

Thoughts on the Construction of Urban Public Transport Emergency Prevention and Control System in China—learning from the United States

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Abstract. During the outbreak of Corona Virus Disease 2019 (COVID-19), there are still some shortages in the emergency prevention and control of urban public transport system in China. This paper summarized problems of COVID-19 epidemic emergency prevention and control measures in urban public transport area, systematically analyzed the top-level guidance documents such as laws, regulations, standards and specifications for urban public transport epidemic prevention and control in the United States, and learning measures selection and cooperation mechanism of urban public transport system epidemic prevention and control. Finally, this paper proposed some thoughts and suggestions on the construction of the emergency prevention and control system of urban public transport system in China, including improving the top-level design, establishing the coordination mechanism, establishing the emergency financial system, developing emergency planning by classification, and strengthening traffic data analysis.

Keywords: urban public transport; COVID-19; emergency; prevention and control system; suggestion

I. Introduction

Public emergencies caused huge loss of life and property to people all over the world, which has attracted great attention of public transport governments and agencies. In 2004, the *Traffic Emergency Regulation for Public Health Emergencies* issued by the Ministry of Health made it clear that the transportation authorities of the cities above the county level should develop transportation emergency plans for emergency. Urban public transport is an important part of transportation emergency system, but it still facing some deficiencies in the current emergency prevention and control of COVID-19. It is very important and urgent to establish a complete urban public transport emergency prevention and control system under the background of building a powerful transportation system and the public transport priority development, which systematically guiding the emergency response, operation order and timely recovery of service quality, improving the capacity and effect of urban transport system in response to public emergencies.

II. Current situation of urban public transport epidemic prevention and control in China

China's bus transit and rail transportation serving an average of 250 million people in urban cities each day[1]. Facing public health emergencies such as COVID-19, the urban

public transport system mainly adopts the basic prevention and control strategy of "isolation and blocking".

A. Challenges

Although the urban public transport system has accumulated some prevention and control experience in the period of SARS, the difficulties and challenges brought by the COVID-19 to the urban public transport system are even greater. For one thing, COVID-19 outbreak rapidly in the whole country, with high infectivity, no drugs and effective vaccine intervention; for another, compared with 2003, China's urban public transport system has larger scale, wider coverage and more diversified services[1-2].

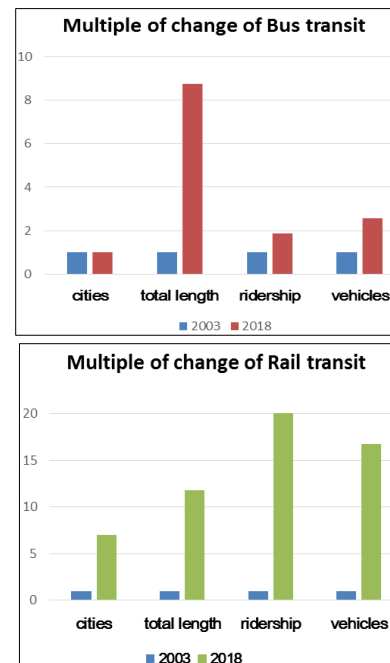


Figure 1. Development of urban transport system in China (2013-2018)[1-2].

B. Epidemic prevention and control measures

At the beginning of COVID-19 outbreak, each city launched the public health event first-level response and shut down all public place and activities. Lacking of scientific and

standardized epidemic prevention and control guidance, public transport agencies take different operation plan based on their own reality, about 40% of prefecture-level and above urban cities, 70% of county-level urban cities, 56% of counties suspend bus service, while the cities which maintaining operation take rigorous disinfection and ventilation, reduce the bus routes, reduce frequency and capacity, implement real-name ride. In the cities with rail transit service, 8 cities suspend service, 2 cities reduce about half of routes, and other cities implement measures such as disinfection, temperature control, close some stations, adjusting operation time and frequency, reduce capacity and implement real-name ride[3]. In February 2020, China's urban bus and trolley bus ridership was 28.15 million, with a year-on-year decrease of 86.6%; rail transit ridership was 3.86 million person times, with a year-on-year decrease of 85.9%[4].

C. Problems

It is necessary to suspend or reduce public transport operation services for containing the spread of the epidemic. However there are some problems:

- **Suspension of public transport services:** for one thing, the essential services (doctors, patients, police, railway station and airport staff without private cars, etc.) are not guaranteed; for another, the maintenance costs of vehicles, assets and equipment during epidemic cause grant pressure for public transport agencies.
- **Maintaining operation service:** for one thing, running with fewer or no riders cause serious loss of operation cost; for another, lacking of necessary disinfection, protection materials and standardized disinfection training increase the expose risk of drivers and passengers.
- **Financial subsidy:** it is an urgent and critical problem for the government to solve whether the operation cost of public transport agencies during epidemic period is linked with financial subsidies and how to subsidize.

