

# Analysis on the construction of intelligent public health prevention and control system of infectious diseases at ports based on SWOT-PEST analysis model

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**Abstract:** The most important thing in epidemic prevention and control is the port. The construction of intelligent prevention and control system of port public health cannot be ignored in maintaining national public health safety, and its development process is bound to be affected by political, economic, social and technical factors. Based on SWOT-PEST analysis model, this paper analyzes the internal and external factors of intelligent public health prevention and control system of port infectious diseases in Hubei Province, aiming at clarifying its own strengths and weaknesses, clarifying external opportunities and threats, and further putting forward corresponding development countermeasures, so as to promote the high-quality development of intelligent public health prevention and control system of port infectious diseases in China.

**Keywords:** SWOT-PEST analysis model; Infectious diseases; Public health; Intelligent prevention and control system.

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## 1. Introduction

The outbreak of major public health emergencies has had a great impact on the global economic development and seriously threatened the health of the whole people. As the hub of international cargo transportation, the port undertakes the heavy responsibility of international trade development, with a large number of goods and personnel at the port, which poses a great risk of infectious diseases, which challenges the public health of port cities. We will build an intelligent public health prevention and control system for customs infectious diseases, and use the intelligent multi-point trigger early warning mechanism and multi-channel monitoring and early warning mechanism for port infectious diseases in Hubei Province to further promote the information and intelligent construction of ports, and finally realize joint prevention and control, build a strong port defense line, and ensure the health of the whole people. However, in the process of epidemic response, due to the limited information collection channels, there are great restrictions on the multi-point trigger mechanism, which also reveals that there are still some shortcomings in the intelligent public health prevention and control system of port customs.[1].

In view of this, this paper takes the port of Hubei Province as an example, adopts SWOT-PEST analysis model, and comprehensively analyzes the advantages, disadvantages, opportunities and threats of the construction of intelligent prevention and control system of port public health in Hubei Province from four dimensions of politics, economy, society and technology, and puts forward some development countermeasures to promote the establishment of intelligent prevention and control system of port infectious diseases in China, in order to provide new ideas for improving public health safety in China and help the "Healthy China Strategy". In this paper, research methods such as on-the-spot investigation and interviews are adopted. The investigation time is July and August, 2022, and the places are Wuhan

Customs Building, Wuhan Xingang Customs and Wuhan Tianhe Airport Customs. The interviewees include the persons in charge of entry-exit inspection and quarantine of Wuhan Customs, the persons in charge of health and quarantine department, import and export food safety department, port supervision department, and the staff in charge of inspection and quarantine, intelligence and information construction at Hubei airport and water port.

SWOT analysis is a qualitative analysis method to comprehensively analyze the internal Strengths, Weakness, external Opportunities and Threats of an organization or industry development, so as to formulate the best development strategy. PEST analysis is a method to analyze the Political, Economic, Social and Technological factors in the macro environment of an organization or industry. There are some disadvantages in the analysis of single SWOT model, such as lack of emphasis, lack of flexibility and lack of innovation.[2]. Therefore, combining the above two strategic analysis methods, some scholars put forward the SWOT-PEST analysis model, which has the advantage of integrating various environmental factors inside and outside the organization or industry, considering the problems comprehensively and clearly, and providing more scientific reference for the strategic planning and development of the organization or industry.[3]. This paper introduces SWOT-PEST analysis model, which is helpful to systematically and comprehensively understand the construction of intelligent public health prevention and control system of port infectious diseases in Hubei Province, foster strengths and avoid weaknesses, and put forward appropriate countermeasures.

## **2. Swot-Pest Analysis of Intelligent Public Health Prevention and Control System for Infectious Diseases at Ports in Hubei Province**

### **2.1. PEST Analysis Based on Superiority (S)**

In August 2022, Wuhan Customs issued the Work Plan for 2022, proposing to adhere to the general tone of striving for progress while maintaining stability, based on the new development stage, implement the new development concept completely, accurately and comprehensively, accelerate the construction of a new development pattern, coordinate development and safety, and continuously promote the construction of the "five customs". In 2022, Hubei Province will comprehensively coordinate the prevention and control of epidemic situation and economic and social development, overcome the adverse factors such as the slowdown of global economic growth, increasing inflationary pressure and the impact of the COVID-19 epidemic, promote high-quality development with a high level of openness, maintain rapid growth in foreign trade import and export, and achieve new heights in scale and steady improvement in quality; Since 2020, the import and export scale of Hubei Province has exceeded 400 billion yuan, 500 billion yuan and 600 billion yuan for three consecutive years. The overall growth rate of import and export, export growth rate and import growth rate are higher than the national average in the same period. Social public health awareness has been deeply rooted in people's hearts, which has aroused citizens' attention, greatly promoted the high-quality development of primary health care, and the development of health quarantine work has become more pragmatic and effective. The epidemic prevention and control system is basically perfect, the emergency mechanism for infectious diseases is basically complete, the airport health and quarantine technology is gradually improved, and the quarantine process is convenient and rapid; The comprehensive application of technologies such as big data and informatization has made great progress in improving the efficiency and effectiveness of prevention and control.

