

RESEARCH ARTICLE

A war without smoke: Infectious disease panic and its response—A case study of Macao-Portuguese government's prevention and control of cholera from 1912 to 1949

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ABSTRACT

With the time frame 1912–1949, and according to the recording in the government gazettes and Chinese press, this essay systematically discusses the powerful and effective measures and achievements in cholera prevention, epidemic prevention, and infectious disease control of the Macao-Portuguese government. Meanwhile, it analyzes and investigates the cooperation and interaction in cholera prevention between the Macao and Hong Kong governments and emphasizes the critical significance of regional developments of Macao's cholera prevention and control, that is, with the internal control to lower incidence and external control to minimize importation and diffusion, the aim to control cholera was achieved thus allayed the public panic among Macao and perimeter zone, creating advantages to stabilize economic development, social order and peaceful living environment in Macao as well as other Cantonese regions. As one of the seaport cities that adopted the European medical system and model and implemented free cholera vaccination for all, the fighting process and measures of Macao-Portuguese government adopted to control the cholera epidemic show that cholera, a dreadful infectious disease, can be effectively managed as long as scientific and appropriate methods are taken. Sorting out the types and characteristics of infectious diseases in Macao during this period and the mechanism of combining medical and preventive treatment at that time, and analyzing the effectiveness of the administration of disease prevention and control by the Macao-Portuguese government and the limitations of governance under the conflict between Chinese and Portuguese will have important academic significance for understanding the efficiency and deficiency of Macao-Portuguese governance towards disease control, the construction, development and change of the urban public health emergency management system and the urban governance. The more important significance will bring to the urban public health emergency management system and the urban governance in modern China.

Keywords: cholera; infectious disease; Macao-Portuguese government; public health emergency management

1. Introduction

Medically, panic is defined as a psychological state or a kind of mentation that responds to an external threat or a substantial group emotional response (always considered irrational)—whether this threat is natural

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or artificial, practical or imagined, temporary or long-term. “We define panic as a collective flight based on a hysterical belief^[1].” Since the 19th century, panic has been understood as a “Primordial” fear, belonging to “the most basic primitive human beings’ emotion^[2]” and a psychological mechanism left over from human evolution. The panic became increasingly associated with modern groups in the second half of the 19th century^[3]. Historically, panic, as a psychological problem, has always been associated with infectious diseases. For example, cholera in India in 1817. It spread to other parts of Asia and Europe, causing great panic^[3], and its shadow still lingers. Macao opened ports in the late 16th century and became one of the important port cities of foreign trade. Some scholars have argued that infectious disease epidemics are always associated with specific natural and human environments^[4]. Due to the hot climate, differences in groups, Macao has become one of the hardest hit areas with frequent infectious diseases outbreaks, such as plague, smallpox, measles, diphtheria, lung disease and so on. In the 1840s, cholera and other contagious diseases broke out alternatively in Macao, causing public fear and panic. The Portuguese government issued relevant laws and regulations to actively regulate the public health environment in Macao actively, focusing on solving various social problems arising from the spread of cholera. Once cholera emerged in Hong Kong and Guangdong areas, Macao either amended public health decrees or cooperated with Hong Kong and Guangdong area to jointly control the spread of cholera and other infectious diseases. These measures undoubtedly benefit for the construction of its public health system and improve its ability to prevent and control infectious diseases and crises response ability.

Taking Macao from 1912 to 1949 as an inspection period, this essay discusses the measures Macao government took to deal with the cholera panic, the public health policies formulated, and their effectiveness. The following historical questions should be answered: First, how did cholera, which came as scheduled almost every year (some broke out in Macao, and some were imported from the surrounding area) affect the governance of Macao government? Second, to what extent did the cholera panic imply the continuity of space and time and was conceptualized as a cross-regional phenomenon in Macao? Third, what role did government gazettes, newspapers, and periodicals play in controlling the cholera panic crisis in Macao? Fourth, the panic study under the infectious disease model emphasizes its “pathogenicity” and “infectiousness”, so what is the relationship between cholera and panic? Fifth, the complex generation mechanism behind the coexistence of cholera panic in Macao, Hong Kong, and Guangdong Province.

Through a systematic study of government gazettes and Chinese newspapers recorded between 1921 and 1949, this research provides valuable historical insights into the measures and achievements of the Macao government in preventing cholera, controlling epidemics, and managing infectious diseases. Analyzing the collaboration and interaction in cholera prevention between the Macao and Hong Kong governments, it highlights the crucial significance of regional development in Macao’s cholera prevention and control. This contributes to a deeper understanding of the collaborative mechanisms and knowledge exchange in public health between Macao and its surrounding regions. Emphasizing the Macao government’s internal control measures to reduce the incidence and external control measures to minimize the importation and diffusion of cholera, the research underscores the importance of maintaining public health, alleviating public panic, and promoting stability in economic development, social order, and peaceful living environments in Macao and neighboring areas. In the realm of medical system exploration, the research mentions that Macao adopted the European medical system and model, providing free cholera vaccination for all. This highlights Macao’s innovative and advanced practices in the medical field, contributing to the study of medical history and international medical systems.

