THESIS

Risk Communication for Emergency Management of Pandemic Prevention and Control in China:
A comparative study of SARS and H7N9

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ABSTRACT

Many large-scaled pandemics and disease outbreaks have been recorded in human history, causing enormous negative impacts on health, economies, and even affecting international security in the world. Recent years have seen many rapidly spreading outbreaks such as the Hantavirus pulmonary syndrome, SARS, H5N1 influenza, H1N1 influenza, Middle East respiratory syndrome (MERS), Ebola and the Zika virus. Not all of these diseases are new, but population movements have increased in both scale and speed, so there are greater risks that infectious diseases will spread rapidly to multiple countries. Pandemic crises have had serious consequences on health, tourism, travel, trade and have even caused significant political and social disruptions. Thus, effective public health emergency management to prevent and control pandemics is very important.

For effective emergency management of pandemics, which are inherently unpredictable and widespread, preparedness, timely decision-making and comprehensive response involving relevant sectors are critical. But adequate preparedness and appropriate response rely on effective communication and coordination among stakeholders as well as the amount of information available at any given time, and these require a multi-sectoral approach with information sharing and communication as key tools for the prevention and management of infectious diseases outbreaks. However, multi-sectoral collaboration, coordination, information sharing and communication are often the key challenges and problems encountered in dealing with public health emergencies.

International experience shows that risk communication is an important means to facilitate cooperation, resources sharing, decision-making and developing response strategies to deal with a crisis. Risk communication has been integral to disaster management for fifty years and to environmental public health since the late 1970s. Current crisis risk communication involving public health workers has its roots in at
least four areas of research and applied professional practice: environmental risk communication, disaster management, health promotion and communication, and media and communication. Effective risk communication ensures clear objectives, consistent messages, and transparent and credible decision-making. Ideally, risk communication should be a multi-level and multi-faceted process that helps stakeholders define risks, identify hazards, assess vulnerabilities, enhance decision-making and promote consensus and community resilience, thereby promoting the capacity to cope with unfolding public health emergencies. This would be very useful for China’s emergency management.

Emergency management is one of the priorities of the Chinese government’s public health crisis management system. But until a few years ago, many areas of China’s emergency management were in need of improvement: information collection was slow, responses to major accidents and emergencies were not adequately unified, joint coordinated response mechanisms were lacking, and ongoing communication and cooperation among the departments associated with all types of emergencies were problematic. This is particularly the case with pandemic outbreaks, which have proved to be a huge challenge for China.

In the past 15 years China has suffered many public health crises caused by disease outbreaks such as SARS in 2003, H1N1 flu in 2009, and H7N9 avian influenza in 2013. These outbreaks have affected not only public health but also social stability. Since the SARS outbreak, China has established and strengthened national and local surveillance systems to prevent and control infectious diseases and has also expanded its laboratory capacity. Moreover, China’s collaboration and communications with WHO and international scientific communities have increased and been strengthened. Most notably, from SARS to H7N9, risk communication conducted for the emergency management has changed significantly.

The SARS coronavirus and the H7N9 virus shared some similarities: both can lead to
severe disease; there are still no specific antiviral drugs or vaccines for them; worldwide, people of all ages have little protective immunity; and both diseases presented a global pandemic and potential pandemic threat. Although the case fatality rate of H7N9 was higher than SARS, the latter had far greater health, and socio-economic impacts. Control efforts for SARS were heavily criticized and considered to be suboptimal. By contrast, the H7N9 response earned the praise of the international community. Comparing the different risk communication practices in the responses to SARS, H7N9 and subsequent outcomes presents a rare opportunity to examine the key role risk communication can play in emergency management.

This research investigates the role of risk communication in emergency management of pandemic by a comparative analysis of two cases of infectious disease outbreak in China: SARS and H7N9. The aim of this PhD research is to compare the strengths and weaknesses of the risk communication approach and processes used in the SARS and H7N9 prevention and control in China in order to inform risk communication strategy development to improve emergency management of pandemics in China.

Apart from an extensive literature review, this research systematically analyzes and compares the SARS and H7N9 prevention and control events in China focusing on the risk communication strategies and practices. Employing a qualitative case study approach, including document analysis, in-depth interviews, and focus groups, this project provides a comprehensive, chronological, comparative analysis of the two cases involved.

The key findings are:

- An extensive review of international literature and risk communication guidelines revealed over 20 principles and themes about risk communication good practices. For the comparative analysis of risk communication relevant to and useful for China, eight key principles were selected to form a frame of
reference for the assessment: developing trust; being transparent; making announcements early; listening well; planning well; being honest and open; being empathetic and caring; and accepting and involving the public as a partner.