III. Experience of epidemic prevention and control of public transport in the United States

A. Top-level design of the system

Facing an epidemic outbreak, under the systematic and comprehensive guidance documents, the US public transport agencies take response and control measures according to local conditions in a clear and standardized framework to improve the level of emergency management.

1) Planning and guideline. In 2005 and 2006, the Department of Homeland Security successively issued the National Strategic Plan for Pandemic Prevention and Control, the *National Pandemic Strategy*, the *National Pandemic Influenza National Strategy Implementation Plan*, and the Special Plan, *Pandemic Influenza Preparedness, Response, and Recovery—Key Infrastructure and Key Resources*, providing macro guidance to six transportation departments, including public transport system, in developing response plans for each stage of epidemic preparedness, response and recovery[5-7]. The

Federal Transit Administration (FTA) and the Transportation Research Board (TRB) have collaborated to develop the *A Guide to Emergency Response Planning at State Transportation Agencies* and *A Guide for Public Transportation Pandemic Planning and Response* to clarify the requirements of each stage of the emergency response plan, including content, guidance and evaluation tools and checklists[8-9]. At the same time, the FTA funded the completion of *Public Transit Emergency Preparedness Against Ebola and Other Infectious Diseases: Legal Issues* research, systematically sorted out the legal issues that public transport agencies may face during the epidemic prevention and control, and clarified authority and responsibility of all relevant departments at federal, states and local levels on emergency responding[10].

2) Standards. American Public Transit Association (APTA) released *Continuity of Operations Plan for Transit Agencies* and *Developing a Contagious Virus Response* standards to help public transport agencies develop outbreak response and quick recovery planning[11-12]. The Centers for Disease Control and Prevention (CDC) of the United States has developed and released the *Interim Guide to Cleaning Passenger Vehicles When Passengers or Team Members Are Discomfort During an Influenza Pandemic* and the *Interim Guide to Cleaning Bus Stations During the Pandemic The agency provides guidelines and a basic framework for implementing standardized cleaning and disinfection procedures during an outbreak, and requires to use disinfection products registered by the US Environmental Protection Agency (EPA)[13].*

B. Scientific countermeasures

Under the framework of emergency response planning, US public transport operating agencies usually develop emergency response plans according to the preparation, response, and recovery stages. The United States divides the pandemic epidemic outbreak into 0-6 levels, and public transport operating agencies take different actions based on the characteristics and goals of each outbreak level, which specified by the CDC.

- **Prepare for prevention and control:** conduct all-hazard assessment, develop emergency response procedures and planning; familiar with and implement decisions issued by the National Emergency Management System (NIMS) and Emergency Command System (ICS); make effective in advance agreement, such as mutual assistance agreement, service agreement; emergency response equipment and materials; regularly conduct drill inside the organization.
- **Prevent the spread of disease:** adopt different response measures according to the epidemic prevention orders (such as personal protection, social distance, isolation, quarantine, community closure, public shut down); cleanse and sterilize public transport stations, vehicles and high-touched areas according to the CDC procedure with EPA products, and increased frequency.

- **Provide essential services:** identify the basic functions and essential services of the public transport system in accordance with the epidemic prevention orders at the stage of epidemic development. Adjust fixed line and demand-response line operation plans according to changes in ridership; suspend or reduce commuting line operations; peripheral lines, reduce frequency, change to on-demand services or integrate with complementary lines; suspend operation of community activity lines unrelated to the epidemic; Persons with disabilities and other necessary passengers travel to provide basic services; develop clear safe riding procedures to protect the health and safety of employees and passengers.
- **Employee protection:** public transport agencies should take proactive measures to provide health and safe working place, including encourage sick employees to stay at home, conduct epidemic prevention training; vaccinating employees; adjusting staffing and shift; recruiting employees for extra work; adjusting work rules according to epidemic orders; providing health and psychological consulting services for employees.

C. Flexible financial rules

The FTA promulgated Emergency Procedures for Public Transportation Systems and Emergency Relief Program regulations, which clarify the legal procedures, rules, standards and funding ratio of public transport agencies and their subsidiaries to obtain emergency relief when entering into a state of emergency[14-15]. FTA announced on March 13, 2020 that expanded eligibility of federal assistance is available under FTA's Emergency Relief Program to help transit agencies respond to the COVID-19 in states where the Governor has declared an emergency. This allowing all transit providers to use federal formula funds for emergency-related capital and operating expenses, and raises the cap on the federal government's share of those expenses, from 50% to 80%[16].