In conclusion, this study not only delves into the historical public health measures in Macao but also offers rich historical information on health cooperation, disease prevention, and medical systems. It provides

valuable experiences and references for future research on similar issues.

2. Internal and external causes of cholera outbreaks

Macao was one of the cholera-prone areas, and the cholera epidemic presented the characteristics of being cyclical and reciprocating. When cholera broke out, the number of infected Chinese people was higher^[5], and the mortality rate was higher. This was related to external factors such as the natural environment, social history, and lack of medical and health resources. At the same time, it was also associated with internal factors such as the harsh living environment of Chinese people, poor daily dietary conditions, lack of common medical sense, inadequate preventive measures. Through the continuous investigation and study of infectious diseases, the Macao government has clarified cholera's causes and morbidity. The overall urban plan focused on managing urban environmental sanitation, especially the sanitary environment in Chinese residential areas and poor daily life. The above measures achieved some results and effectively controlled the incidence and spread of cholera. It should be emphasized that not all cholera epidemics in Macao were bred locally.

In many cases, they were caused by imported cases in the surrounding areas, and sometimes, the local outbreak would even occur at the same time as the imported epidemic. As an international trade port, Macao is also an international city trade center in South China. The number of urban floating people was significant, and the component was diverse. If cholera occurred in one city or region in its regional plates, it would affect a wide range, undoubtedly affecting the surrounding regions' economic development, social stability, daily life, and public security. Therefore, Macao's cholera prevention and control focused on strictly preventing local and external imports. Two effective measures were taken: increasing public health resource investment and free vaccination for Macao residents to minimize the probability of a local cholera outbreak. They have paid close attention to the epidemic situation in the surrounding areas. Once the epidemic occurred nearby or in other regions, the government would immediately launch an emergency plan to prevent the outbreak.

2.1. Clarify the causes of frequent local cholera and prevent and reduce the incidence of local epidemics

After a survey of cholera epidemiology, the Macao government found that the Chinese-populated areas were densely populated, the living environment and conditions were poor, and problems such as residents' hygiene, daily dietary hygiene, drinking water cleaning, and poor sanitation were particularly prominent. Daily, especially during the cholera-prone season, the government issued announcements to popularize relevant medical and health knowledge, such as cholera transmission, emphasizing prevention and hygiene, and cleanliness in the living environment and drinking water. Because faeces, urine, rubbish and kitchen waste were the breeding grounds of cholera. In addition, new requirements were put forward to Macao residents.

2.2. Find the source of cholera external input, strictly prevent and control imported cases

Macao is an open international trade port city. On the one hand, Portuguese or Chinese, due to factors of geopolitics, historical origins and high dependence on production, life and commercial goods in the surrounding areas, had an increasingly close relationship to the outside world, thus forming an inseparable regional network system naturally; on the other hand, the outsiders, with complex composition, engaged in commercial trade and tried to make a living in Macao. People worldwide regarded Macao as a heavenly place and paradise to make a fortune. The footprints of this very transient population covered the surrounding areas, home and abroad. If cholera occurred in the neighbouring regions or coastal port cities, the risk of being affected or infected in Macao was extremely high. This is an inevitable result of long-term economic and trade development between the geopolitical plates and regions. The coexistence of interests and risks has become a practical problem that Macao and its surrounding areas must face.

When cholera occurs in Macao or any part of Hong Kong, Guangzhou, the Pearl River Delta region, or coastal port cities, it is difficult to manage alone. According to relevant documents, on August 17, 1916, Hong Kong media reported that cholera broke out in Macao and was declared an epidemic. Hong Kong government issued an announcement prohibiting the entry of Macao residents. The Governor of Macao immediately called the Portuguese Consul in Hong Kong to deny these reports and clarify that only 14 cholera patients were found in Macao, mainly imported from Guangzhou. On the 19th, the Macao government announced that from the 1st to the 16th of this month, a total of 196 people died in Macao, of which only 15 died of cholera. In 1920, there was another outbreak of cholera and other infectious diseases in Macao. Some were infected in Guangzhou and spread to Macao. After the outbreak of the Pacific War in December 1941, South China was occupied by the Japanese army. Macao was declared a “neutral island”, and refugees regarded it as a “shelter haven”. In July 1942, a large number of refugees moved to Macao, including a large number of Hong Kong asylum seekers. Due to the highly unsatisfactory living and sanitary conditions in Macao, the cholera epidemic increased significantly. According to statistics, the mortality rate of patients was as high as 89.5% at that time^[6]. It can be seen that the influx of refugees from Hong Kong, coastal and surrounding areas during the war was also an external cause of the high incidence and mortality rate of cholera and epidemics in Macao.