- The SARS outbreak fully exposed China's lack of experience in public health risk communication. Poor internal communication and external information blockades seriously affected the credibility of the government internally and externally. In contrast, by the time of the H7N9 outbreak, the Chinese government’s risk communication strategies had improved significantly by increasing its public trust by providing open, transparent and timely dissemination of information, planning, engagement with the public, and collaboration between sectors. These were associated with a smoother process, a more responsive community, less social disruptions, and rapid control of this serious disease.

- Previous literature seldom mentioned the role of risk communication in facilitating decision-making and cooperation, but this study revealed the importance of risk communication towards decision-making and cooperation in dealing with uncertainties involved with pandemics. From SARS to H7N9, risk communication practices in China have greatly improved, which in turn has facilitated the decision-making process in public health crisis management. Timely decision-making, smooth implementation, and effectiveness of pandemic emergency management relied greatly on collaboration between different stakeholders, which was enhanced by risk communication.

- The keys to effective multi-sectoral collaboration are information sharing and the development of a coordination mechanism. More importantly, early engagement of key stakeholders and involving them in the decision-making process is vital for the success of cooperation for prompt responses to crisis.
Risk communication strategy should incorporate such measures.

Based on the findings of this study, recommendations include the following:

Increase the awareness of the why, what and how of risk communication for emergency management; incorporate risk communication principles into daily management of disease prevention and control; provide timely and comprehensive scientific information to enhance public trust; protect the public's right to know; recognize the diverse public needs; value the community as a resource and respect their right of expression; strengthen information communication; establish mutual trust and good partnerships among stakeholders; respect and engage key stakeholders as early as possible; take advantage of new media and other non-government information channels; ensure open, transparent and timely dissemination of information; establish and implement comprehensive laws, regulations and plans related to emergency risk communication; strengthen multisector cooperation and communication mechanism; and enhance decision-making and capacity for emergency management.

Drawing from a range of international literature, this research has formulated a frame of reference consisting of eight principles useful to guide risk communication practices for public health emergencies in China. Apart from contributing to a better understanding of the field of risk communication, by comparing the SARS and H7N9 responses in China, the research demonstrates the importance of risk communication for emergency management, and its role in facilitating multi-sectoral cooperation and decision-making. Moreover, the study provides useful evidence and recommendations to policy-makers on future risk communication strategy development for pandemic response; this is not only useful for China but for global communities in general to deal with infectious outbreaks.

Key Words: Risk Communication; Emergency Management; Pandemic; Diseases outbreak; China
STATEMENT OF ORIGINALITY

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

Student’s Signature: Wuqi Qiu  Date: December 2, 2016
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ABBREVIATIONS

ADB          Asian Development Bank
AHC          Acute Hemorrhagic Conjunctivitis
CEPH         Centre for Environment and Population Health
CDC          Centre for Disease Control and Prevention
EPA          Environmental Protection Agency
FAO          Food and Agriculture Organization
GDP          Gross Domestic Product
H5N1         The highly pathogenic avian influenza A H5N1
H7N9         Influenza A virus Subtype H7N9
HIV          Human immunodeficiency virus
IHR          International Health Regulations
JPCM         joint multi-sectoral prevention and control mechanism
ILO          International Labor Organization
LPMs         Live poultry markets
LRN          laboratory network system
MERS         Middle East respiratory syndrome
MMR          The combined measles, mumps and rubella vaccination
MOA          Ministry of Agriculture
MOH          Ministry of Health
NEMS         National Emergency Management System
NGOs         Non-governmental organizations
NHFPC        National Health and Family Planning Commission
PHEM         Public health emergency management
RDS          Respiratory distress syndrome
RTI          Respiratory tract infection
SARS         Severe Acute Respiratory Syndromes
UN           United Nations
WHO          World Health Organization
Chapter One  Introduction

1.1 Introduction

Disease outbreaks, particularly those that become pandemics, have caused enormous negative impacts on health, economies, and even global security in the world. There have been many large scale disease outbreaks and pandemics recorded in history, including Spanish Flu, Hong Kong Flu, severe acute respiratory syndrome (SARS), Influenza A virus Subtype H7N9 (H7N9), Middle East respiratory syndrome (MERS), and in recent years, the re-emergence of Ebola and Zika. Not only do they present a large risk to human health, they also influence tourism, travel and trade, and can cause significant political and social disruption (WHO, 2011b) (Rewar, Mirdha, & Rewar, 2015) (Maurice, 2016).

