents to understand factors including diagnosis and treatment plans, prevention

and minimization strategies, and infection control measures at different stages of the development of the disease.

By referencing two landmark events, we divided the prevention and control of COVID-19 epidemic into three phases (*Figure 1*). The first of these occurred on January 2020 when the National Health Commission designated the novel coronavirus-infected pneumonia as a Class B infectious disease and adopted Class A management. The second landmark occurred on February 8, 2020, when the State Council issued the “Notice on Effectively Strengthening Scientific Prevention and Control of the Epidemic and Doing a Good Job of Enterprise Work and Production Restoration in an Orderly Way” (3,4).

## Discussion

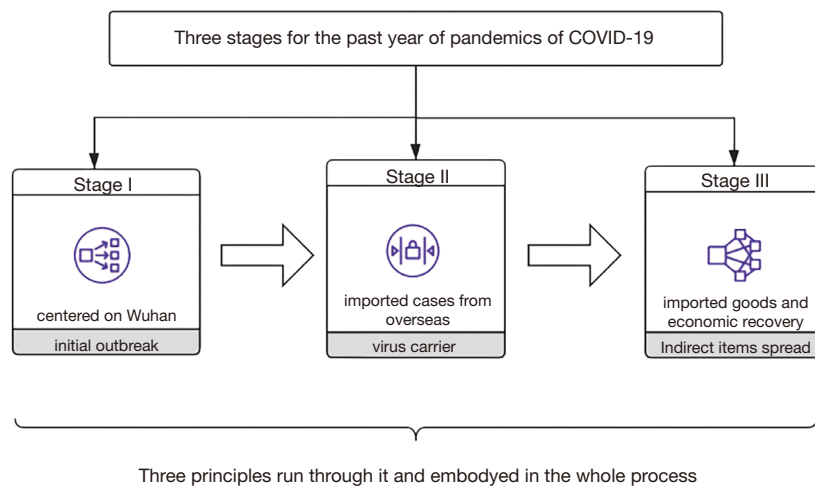
### *Phase 1: intensive attention on Wuban*

While in a previous paper, the epidemic in Wuhan was analyzed as being composed of five stages (insert the desktop paper), we believe analysis can also be performed by focusing on the effect of the restrictions on and policy surrounding individuals, communities, and cities (5).

The isolation of individuals in Wuhan saw the city establish four categories of personnel effected by COVID-19; confirmed patients who must be admitted and treated; suspected patients who must be quarantined; patients with fever who cannot be clearly excluded and who must be quarantined; and close contacts of confirmed patients who must be quarantined and centrally observed. At the same time, the activity routes of infected patients were tracked, and accurate personnel isolation and route backtracking prevention and control work were implemented.

Communities across the country, beginning in Wuhan, were designated as the unit of quarantine. In China, urban communities are uniformly managed by residents committees and sometimes further subdivided into smaller grid units. Empowering small community units to be responsible for the enforcement of government policies concerning infection control and minimizing transmission routes allowed for more fine-grained management and accurate surveillance of outbreaks.

The lockdown of the city of Wuhan commenced on January 23, 2020 to and ended on April 8, 2020; a total of 76 days. At the same time, people who had recently left the city were screened and registered throughout the country. The lockdown of Wuhan was a pivotal event in the history



**Figure 1** Shanghai's rapid response presents a successful model.

of public health in China and the world and was only possible through a policy which placed regions, cities and communities as units responsible for implementation and enforcement (6-8).

The travel ban in Wuhan and the national emergency response delayed the growth and ultimately limited the size of the COVID-19 outbreak and it is estimated that Wuhan's closure delayed the spread of the epidemic to other cities by 2.91 days (95% confidence interval: 2.54–3.29) (9).

The above measures, which revolve around the classical principles of infectious disease prevention and control of the source of infection, cutting off the route of transmission and implementing precise prevention to protect vulnerable populations, have delayed the growth of the epidemic in other parts of China and the rest of the global population.

### ***Phase 2: internal stability but a threat from abroad***

From the beginning of the outbreak until 15 March 2020, the global total of confirmed COVID-19 cases had exceeded 700,000, and the number of cases acquired outside of China, or imported cases, had increased to 123. According to official statistics, nine provinces and cities had received cases acquired outside of China, and a policy of "prevention import from abroad" became one of the priorities of epidemic prevention and control.

As the strict prevention of cases acquired abroad became a major policy in epidemic prevention and control, many regions and communities took targeted measures. Inspection and quarantine were comprehensively strengthened and the

application of an electronic Health Declaration Card for all inbound personnel was strictly implemented. All individuals attempting to enter China from countries seriously affected by the pandemic, regardless of their nationality, were placed under quarantine for 14 days and were subject to mandatory nucleic acid testing. These measures effectively cut off the route of transmission and had a dramatic effect on case numbers.

While these and other measures to control COVID-19 were strictly implemented, the resumption of work and production in an orderly manner was also effectively promoted. With continued vigilance surrounding the use of masks and screening and temperature detection centres established in public places, schools and industry slowly began to resume operation. Hospitals were allocated a full appointment system for outpatient services and the monitoring of suspected cases in fever clinics, community fever sentinel clinics, and pharmacies was strengthened.