3. System constructed to promote the implementation of cholera prevention and control measures

From the early 20th century to the 1950s, Macao could not stop the occurrence of local cholera. However, specific prevention and control measures could slow down its frequency, reduce the risk of cholera epidemic transmission, save government resources, and eliminate the resulting social fear and panic. The original intention of the Macao government to control cholera is also its fundamental goal. When cholera occurs in surrounding areas, coastal ports, and other places, the Macao government must solve the problem of cholera import or spread in the face of external cholera threats. Therefore, its conventional preventive measures can be divided into internal and external aspects, focusing on internal prevention and breeding and external prevention and importation.

3.1. Formulated relevant regulations to strengthen prevention

Regarding the policy of cholera prevention, the Macao government’s consistent practice was to formulate relevant laws and regulations, take adequate measures, implement comprehensive treatment, reduce the probability of cholera outbreak, and ensure public health safety.

First, the Macao government promulgated health regulations and set up particular institutions responsible for improving the urban public health environment. In March 1912, the Macao government issued an announcement claiming that the stagnant water in Macao rice fields was accessible to reproduce mosquitoes and flies, which was a potential factor in the transmission of germs and prohibited the cultivation of rice in basins near Coloane Island^[7]. In addition, many domestic sewage ponds in the east of the Macao Peninsula were a hidden risk of plague and cholera. The government used public resources to improve the dirty and messy urban sanitation environment^[8]. At the same time, special personnel were sent to the Chinese-populated communities to check the sanitary condition, urging the cleaning of houses, spraying potions, and removing dirt. As a result, the living environment of Chinese communities was rectified. Meanwhile, it rebuilt Chinese markets, corrected its chaotic and hygienic environment, sent special personnel to remove street garbage, and required residents not to spit everywhere. As a result, after continuous supervision, inspection, and rectification, the public health troubles in Macao gradually improved, and residents gradually formed good health habits^[6]. Moreover, by targeting the problems of trash and manure accumulation in urban streets and residential communities, unclean private and public toilets, and improper treatment of domestic sewage, the government

has promptly dealt with them to eliminate dead corners and hidden risks that bred plague^[9].

Second: strengthen the supervision of the catering environment. Macao government believed that poor dietary hygiene and eating unsterilized and cholera-infected vegetables and fruits were among the leading causes of the disease among many residents. Therefore, during every cholera high-incidence season, the government spared no effort to publicize the importance of a healthy diet, such as advising residents not to drink raw, healthy water and spring water and not to eat unripe food. It was recommended that vegetables, melons, and fruits be disinfected with disinfectants and washed with boiling water before eating. Since July 1938, raw, cold, and unhygienic food had been banned, and so had residents' favourite in summer-ice cream. "Amusement Park" ice cream made in Hong Kong, after being quarantined by chemists and doctors, had acquired proof of micro bacterial contamination and thus enjoyed exclusive sales privileges. Other ice cream brands and products were prohibited because they might contain germs and were prone to cholera infection. Traders were banned from selling food near the Macao Bacteriological Inspection Institution. If they violated the regulations, their goods were confiscated. Health and quarantine personnel were dispatched regularly to inspect urban food stores' kitchen facilities and hygienic environments. As a result, public health management was strengthened, which achieved the effect of preventing or stopping the high or multiple incidences of cholera in the summer.

Macao was short of water resources. Macao residents mainly use wells and spring water in their daily lives. The poor quality of well and spring water and its susceptibility to bacterial contamination was the primary cause of cholera. Since the beginning of the 20th century, the Macao government has attached great importance to the issues of sanitation, construction, and a safe and hygienic drinking water supply. For example, in June 1917, reservoir facilities that meet sanitary drinking water standards were built on the slopes of Colina da Guia. In January 1930, Macao established Water Supply Co., Ltd. to provide residents with clean and hygienic drinking water^[10]. In June 1932, the Macao City Hall signed a contract with the Macao Water Supply Company to supply drinking water in the island area. In July 1936, the Ilha Verde Treatment Plant, the first waterworks in Macao to supply purified and chlorinated tap water, was completed and put into operation^[8]. Due to poor quality and vulnerability to pollution in most wells and springs water used by private households in Macao, the government sent health personnel to test quality and sanitary conditions regularly. Wells that did not meet hygienic standards or were in poor, clean environments were immediately closed^[8]. Through investigations of cholera epidemiology, the government found that infected dirty laundry water, if spilt on the ground, would likely flow into wells, springs, and other places through rainwater. Faeces discharged by patients would flow into the inland port and river channels through surface or ditch water. Meanwhile, the cholera virus would spread into larger areas. If residents used infected water or ate infected seafood or aquatic products, it would increase the risk of cholera infection. Therefore, the government calls on residents to drink tap water, use well and spring water cautiously as well as unpurified water. In hot summer, residents would use more water. In order to lower living costs, residents had urged the government to open those closed wells. The government refused their request because the healthy water quality did not meet the sanitary standards. Wells that met clean criteria and were not closed were allowed to be used continuously. During the cholera epidemic seasons, the Macao Health Bureau (MHB) assigned health personnel to inspect healthy water used in tea-houses, restaurants, and households to avoid contamination by cholera bacteria daily.