Effective preparedness and response are critical to reduce the impacts of all public health emergencies including disease outbreaks. The effectiveness of emergency preparedness and responses is highly dependent on the quality and amount of information that is available at any given time, and quality communication and coordination among partners is crucial. Information sharing and communication are considered key tools for the coordination of prevention and management of infectious diseases.

As public health emergencies such as pandemic outbreaks often involve risks and uncertainties as the incidents unfold, the management of the responding processes require information and data from various sources, including relevant sectors and many disciplines such as virology, socio-demography, geography, epidemiology, statistics and informatics. Developing an appropriate response to a public health emergency requires extensive information sharing and collaboration among all stakeholder organizations. Risk communication is a useful tool as it helps to consider stakeholder views and their perceptions of risk, enhances collaboration, and
facilitates the understanding all of risks by stakeholders, hence enhancing the necessary collective response. Specifically, it enables practitioners to make appropriate decisions for prevention of, and response to, disease outbreaks. However there are still many challenges to effective risk communication in practice.

Emergency management is one of the priorities of the Chinese government’s public health management system (Hu, 2012). Although emergency management has greatly improved in the past few years, the emergency network in China still requires improvement: the information collection process is slow, responses for major accidents and emergencies are not adequately unified, and communication and cooperation among relevant departments are less effective than they could be.

China’s experiences in emergency management for epidemics have varied. The outbreak of SARS in 2003 can be thought of as the beginning of awareness of the need for risk communication in China’s public health system. In dealing with subsequent infectious diseases in recent years, such as H1N1, and H7N9, international risk communication theory and principles have started to be applied in practice.

SARS coronavirus and the H7N9 virus share some epidemiological similarities, though the case fatality rate of H7N9 was higher than SARS. Both viruses can lead to severe disease, but there still are no specific antiviral drugs and vaccines for them. Worldwide, people of all ages had little protective immunity, and both diseases presented a global pandemic and potential pandemic threat. However, the control efforts for SARS were heavily criticized and generally considered to be suboptimal, while the H7N9 response earned the praise of the international community. Understanding risk communication practice is an important element in understanding the different management responses to SARS and H7N9 and subsequent outcomes. However few systematic analysis of the role of risk communication in the
emergency management system has been undertaken in China.

This chapter provides an overview of this thesis. It first discusses the background and rationale for the research, followed by the aims and purpose of this research, and a description of the methodology. Finally it presents the structure and topics of the thesis.

1.2 Research background and rationale

1.2.1 Research background

Disease outbreaks and pandemics

A pandemic is an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people (Harris, 2000). There are some important features of a pandemic that differentiate it from other disease outbreak. They include wide geographic extension, disease movement, novelty, severity, high attack rates and explosiveness, minimal population immunity, infectiousness and contagiousness.

Numerous significant pandemics have been recorded in human history, including smallpox, cholera, plague, dengue, AIDS, influenza, SARS, West Nile disease and tuberculosis. Influenza pandemics in particular are unpredictable but recurring events that can have severe consequences on societies worldwide. Influenza pandemics have struck about three times every century since the 1500s, or roughly every 10-50 years. In the 20th century, there were 3 influenza pandemics which were named “Spanish flu” in 1918-1919, “Asian flu” in 1957-1958, and “Hong Kong flu” in 1968-1969.

Recent years have seen at least six large-scale outbreaks with potential to become pandemics—hantavirus pulmonary syndrome, SARS, H5N1 influenza, H1N1 influenza, Middle East respiratory syndrome and Ebola virus disease (Gostin et al., 2016). Pandemic and
infectious disease outbreaks can easily cross borders to threaten economic and regional stability, as has been demonstrated by the HIV, H1N1, H5N1, and SARS epidemics and pandemics (Verikios, Sullivan, Stojanovski, Giesecke, & Woo, 2015). Pandemics have infected millions of people, causing wide-spread serious illness across large populations and thousands of deaths.

Beyond the debilitating, sometimes fatal, consequences for those directly affected, pandemics have a range of negative social, economic and political consequences (Davies, 2013). Economic losses can result in instability of the economy. The economic impact is through direct costs, long term burden, and indirect costs. The social impacts of pandemics can also be severe. They include restrictions on travel, closures of schools, markets and sporting events. All these are a likely reality should a pandemic with true potential for high morbidity and mortality emerge. Global security in terms of lives and economic stability, is also threatened by pandemics (Maurice, 2016).