COVID-19 has indeed improved China's public health and quarantine, supervision, medical system and attention, including the accumulated emergency experience and mechanism, as well as national education.[4]

The whole process management of laboratory testing projects has achieved the coverage of information system. The technology center accepts the legal inspection business, and the health center issues COVID-19 inspection. In addition, the customs area also makes full use of information technology to improve the ability of laboratory safety management. The Wuhan Customs laboratory facilities and supplies safety video remote monitoring platform has been built, which has achieved the full video coverage of COVID-19 testing, dangerous chemicals storage and other areas, and achieved traceability.[5]

### **2.2. PEST analysis based on disadvantage (W)**

With the rapid development of national epidemic prevention and control work, a series of problems have emerged. In December, 2021, the State Council issued the Notice on Strengthening the Prevention and Control of the Epidemic Situation in COVID-19, a port city, in response to the joint prevention and control mechanism of pneumonia in novel coronavirus. However, the emergency response to

public health emergencies at other ports has not been well reflected in the Notice, such as the unclear assessment mechanism of emergencies, the imperfect system and mechanism of prevention, early warning, disposal and rescue of emergencies, and the imperfect administrative compulsory guarantee mechanism of emergency response.[6].The intelligent construction of public health in Tianhe Airport is in the exploratory stage, and there are some problems such as imperfect market operation mechanism, large investment and long break-even period, and there are great restrictions on multi-point trigger mechanism, and theoretical and practical research lacks provincial and municipal support. The epidemic situation is strictly controlled, and the public is prone to resist because of mistakes in emergency management. The negative impression of the relevant institutions is under great public pressure.[7].Airport Customs relies on internal forces to collect information on overseas infectious diseases, but has insufficient knowledge of local infectious disease epidemic situation information, and there are loopholes in information sharing with provincial health and health commission and CDC. In terms of joint prevention and control of infectious diseases, all departments attach great importance to the epidemic situation in COVID-19 and are closely related, but pay insufficient attention to joint prevention and control of other infectious diseases.

The information sharing of epidemic situation monitoring needs to be strengthened urgently. The customs relies on internal forces to collect information on overseas infectious diseases, but it has insufficient knowledge of local infectious disease information, and strengthens information sharing with the provincial health and health commission and the CDC. Before the media release, as a member department, get the information of infectious diseases in time. Long-term active notification to the Provincial Health and Health Commission, CDC, multi-point joint prevention and control should be applied to the prevention and control of infectious diseases outside the COVID-19 epidemic. In terms of joint prevention and control of infectious diseases, all departments attach great importance to the epidemic situation in COVID-19, and all departments are closely linked, but they do not pay enough attention to joint prevention and control of other infectious diseases.[8]

### **2.3. PEST analysis based on opportunity (O)**

In July 2021, the Statistics and Analysis Department of the General Administration of Customs issued the Customs Development Plan during the 14th Five-Year Plan, which summarized the achievements of port development during the 13th Five-Year Plan period, deployed 11 major tasks, 4 key projects and 5 major initiatives, formulated a detailed task list for China's port development during the 14th Five-Year Plan period, and defined the specific implementation plan. The continuous attention and support of national policies will contribute to the rapid development of intelligent prevention and control system of port public health. According to customs statistics, in 2022, the total import and export value of Hubei Province was 617.08 billion yuan, an increase of 14.9% over the same period of last year. Among them, exports reached 420.93 billion yuan, up by 20%; Imports reached 196.15 billion yuan, up by 5.4%; The import and export of Wuhan was 353.22 billion yuan, up by 5.3%. The state attaches great importance to the prevention and control of infectious diseases. The customs of Wuhan Tianhe Airport and various departments have joined forces to form a joint

effort, and the sense of cooperation is strong, and it is easy to reach a consensus. The co-governance system of various institutions and agencies has reached a new height. The construction of airport customs prevention and control materials support has been continuously strengthened, further reducing the risk of infection and ensuring "zero infection" for staff; Intelligent system technology and information platform, such as mobile vehicle-mounted integrated shelter testing laboratory and smart travel inspection and customs clearance platform, have greatly improved the quarantine level; Flexible use of innovative technologies has effectively improved industrial efficiency.

There is a special class in the airport, and an information sharing mechanism with the frontier defense and health commission has been established. It is composed of health and health commission, foreign affairs office, transportation bureau, airport group and heads of epidemic prevention offices of various airlines, which coordinate the work and ensure smooth communication in time every time passengers are transferred. Especially for special flights, the identity information can be clarified in the first time.[9]

Flexible use of new technologies such as intelligent map checking, intelligent travel inspection and intelligent individual soldier, and innovative application of remote video inspection technology and new mode of destination inspection have realized remote visual inspection operation and effectively improved industrial efficiency.[10]