D. Extensive departmental collaboration

Timely and effective coordination and cooperation among different departments and organizations is very important for epidemic prevention and control. The key to achieve effective cooperation is to establish cooperative protocols and understand the functions, resources, technologies and limitations of other relevant organizations before the epidemic outbreak. During the outbreak of the epidemic, public transport agencies shall establish cooperation and strengthen information sharing with state and local emergency management centers, local governments, communities, public health departments, public service agencies, other transportation organizations, state and regional public transport agencies, labor departments, material suppliers, customers and other related organizations. Public transport agencies should maintain awareness and analysis of epidemic situation, share information with other emergency response agencies through formal and informal ways, including data collection and analysis.

E. Positive publicity

Information release and public awareness are an important challenge for epidemic prevention and control. Crisis and emergency risk communication is based on information provided by experts to urge individuals, stakeholders and the entire community making best decision to protect their own interests in a limited time. During the epidemic, the public health department is the main epidemic information release agency. Public transport agencies must release clear and consistent information to all stakeholders (such as employees, response partners, and passengers) based on the health department information, training staffs to ensure that information released are key, concise and positive, use traditional media and social media to release information to the public, and ensure continuous updates.

IV. Thoughts and suggestions on the construction of urban public transport emergency prevention and control system in China

A. Improve top-level design and systematically guide emergency plans

We should complete and improve the top-level guideline design and organizational structure of the urban public transport emergency prevention and control system, and clarify the organizational functions, powers, responsibilities and work systems. We will develop comprehensive emergency response planning, action plan guide, training courses, cleaning and disinfection standards, and establish relevant rules and regulations, and promote emergency planning covered by urban public transport planning, construction and management. Finally, we could ensure the specialization and systematization of emergency management laws and regulations, diversification and networking of management system, and the standardization, institutionalization and legalization of operation procedures.

B. Establish coordination mechanism and cooperation platform

We will establish the communication and coordination mechanism among urban public transport agencies, emergency command organizations, disease control centers, emergency rescue teams and other relevant external departments, as well as other transportation authorities, transport enterprises, material and equipment suppliers, passengers and other relevant internal doors. Then, we should establish the normal cooperation relationship and communication mode in advance, use the Internet and big-data technology to build information exchange platform to speed up data update and sharing. At the same time, we should enhanced cooperation among urban public transport agencies, research institutes and consultants, jointly hold technical exchanges and seminars of emergency response and control measures.

C. Establish emergency financial system and provide flexible fund guarantee

The financial department shall establish and improve the emergency funding plan to deal with emergencies, define the calculation standard, application requirements and process of emergency financial funds, institutionalize the emergency budget, ensure the emergency funds will quickly applied and place in time when an emergency event occur.

D. Develop emergency plan by category and take measures according to local conditions

In case of public emergency, the supply mode and travel demand characteristics of urban public transport have changed significantly. Traditional public transport cannot meet the situation changes under specific needs, so we suggest to develop demand responsive public transport system according to local conditions as a supplement to conventional public transport. At the same time, the emergency prevention and control plan of urban public transport system will be developed in different levels and classified way, that ensure the urban public transport system can maintain the basic operation, provide essential service and material allocation during emergency prevention and control and.

E. Strengthen traffic data analysis and accurately reflect travel demands

We should build an analysis model of urban public transport system in case of emergency, based on historical data and scenario analysis, assess the risk and impact degree of an event on the system operation, predict the duration of the impact, provide the basis for developing a reasonable operation plan during the emergency prevention and control period, and estimate the investment of human, financial and material resources. Besides, we also need to establish a traceable travel information reporting system, realize the information recording and gathering of the whole trips of subway, bus, taxi, bike sharing and other travel modes.

V. Conclusion

Under emergencies such as epidemics, urban public transportation systems urgently need to establish a comprehensive emergency prevention and control system, provide comprehensive top-level design system, unblocked coordination mechanisms, reliable funding guarantees, and accurate data analysis, which assist urban public transport agencies and organizations developing reasonable and effective emergency plans and actions, thus improve emergency prevention and control capabilities and effects, and effectively reduce the losses caused by emergencies.

Acknowledgments

The research was financially supported by the Ministry of Sciences and Technology Projects "Research on Coordinated Service and Integrated Transportation Operation Mode of Multi-modal Passenger Hub in Urban Agglomeration" (018YFB1601301).

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