**Public Health Emergency Management**

Public health emergencies can be defined as unexpected events which threaten human health with severe injury, mortality and morbidity, and which have impacts on the economy and the security and stability of the society, and which exceed the community’s capacity to deal with them. Emergency management can reduce vulnerabilities and enhance capacities to withstand emergencies as well as cope with and recover from their impacts. The process of emergency management relates to developing and implementing policies that are concerned with mitigation, preparedness, response and recovery (Petak, 1985).

Effective preparedness and response are very important to reduce the impacts of all public health emergencies (T O’Sullivan, Khan, Fazli, Henry, & De Villa, 2015). Constant
preparedness and response capacity are required in the management of public health crises (Lee, Oh, Park, Chu, & Son, 2013). There has been substantial attention to and investment in emergency preparedness and response capacity for emergencies with health impacts for more than a decade. The importance of robust emergency preparedness and response systems for health emergencies was highlighted most recently by events such as the Ebola outbreak in West Africa and the emergence of Middle East Respiratory Syndrome Coronavirus (T O’Sullivan et al., 2015). As public health crises caused by pandemics and emerging infectious diseases are characterized as unpredictable and widespread, comprehensive, well developed and tested preparedness and response plans are necessary.

Good quality emergency communication and coordination among partners is crucial for the effectiveness of an emergency response, as an effective response is based on the amount of information that is available at any given time. But for many reasons, it can be difficult for stakeholders to collaborate and share knowledge in response to a disease outbreak or pandemic crisis.

**Public Health Emergency Management in China**

Emergency management is one of the priorities for the whole Chinese government (Hu, 2012). Historically health emergency management in China can be divided into two phases. The first phase was from the early days of establishment of the nation in 1949 to 2002, and the second phase is from the outbreak of the SARS epidemic in 2003. Gradually the core content of plans, the system of organization, mechanism and legal framework for the emergency response system has been built (Jin, Xu, Xu, & Sun, 2012). The SARS outbreak in 2003, in particular, served as a wake-up call for China to re-examine and revamp its national emergency management policy.
China’s early emergency management system originated from the former planned economic system. It was characterized by centralized planning, a top-down management and bureaucratic inertia. Public health emergency management system has developed very fast in the decades after SARS (M. Xu, 2015). China built a new National Emergency Management System (NEMS) after the 2003 SARS crisis to cope with the challenges of crisis and disaster management, particularly the challenge of joint decision-making (Lu & Xue, 2016). The NEMS includes emergency management offices, national and local contingency plans, emergency response mechanisms and emergency response laws (Lu & Xue, 2016). Most local governments in China have developed their own emergency plans for managing public health emergencies according to the requirement of article 10 of the National Public Health Emergencies Statute (2003) (G. Hu, Rao, Sun, & Sun, 2007). Although China’s emergency management has greatly improved in the past few years, the emergency network in China still need improvement. One such area for improvement is risk communication.

*Risk communication for public health emergency management*

Risk communication is an interactive process of exchange of information and opinion among individuals, groups and institutions (Covello & Sandman, 2001). It often involves multiple messages about the nature of risk or message expressing concerns, opinions or reactions to risk messages or to legal and institutional arrangements for risk management. Covello et al. has identified four theoretical models of risk communication: risk perception, mental noise, negative dominance and trust determination (Covello & Sandman, 2001). Others have examined other theories relating psychological cognitive processes. The fundamental goal of risk communication is to provide meaningful, relevant and accurate information, in clear and understandable terms targeted to specific audiences. It may not resolve all differences between parties, but may lead to a better understanding of those differences (Covello, 1995). It may also
lead to more widely understood and accepted risk management decisions.

Risk communication helps to improve the communication of risk information and improve the effectiveness and efficiency of multi-sectoral collaboration, and therefore can be an ideal tool for experts and the public to improve the management of public health events. For public health emergencies, risk communication includes the range of communication capacities required through the preparedness, response and recovery phases of a serious public health event to encourage informed decision making, positive behaviour change and the maintenance of trust (WHO, 2009). Risk communication plays a central role in the management of infectious disease. It is an ongoing process that helps to define a problem and solicit involvement and action before an emergency occurs, which is central to epidemic and pandemic control (Gamhewage, 2016).