#### **2.4. PEST analysis based on threat (T)**

Public health emergencies are characterized by uncertainty and complexity.[11]. At present, the joint prevention and control of infectious diseases in China involves a large number of departments, including customs departments, maritime departments, health and wellness committees, centers for disease control and prevention, etc. There is a lack of a public platform to provide information for all demanders, which is inefficient and inconvenient to communicate. The responsibilities and conflicts between departments are not conducive to the effective integration of resources in the intelligent prevention and control system. With the continuous development of normalized epidemic management, virus variability and infectivity are strengthened, the government's financial burden is too heavy, and the funding projects are gradually unable to make ends meet. Moreover, the comprehensive management level of intelligent equipment needs to be improved, which hinders the construction of customs intelligent prevention and control system at Wuhan Tianhe Airport to some extent. Due to various reasons, the awareness of voluntary declaration of cases is weak, and the virus evolves rapidly and its infectivity is improved, which poses a great threat to the public health safety prevention and control of airport customs. Due to the limited information collection channels, there are only three modes of multi-point trigger mechanism for airport customs at present. At the same time, its theoretical and practical research lacks the support of provinces and cities, with more restrictions, and the information fluency with provincial health and health commission, disease control and other departments is low.

There are great restrictions on the multi-trigger mechanism, because there are limited ways to collect information. At present, there are only three modes of multi-trigger mechanism in customs. At the same time, the theoretical and practical research of Wuhan Customs lacks the support of

provinces and cities, and there are many restrictions. I hope to strengthen the exchange of experience with the provincial health and health commission, disease control and other departments. In terms of vector monitoring, Wuhan Customs lacks technical support and advanced intelligent equipment. At present, there is no relevant platform, and it is expected to obtain more technical support to realize the networking and informatization of vector monitoring. [12]

### **3. Strategy Analysis**

#### **3.1. Strengthen joint prevention and control and deepen inter-agency cooperation.**

The prevention and control of port epidemic situation needs to collect a large number of multi-source data for decision-making reference after statistical analysis. Because most of the port customs have not built a unified and efficient integrated platform of wisdom, health and health covering the whole city, the relevant institutions have their own arrays, which is easy to cause information "chimneys" and "islands"[13]. Therefore, we should strengthen the communication between airport customs and local health and health commission, municipal government, public security, cultural tourism, border inspection, transportation, maritime affairs and other departments, ensure the smooth transshipment mechanism, establish a rapid response mechanism for joint prevention and control, and effectively play the role of "firewall" for entry health and quarantine. Before the release of the media, as a member department, it obtained the information of infectious diseases in time, and actively notified the Provincial Health and Health Commission and the CDC for a long time. Multi-point joint prevention and control was applied to the prevention and control of infectious diseases outside the COVID-19 epidemic.[14].

#### **3.2. Establish a unified information platform to improve communication efficiency**

Government-led is the premise, and the municipal government where the port is located must give full play to its leading role, comprehensively coordinate the linkage and cooperation between the central inspection unit at the local port and relevant local departments, and promote the establishment, improvement and effective implementation of relevant working mechanisms as a whole.[6]. Therefore, it is suggested that the government should come forward to solve the problem of administrative licensing related to confidentiality, and then the airport group should establish a public platform for all parties to use, improve the utilization rate of information, strengthen communication between various institutions and departments, carry out multi-channel and multi-party communication and cooperation strategies, introduce social forces to comprehensively build an intelligent prevention and control system for port public health, and enhance the ability of airport customs to prevent and control infectious diseases.

#### **3.3. Establish an effective risk early warning mechanism for infectious diseases**

The port is the most advanced department in the emergency management system of public health emergencies. It is necessary to prepare for public health emergencies at the port, establish an intelligent early warning multi-point trigger mechanism, and improve multi-channel monitoring and early

warning.[15]. Among them, the communication of information is the first. The intelligent multi-point triggered infectious disease monitoring and early warning platform based on information technology is based on the mechanism advantages of joint prevention and control of infectious diseases in China, breaking through the data barriers related to infectious diseases between management departments and executing agencies, and using big data, 5G, blockchain, cloud computing, AI and other technologies to establish a multi-data sharing mechanism to automatically collect information related to public health emergencies from multiple monitoring points and channels. Carry out the integration, governance, visualization, detection and analysis of public health big data, judge the risk of public health emergencies or the "signs" that have appeared early and intelligently, and automatically issue early warning signals to provide support for scientific prevention and control decisions.

### 3.4. Perfecting the construction of talent echelon and cultivating high-quality talents

The evaluation of emergency management ability is an indispensable link to improve emergency management ability.[16].Senior emergency management personnel should be introduced, technical support should be supplemented, advanced intelligent equipment should be supplemented, relevant platforms should be established, network and informatization of vector monitoring should be realized, and informatization and management should be fully combined.[17]To make up for the cumbersome internal management procedures of the customs and improve the supervision efficiency of the customs. By exploring effective learning and training channels, we will increase the exchange of professionals between ports, increase business drills and provide exercise opportunities. Such as establishing a training point subordinate to the customs level; With local medical institutions, disease prevention, health supervision, emergency management and other departments to carry out "mutual learning", effectively improve the team's emergency handling capacity.

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