Third: solidly promoted cholera prevention. During the cholera season, or when the cholera epidemic broke out in the surrounding areas, the Macao government would launch an epidemic prevention campaign in the whole of Macao, making full use of government affairs and media platforms, such as gazettes, bulletin, Chinese and Portuguese newspapers, to widely publicize the common sense of cholera health and repeatedly emphasized the importance of health and safety by posting written propaganda on streets, in restaurants, tea-

houses, and schools, as well as subtitles in theaters. In the cholera epidemic-prone season, people were prohibited from gathering and recreation, especially recreation in the contaminated seawater. The primary purpose is to prevent the breeding of the cholera epidemic. The government's anti-epidemic campaign focused on providing free vaccinations for residents, reducing their vulnerability to cholera. From the perspective of the cholera vaccine procurement source in Macao, before 1937, it was mainly purchased from Hong Kong and other places. After the fall of Hong Kong in 1941, the Macao health authorities went to Guangzhou or Hong Kong to buy new drugs or vaccines with better epidemic prevention effects. Due to the short validity period of the cholera vaccine and the hot weather in South China, the storage and storage requirements were relatively high. If not handled properly, it would cause significant economic losses. Therefore, the Macao government would procure on-demand in every cholera-prone season in the above places. The free vaccination group mainly included people living in Macao, boat dwellers, British and American expatriates seeking refuge in Macao, missionaries, ship staff, and Chinese and foreign people engaged in commercial trade. Considering the wide range of Chinese and foreign business groups and the high risk of potential transmission, the government had arranged special personnel to vaccinate tourists to Macao at the Hong Kong and Guangzhou ship terminals and other cargo terminals. Vaccine timing could last for four or five months, with a limit of two doses per person, and the interval of injections of each needle was one week. The government stipulated that government employees, their families, school teachers, and students must be vaccinated and could collectively go to Senado Square Doctors' Bureau and other places for injections. In order to reduce the risk of cholera outbreaks in schools, medical staff were assigned to schools to vaccinate teachers and students. Every year, Macao's Central District Health Bureau, Public Ambulance Team, and other health institutions would open alternatively to offer free vaccination for residents. Portuguese doctors and temporary recruitment professionals mainly finished the injection work^[11]. In addition, stations had been set up on major streets, such as Nanjing Market and Almeida Ribeiro, to offer convenience for residents^[12]. Many Chinese feared cholera while sceptical and had a wait-and-see attitude toward vaccination. There existed a mentality that they could luckily escape from cholera without vaccine injection. Therefore, the government set up vaccination sites in the Kiang Wu Hospital medicine branch and assigned Chinese doctors and nurses to vaccinate Chinese to dispel their concerns and eliminate their vigilance and contradictions. In 1947, the Health Bureau (HB) stipulated that residents could get vaccinated at Fai Chi Kei Terminal, St. Lafayette Hospital, and other places. What was different at that time was that sites set up for free vaccination covered the whole of Macao, which could effectively avoid cross-infection and improve the residents' willingness to vaccinate. On the other hand, people engaged in economic and trade activities would not have the epidemic prevention certificate (a permit to enter and exit Macao), and their movement would be restricted.

Fourth, cholera vaccination data showed that the number of vaccinated people each year varied, but the government's efforts to promote free vaccination had never stopped. Before the 1930s, the lack of statistics made it impossible to assess its details. During the Sino-Japanese War in the 1930s, coastal and surrounding residents took refuge in Macao. As of May 1937, the total population of Macao was 248,953, including 21,174 Portuguese, 22,030 Chinese, and 749 other nationalities. Macao Peninsula was a residential area with a population of 23,1953, accounting for 93% of the total population; the total number of boat dwellers here was 21,384, accounting for 8.58%. After the fall of Guangzhou in October 1937, refugees continued to flock to Macao.