The application of risk communication in the public arena often involves events of interest to the whole society, and poor risk communication may even lead to mass panic such as happened with the epidemics of SARS, avian flu and Ebola. Governments and health agencies have responded to public health crises with the rapid development of risk communication plans and guidelines, the vast majority identifying risk communication as an essential component of the larger process of risk analysis and management. Based on analysis of some important guideline documents and best practice studies, eight key principles are identified as essential for a comprehensive risk communication for outbreak management: developing trust; being transparent; making announcements early; listening well; planning well; being honest and open; being empathetic and caring; accepting and involving the public as a partner.

Before the outbreak of SARS, the Chinese government had been conservative about information disclosure. However, the developing strategies for crisis management and risk communication of the Chinese Government have focused more and more on the public, and the
satisfaction of the public has become an important criteria for evaluating government’s response to a crisis. For example, when dealing with H7N9, the government attached great importance to developing channels of communication with the public through various media and social media pathways and strengthening two-way exchanges and communication with the public.

Despite these advances, it is helpful to look back to assess risk communication in practice in order to look forward and find ways to improve risk communication for emergency management of disease outbreaks.

1.2.2 Research Rationale

Despite the growing recognition of the necessity and importance of risk communication for emergency management of pandemics and disease outbreaks in international community, China has had a varied history in the application of risk communication for public health events. Literature and practice suggests that risk communication theories and principles have been applied since the SARS outbreak in 2003. Nevertheless, awareness and knowledge of risk communication is still limited, potentially slowing the improvement in China’s public health emergency management system.

Emergency management for pandemics requires different stakeholders to collaborate and share information. Developing an appropriate response to a public health emergency requires extensive information sharing and collaboration among all stakeholder organizations. In China, SARS, H7N9, MERS and other disease outbreaks have particularly highlighted the need for collaboration among those responsible for human and animal health, and for the environment. But this is difficult for many reasons. International experience shows that risk communication is an important means to enable different stakeholders to cooperate and share information in a
public and environmental health crisis.

China’s experiences of emergency management for epidemics have varied. Although SARS coronavirus and H7N9 virus share some similarities, the control efforts for SARS were problematic and the disease spread globally, while the H7N9 response was highly praised and the disease did not spread widely. The question one might ask is “what was the role of risk communication?” It seems to have had an important influence on these different outbreaks. There has been little systematic analysis of the role of risk.

This research demonstrates global knowledge of the role of risk communication in emergency management by providing a systematic analysis and examples from two cases in China, hence contributing to a better understanding of the role of risk communication in this important field. By comparing the SARS and H7N9 prevention and control processes in China with a focus on risk communication, the research will provide real examples of risk communication in practice and an evidence base to inform the development of risk communication strategies so as to improve emergency management of pandemics in China.

1.3 Scope and aims of the research

This research focuses on risk communication for emergency management of pandemic prevention and control in China, by comparing SARS and H7N9 using a framework of principles drawn from international good risk communication practice. It identifies the limitations of risk communication for emergency management of disease outbreaks in China, and makes recommendations for risk communication improvement within the emergency management system for pandemics.

The overall aim of this research is to compare SARS and H7N9 on the framework of principles drawn from international good risk communication practice in China in order to inform risk
communication strategy development to improve emergency management of pandemics in China.

The objectives of this research include:

1. To identify the negative impacts of pandemic crises on health, economy and security.
2. To explore public health emergency management and related issues for public health emergency management of pandemics and disease outbreaks.
3. To analyze the good principles and practices of effective risk communication that can be applied to emergency management of pandemics and disease outbreaks.
4. To analyze the role of risk communication in emergency management and to evaluate the risk communication processes used for emergency management during the SARS and H7N9 events in China.
5. To recommend potential strategies of risk communication for emergency management in pandemics in China.

1.4 Research methodology

Case studies can be used to explain, describe or explore events or phenomena in the everyday contexts in which they occur. This research has chosen the SARS and H7N9 events in China to conduct comparative case study research, because they represent two major disease outbreak events with different outcomes. This research systematically analyzes and compares the SARS and H7N9 prevention and control ‘cases’ in China from a risk communication perspective. This will provide a more comprehensive assessment of the use of risk communication theory and practice in emergency management by using a qualitative case study approach including document analysis, in-depth interviews, and focus groups.

This research can be divided into three phases: literature review, data collection and data
analysis. In the first stage, a large number of data sources covering the contextual fields were reviewed. They included journal articles, books, research organization reports, government documents, policy reports, newspapers, academic seminars and conference papers covering the research’s contextual fields of disease outbreaks and pandemics, public health emergency management, public health emergency management in China, and risk communication. The literature review established the background of the study and the context for the analysis, helping me to understand the knowledge, structure in-depth interviews, share the results of other studies, and provided a framework for establishing the importance of the research. I identified the research gaps and then formulated the research question followed by several focus questions which collectively serve to answer the research question. In this research phase, ethical issues were also addressed before data collection.