### ***Phase 3: prevention and control of imported goods and the economic recovery***

The possible spread of the virus through cold chain products was first observed in June 2020. Since that time, more than 10 provinces have recorded positive cases transmitted through cold chain products. An outbreak site in Beijing was the first to attract concerns in authorities of a link between the transportation of frozen products and COVID-19, and this was also the first indication that cold chain transportation could trigger COVID-19 outbreaks

across borders. Subsequent outbreaks in Dalian, and Qingdao confirmed that this mode of transmission was a real and serious threat.

Fortunately, the three outbreaks in Beijing, Dalian and Qingdao were detected early and on a smaller scale, which was the result of our continuous learning and experience. This experience has resulted in the regular monitoring of asymptomatic workers in cold chain industries and regular nucleic acid screening of employees not less than once a week, as well as stringent environmental testing to enable the timely detection of early infections (8). 2020 also saw the successful conduct of the third China International Import Expo in Shanghai. Focusing on the three key areas of “people, materials, and museums”, the expo highlighted the five measures initiated in China to contain COVID-19; whole-process closed-loop management, whole-chain traceability, full-amount nucleic acid testing, all-access inspection, and comprehensive environmental clearance. The establishment of four epidemic prevention and control lines in the “border, urban, regional, and exhibition areas” was also highlighted. The principles resulting from the expo fully embody those of controlling the source of infection, cutting off the route of transmission, and precise prevention and control.

The Shanghai Public Health Clinical Center established the “COVID-19 Department” on December 26, 2020 to help normalize epidemic prevention and control, which was also a national initiative. On the basis of precise prevention and control, the resumption of work and production has yielded initial positive results.

At the time of writing, China has entered the busy Spring Festival travel season, raising government concerns that this may increase the risk of a new bout of infections. In response, local governments have issued policies to restrict travel during the festival and bolster local control measures.

Shanghai recorded 16 local cases of COVID-19 between January 20, 2021 and February 27, demonstrating an accurate and effective method of infection control in that city. In response to the epidemic, the city employed three strategies. The first was based around the theme of “proactively discover”. This was achieved through vigilant monitoring in addition to preventative measures. The second concerned “quick disposal”. Once an outbreak was confirmed, the Shanghai government immediately launched an emergency response mechanism and contingency plan, and quickly identified the sites of infection, cases and targets for intervention and treatment. The third strategy adopted by the Shanghai government was to ensure that

all of these mechanisms were conducted in a precise and orderly manner. Contact tracing took place using the latest technology and closed-loop management measures were implemented with ongoing refinement.

The approach in Shanghai was also strongly influenced by another strategic policy, that of “try not to affect people’s lives because of epidemic prevention”. This policy has been likened to “catching mice in a ceramic shop”, where “we hope to catch the mice without breaking the porcelain”. Whilst some degree of impact on industry, education and other social activities has been inevitable, minimizing the impact of COVID-19 restrictions on these and other features of daily life has also been at the forefront of government thinking. Fortunately, the results show that there has been basically no significant adverse impact on the lives of community members in Shanghai, and normal business and industry production has occurred.

In the phase management of COVID-19, our original suggestion in writing this paper is to timely adjust the prevention, treatment and management policies according to the occurrence and development of the epidemic at different stages by observing and judging the epidemic at different stages. In different periods, there are different transmission characteristics, and the transmission relationship between animals and people will also change with the occurrence and development of the epidemic. These characteristics and changes determine the policy characteristics of relevant epidemic management policies. It is of great guiding significance for the government and relevant personnel to adjust specific policies, realize point-to-point prevention and stage-to-stage control to clarify and clarify the stages and characteristics of the development of the epidemic in a timely and early manner, and constantly update the latest understanding of the development stage of the epidemic.

This article solves the scientific problem for the COVID-19 outbreak of epidemic and performance, we review and reflection, how to face the unknown and suddenly next time can have a better response in the outbreak, in the case of reducing losses and costs timely adjust our policy and management measures, for individuals and groups to prevent and cure and so on. Treatment and so on can have a certain enlightening and suggestive significance.

## Conclusions

The global novel coronavirus pandemic has entered its second year and its cost across all facets of life continues to

rise. While the development of vaccines to prevent infection or minimize its effects, coupled with these being provided free of cost in China provide great hope for the future, vigilance must not be relaxed (10).

Strict adherence to both public and personal health measures is essential to control infection and cut off the route of transmission, and the principle of protecting vulnerable groups, must be maintained. All these measures are required to ensure the smooth recovery towards normalizing daily social life and restoring the world economy. This study has reviewed the development process by which the pandemic has been managed in China. The different prevention measures and policies have been summarized with the hope that sharing of the Chinese experience may benefit other countries in dealing with the COVID-19 pandemic.

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### Footnote

*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at <https://dx.doi.org/10.21037/apm-21-1582>). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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