The number of people waiting to enter Macao at Gongbei Port was 20,000. In April 1939, Macao hosted more than 900 refugees, including more than 300 children. In response to the call of the government's epidemic prevention campaign, Macao residents, both permanent residents and other groups, were required to be vaccinated. However, there needed to be more accurate data on the total number of people vaccinated. At that

literature, there was a scene of overcrowding in the Central District Health Department, St. Lafayette Hospital, and other temporary injection points, in sharp contrast to the previous situation. In June 1945, the total population of Macao was about 380,000. By the end of June of that year, vaccinated people were 55,000, accounting for about one-seventh of the total population. At the end of 1945, two-thirds of the total population was vaccinated, and only a few died of cholera that year. In October 1949, more than 200,000 residents were in Macao, and about half were immunized. The consciousness of residents' vaccination improved significantly, which showed that the vaccination prevention carried out in Macao had achieved remarkable results and greatly promoted the control of the cholera epidemic.

Fifth: institutional care and humanist concerns in the epidemic. During the epidemic control, regulations such as patient reporting systems, isolation measures, medical treatment systems, and disinfection and management of dead bodies drawn by the government effectively controlled the spread of the epidemic. The government offered free treatments and cared for people experiencing poverty, showing solid humanist concerns and maintaining patients' dignity and rights. The registration and reporting system stipulated that the MHB installed phones specialized in registering states of cholera patients in Centro Hospitalar Conde de São Januário (in the future referred to as CHCSJ), the Central District Health Bureau and the Public Residents could also report to the district police to send patients to the hospital in time and prevent the spread of the epidemic. The HB repeatedly emphasized that if cholera or suspected diseases were found in residential areas, residents or patients' families were expected to go to Largo do Senado Health Bureau to report in person or use particular phones to report the disease in time so that the HB could carry out treatment measures at once so as not to endanger the lives of patients. Isolation measures stipulated that cholera was highly contagious, and it was not appropriate for patients to receive home treatment. They should be sent to the isolation wards in CHCSJ for treatment by specialized medical staff. The government also stipulated that cholera patients admitted to doctors of traditional Chinese medicine should be sent to isolation wards, and one family member was allowed to accompany and attend to them. Traditional Chinese medicine practitioners in Macao should cooperate with the HB to prevent cholera. Patients should inform CHCSJ and the HB if cholera symptoms are found.

Regarding managing dead bodies, the HB paid particular attention to the two major groups: Chinese residents and refugees. According to Chinese traditional customs, the remains of the deceased should be kept for seven days before being buried. The cause of death of many of them was unknown, and cholera patients were not excluded. For example, when the cholera epidemic occurred in Hong Kong and Macao in May 1941, Macao did not unilaterally disclose information about the cholera epidemic. However, when the Japanese army near Zhongshan County quarantined the bodies shipped from Macao, 26 infected bodies were found within two days. Because of these holes and problems that violated the public epidemic prevention policy, the MHB believed that the body would emit stench after being parked for many days, significantly impacting environmental sanitation. Relatives of the deceased would suffer the risk of infection; meanwhile, the fundamental rights and obligations of the living were not reflected. Therefore, special regulations were issued that residents must report to the HB as soon as possible if death occurred. Encoffining must be made within 24 h. Otherwise, one may confront a fine of MOP 50. However, there were still violations, so the HB once again stressed that if the body of a Chinese weren't relocated to another place without the HB's permission, violators would face a fine of five yuan; any Chinese patients who, unfortunately, died on the way to the hospital must be sent to the morgue in Kiang Wu Hospital in the first place, but their relatives must go to the HB to state the reason for not having a certificate to exempt from punishment; meanwhile, the body should be buried within 36 h. If it needs to be placed for a long time following Chinese traditional customs, as long as it has placed conditions, it must be sent to a temporary place to lay coffins in Kiang Wu Hospital. The purpose

was to prevent the spread of germs and give the deceased a decent funeral. To sum up, the Macao government could isolate and treat cholera patients, and patients could receive timely treatment, which benefited in controlling the epidemic and reducing the potential risk of social spread.

3.2. Internal and external defense worked along both lines

Macao faced dual pressure and challenges in epidemic prevention and control from preventing the outbreak and external imports. In order to eliminate residents' fear of cholera and stabilize the social life order, on the one hand, the government had strengthened the information collection, research, and judgment in epidemic areas, formulated and implemented necessary preventive measures, and on the other hand, carried out regional coordination and cooperation with relative health departments in epidemic areas to deal with various risks in controlling and spread of cholera. Areas adjacent to Macao, namely Hong Kong and Guangdong Province, were all areas with a high prevalence of cholera. Therefore, whether there was an epidemic or not, cross-border merchants and the transient population would be regarded as focus groups and targets for prevention in the above three regions every year to prevent spillover and spread. The standard measure the Macao government took was to send medical personnel to Macao city deeps and shipping docks and vaccinate Chinese and foreign merchants arriving in Macao. Unless there was an uncontrollable state of the epidemic, the Macao government would not quickly close customs or prohibit Chinese and foreign merchants from entering. In the long-term "game" with cholera, Macao had accumulated rich practical experience. Carrying out universal epidemic prevention every year, which controlled the spread of the epidemic to a certain extent and protected the fundamental rights and interests of traders, played a positive role in maintaining economic development, the regular operation of social life order, and public health safety. If there were no major outbreak of the epidemic, Guangdong Province, Hong Kong, and Macao would mutually recognize people from any one of the three places were allowed to enter and exit as long as they presented the certificate issued by the local HB, with their photos posted on and the vaccination period valid for six months. If the cholera epidemic rapidly spread in one or more of the three places, stricter preventive measures would be taken to each other: personnel exchanges refused in the epidemic area, or transportation and passenger exchanges suspended. It was the last resort, mainly for the sake of security. For example, after the cholera outbreak in Hong Kong and Macao in September 1940, the Guangdong Provincial Government temporarily suspended Hong Kong and Macao routes^[6]. Once cholera broke out in any place in South China, such measures would be taken, whether between Hong Kong and Macao or between Guangdong Province, Hong Kong, and Macao. The purpose was to cut off the chain of rapid spread and restore regular social order as soon as possible. It was necessary and had nothing to do with right or wrong. Historical experience shows that stopping population mobility and adopting closed control are effective measures to cut off the rapid spread of the cholera epidemic.

4. Mystery of cholera death toll

4.1. Mysterious nature of death data

Cholera is an infectious disease with extremely high mortality rates. When cholera occurred in Macao, death occurred from time to time, but the number varied. It is difficult to obtain an accurate death toll because the government did not make detailed statistics then. The political sensitivity of epidemic prevention and control was high, related to the complex public health and safety situations. So, disclosure of actual figures would certainly bring fear and panic to the public and damage the image of the Macao government. Therefore, official channels announced two defects and shortcomings in the death toll. First, the official information released was general and vague, often labeled with "epidemic" or "plague". As for what epidemic or plague was, there were no further explanations. So, it is not easy to judge the specific numbers. Second, sometimes, the toll released was data at a particular time, which failed to reflect the real epidemic situation. Even if the

annual death toll may not reflect the actual condition of that year. If the government truthfully released the statistics to the public, speculations and doubts about Macao's epidemic prevention policy arose, which was undoubtedly detrimental to governance and was bound to cast a shadow over the economy, society, and the residents' everyday lives. The severe consequences would be difficult to eliminate in the short term.

4.2. Governance reference value of death data

Data release paves the way for epidemic control and its achievements. Despite the above problems in the statistics and disclosure of the cholera death toll in Macao, through the fragmented data disclosed, it is still possible to know the approximate death data in Macao and judge the difficulties and problems in managing the cholera epidemic. According to the literature, in March 1912, a plague broke out in Macao, and most infected people were Chinese. The patients were arranged for treatment in the isolation ward of the Chinese Hospital in Wan Chai. In July, the epidemic disappeared, killing a total of 723 people^[6]. In 1913, 2 cholera patients appeared, 1 in 1915 and 32 in 1916. A severe cholera outbreak broke out in 1937, with 600 patients and 400 deaths. The mortality rate was 66.7%. In September 1940, there were simultaneous outbreaks in Hong Kong and Macao. From September 1 to 15, there were 120 cholera patients, of which 60 died. According to statistics from late September to early October, Macao had 296 cholera patients and 172 deaths, and the mortality rate was about 58%. In April 1941, the cholera epidemic occurred, and nine patients were found, four of whom were sent to the isolation ward of CHCSJ from Kiang Wu Hospital, most of whom were women. At the beginning of June, Macao's cholera had spread with up to 200 patients in a week^[14]. Affected by the Pacific War that year, the total population of Macao soared to 374,737, with 10,844 deaths due to illness or epidemic. However, the MHB report did not specify the number of cholera deaths. However, judging from the measures taken and the Macao government's importance in promoting a large-scale epidemic prevention campaign and free vaccination in March 1942, the cholera epidemic should be severe. At the same time, media reports also warned that thousands of Macao residents had died of cholera in the past few years, but it was a vague figure. In March 1942, there was a cholera epidemic in Macao, and 13 people died, exacerbating public panic. In order to prevent the spread of cholera, the government sent special personnel to check the vaccination of passers-by in the streets. Those who were not vaccinated would be vaccinated. By May 1943, under the supervision or coercion of the government, more than tens of thousands of Macao residents were vaccinated against cholera. At that time, fewer people were hospitalized with cholera. In early September, cholera patients appeared in Macao, and the government continued to set up street stations to vaccinate residents. In April 1944, the government claimed that there were many cholera deaths this year, but to what extent was not disclosed? In April 1945, due to the assertive promotion of the government, residents' willingness to be vaccinated increased, and coupled with the concern for dietary hygiene, there was only one cholera patient. As of the high incidence of cholera in June of that year, only two cholera patients were admitted to the isolation ward in CHCSJ. At the end of that year, there were only a few cholera deaths, indicating that the epidemic prevention measures had achieved remarkable results. In 1946, there were only a few cases of cholera in Macao. Macao had no cholera epidemic in 1949, but malaria, diphtheria, tuberculosis, and other epidemics were more profound. To sum up, before the 1950s, to prevent, suppress or eliminate the recurrent trend of cholera, the Macao government continued to carry out prevention and control: free vaccination, improving the public health environment, and promoting health and hygiene. Achievements were obvious.

5. Regional responding to cholera panic and interaction and cooperation

5.1 Macao's massive contribution to cholera control

First, the Macao government issued laws and regulations every year during the cholera-prone season to publicize general knowledge of cholera prevention, focused on various problems in urban public health and

daily hygiene, offered free vaccinations for residents, and treated patients on time. As a result, there were no uncontrolled cholera epidemics. This was Macao's main contribution to the epidemic prevention and control for Guangdong Province and Hong Kong. Secondly, Macao declared a "neutral zone" in 1932. After the outbreak of the Anti-Japanese War in 1937, Macao was not occupied by the Japanese. At that time, there was unprecedented pressure on cholera prevention and control in Macao, where there were various control objects and a large population. Confronted with economic blockade, military threat from the Japanese, and an increasingly harsh living environment, the Macao government had overcome unimaginable difficulties such as food, energy, refugee, and medical crises and regularly vaccinated residents free of charge every year. Take free vaccination, for example. The government increased investment in public resources and overcame difficulties such as large procurement, transportation, storage, drug effectiveness retention, and injection processes. The complexity and problems were beyond imagination.

Even so, the Macao government's effective prevention and control measures were essential in controlling the cholera epidemic in South China without massive spread.

5.2. The status as main governance entities in the cholera epidemic controlling the regional network system

First of all, Guangdong Province, Hong Kong, and Macao were areas with high incidences of cholera. The three places formed an organic whole in the geographical sector, exchanging epidemic information and judging the development trend of the epidemic promptly. At the same time, taking the regional network system as the centre, the three strengthened contacts and cooperation, which had played an essential role in managing and controlling the epidemic. Although there were significant differences in the political systems and governance concepts among the three, they had shown a willingness to strengthen inter-regional cooperation to fight the epidemic and deal with the problems that arose in the spread of cholera to solve the risks of public governance and ensure the orderly operation of the public administration system. Secondly, from the perspective of the everyday needs of public authority, the whole area suffered if any city in the region failed to control the epidemic's occurrence, spillover, and spread; none of them could be left alone. Therefore, in order to solve the urgent and realistic serious challenges faced together and ensure the regular operation of the regional public health safety order and governance system, it was the best policy for the three to control the multiple or high incidences of cholera epidemic by strengthening cooperation links, integrating resource advantages, and building an effective epidemic prevention system. Due to the unanimous demands, solid desires, and effective measures in responding to the cholera crisis, the economic and trade network between regions and the regional social order achieved a relatively stable development environment.

5.3. The status as hubs in the regional control of cholera

The three belong to three different political and legal systems. There was no affiliation in the administrative systems. Therefore, when cholera occurred in this region, based on its own political, economic and social needs, regulations or measures would be issued to maintain regional health and safety and prevent the spread of the epidemic. In the face of a cholera epidemic, the three hubs generally took the initiative to strengthen communication and contacts and adopted a linkage mechanism of synchronous coordination and cooperation. However, they could only treat the other two equally when safeguarding their interests. They would maintain formal reciprocity and adopt a moderate strategy in a favourable situation. For example, in June 1939, Hong Kong and Macao sought equal rights and obligations in order to prevent the spread of cholera, requiring that people to and from any of the two cities must hold the epidemic prevention certificate. Residents applied for certificates following regulations and for convenience, so there was unusual congestion at the vaccination site in Macao; however, Hong Kong and Macao sometimes would safeguard unilateral rights and

interests and require the other party to obey. For example, in August 1939, Hong Kong authorities wrote to the Macao government, asking that Hong Kong arrivals be exempt from the inspection without a vaccination certificate. Those who travelled from Macao must show the vaccination certificate before entry. This example reflected the in-equivalence between the two sides vividly. Sometimes, to cut off the spread of cholera, Guangzhou city would unilaterally announce the suspension of traffic and merchant exchanges with Hong Kong and Macao, as did Hong Kong. For example, in April 1946, a severe cholera epidemic broke out in Guangzhou, with 366 infected people and 146 deaths. In order to prevent it from spreading into Hong Kong, transportation and personnel exchanges with Guangzhou were immediately interrupted. Only Macao, though located between Hong Kong and Guangzhou city and was under pressure from many aspects, had never adopted a policy of self-seclusion, which showed that Macao held an active and cooperative attitude and had played an essential role in joint cholera management.

6. Conclusions

This article systematically discusses the prevention and control measures and various efforts taken by the Macao government in response to the cholera epidemic from the beginning of the 20th century to the 1950s. Based on this point, it analyzes the cooperation and interaction between Macao, Guangdong Province, and Hong Kong. Facts have shown that measures taken by the Macao government were effective when facing the cholera epidemic, which came in time every year. This played an important role in eliminating residents' fear and panic, alleviating the spread of the cholera epidemic, and effectively maintaining the economic development and social order in Guangdong Province, Hong Kong, and Macao, creating a peaceful living environment for the general public, reducing the losses caused by the cholera epidemic, and created favourable conditions in eradicating infectious diseases at the root. The practical process of preventing and controlling the cholera epidemic in Macao shows that cholera, a dreadful contagious illness, can be effectively managed as long as the methods are scientific and measures are appropriate.

Macao is one of the port cities in South China that adopted the European medical system and model and implemented free cholera vaccination for all. It had a far-reaching impact on the Chinese mainland and the surrounding areas. Free vaccination required civil servants and their families, Portuguese or Chinese school teachers and students, etc., to be vaccinated at appointed medical institutions. At the same time, highly mobile groups such as Chinese and foreign merchants were allowed to travel between Macao and Guangdong Province or other places only if they held vaccination certificates valid within six months. Measures such as regularly inspecting the environmental hygiene of all dining places in public activity spaces; forcibly closing wells and springs that did not meet general health conditions; carrying out sanitary cleaning and disinfection in residential houses; prohibiting bazaars, festival celebrations that may endanger public health; banned public gatherings or icon parades during the epidemic; cholera patients were required to report and be hospitalized for isolation; provide free treatment for poor patients; allowed Chinese to dispose of bodies quickly; quarantined passengers passing through land and sea terminals; searched for passengers with infection symptoms, etc. The above measures have formed an epidemic prevention network covering the whole of Macao, bringing the supervision of the cholera epidemic into practice and reflecting a new governance concept and a management model to keep pace with the times. Although Macao residents, especially Chinese, were wary, suspicious, and even afraid of vaccination. Sometimes, they gossiped to slander the government's goodwill, leading to greater fear among residents, unawareness of the truth, and exacerbating conflicts between residents and the government. It invisibly increased the epidemic prevention cost as well as administrative resources. However, with the continuous implementation of these mandatory policies and better epidemic prevention achievements, residents' attitudes have changed, and prevention and control have become more effective. Since then, the government has changed its governance perspective and conducted rational and educational activities.

Although it took longer, the government finally moved the people and won their support and cooperation. Therefore, by the 1950s, the frequency of cholera outbreaks in Macao was significantly lower than in the early days, and it was fading. For the public, cholera was no longer a terrible disease that caused panic. This smoke-free war finally won the expected victory.

The response, prevention and control of infectious diseases is an important index to measure the level of urban governance and the degree of urban civilization. The complex regional cultural characteristics behind the infectious diseases determined the existence of the urban governance crisis in Macao at that time. The Macao-Portuguese government had reduced morbidity and mortality through extensive vaccination and other measures, to a certain extent, reducing the negative impact on the local economy and society. On the basis of many years of prevention and control experience, in modern times, Macao has gradually formed an anti-epidemic mechanism based on the combination of medical treatment and prevention, and prevention, and matched control methods. From “passive response” to “active prevention”, the daily health concept derived from the public health concept.

The epidemic prevention and control had also provided a normal reason and opportunity for the Macao-Portuguese government to strengthen control over the Chinese community. The Government had set up a special medical and health department, which was directly responsible for medical and health affairs in Macao. Collaborating with social communities to form multiple collaborative governance models of individuals, groups and organizations. Macao-Portuguese government would report the epidemic prevention situation in a timely manner to seek for coordination and cooperation among regional governments when necessary. However, due to the following reasons: first, the implementation of colonial governance by the government; second, the lack of long-term planning, sluggish administration, and limitation of local financial situation in the governance, third, the difficult to eliminate the gap between China and the West, the prevention and control of infectious diseases was satisfactory to some extent. Disease prevention and control and health system construction coexisted with colonial and modern construction, which reduced the efficiency of infectious disease management to a certain extent. It was also the deep political and social reason for the frequent occurrence of infectious diseases in Macao at that time.

Author contributions

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Conflict of interest

The authors declare no conflict of interest.

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