In the second stage of data collection, I collected multiple sources of evidence including qualitative data to address the research question and focus questions. These sources included documentary review, in-depth interviews and focus group interviews. Semi-structured interview outlines were designed based on the four research contextual fields. Most cases of SARS and H7N9 were reported in 4 cities in China: Beijing, Shanghai, Guangzhou and Zhejiang, and all data collection was carried out in these cities. The main data collection techniques were in-depth interviews and focus group discussions. All data collected in in-depth interviews and focus group interviews were recorded as all participants consented to do so.

The third stage was the data analysis stage. All the data including qualitative data were analyzed to provide the evidence for the findings and recommendations for the research. QSR NVivo and Mind-manager software were useful for analysis in this research.

1.5 Thesis structure
This thesis includes two parts, comprised of ten chapters. Part I, the literature review, sets the background for this research; it provides a review of the literature of four contextual fields including disease outbreaks and pandemics, public health emergency management, public health emergency management in China, and risk communication for public health management.

Part II, the research methodology, findings and the discussion starts with the research design and methodology of this study, followed by the results, discussion, recommendations and conclusion in five chapters. It examines the two cases of SARS and H7N9 prevention and control processes in China, and presents the results of a comparative analysis of risk communication used in the responses to SARS and H7N9. It includes a discussion based on the major findings, draws some conclusions, makes some recommendations about risk communication for public health emergency management in China, and ends with the conclusion of the thesis, and its significance to the field and to China.

Chapter One, this introductory chapter sets the scene for the research, develops the background and rationale and aim of the research, and the study methodology, and then describes its structure.

Part I, the Literature Review, includes Chapters Two to Five. Chapter Two reviews the concept and history of pandemics; the seven key features of a pandemic are identified, including wide geographic extension, disease movement, novelty, severity, high attack rates and explosiveness, minimal population immunity, infectiousness and contagiousness. It also describes the negative impacts on health, economy, social and global security of pandemics and disease outbreaks.

Chapter Three explores how effective public health emergency management reduces the
negative impacts of pandemics and disease outbreaks. This chapter explores the concepts of emergency management and public health emergency management, and discusses the principles of emergency preparedness and response, and related challenges relating to collaboration, information sharing and risk communication for public health emergency management.

Chapter Four explains the public health emergency management system in China. This chapter provides an overview of the system, focusing on the organizational structure, legal framework, management system and challenges for the system.

Chapter Five examines risk communication theories, principles and practices in public health. This chapter identifies the concepts of risk and risk communication, explains the purpose and theories of risk communication, and examines its roles, principles, and practices and the problems of risk communication in public health. Based on analysis of good practice studies, some key principles are identified as essential for a comprehensive risk communication for outbreak management.

Part II, Chapters Six to Ten, includes the methodology, findings and discussion of this research. The research design and methodology are provided in Chapter Six. This chapter describes the research background and its rationale, aims and specific objectives. Then, based on the conceptual framework, the chapter develops the research design and explains how the methodological approach for this research was chosen. Three stages of data collection methods are detailed. The methods of data analysis and issues of rigour, and ethics are also discussed.

Chapter Seven examines the two case studies of SARS and H7N9 prevention and control processes in China. It includes an analysis of epidemiological characteristics, history, impacts, emergency management, and some of the problems with the emergency management response.
Chapter Eight presents the results of a comparative analysis of risk communication used in the responses to SARS and H7N9 using a framework of principles designed for China drawn from international good risk communication practice, and risk communication for multi-sector cooperation in SARS and H7N9.

Chapter Nine provides a discussion of the key findings based on the literature review and case study analysis, and identifies the learnings about risk communication in disease outbreak prevention and control in China. Then it makes recommendations for risk communication for emergency management of pandemic in China.

This final chapter, Chapter Ten, summarizes the overall findings of the research, emphasizes the findings of each chapter, and draws attention to the major contribution and significance of the research. Limitations of the research and suggestions about possible directions for further research on China’s risk communication for emergency management are also discussed.

1.6 Conclusion

This chapter provides an overview of the background and rationale, scope and aims of the research, methods and thesis structure for this research. The next chapter is the first of the literature review chapters that provide an overview of the state of knowledge that underpin this research. This first review chapter is about disease outbreaks and pandemics.
Part I: Literature Review

Chapter Two  Disease Outbreaks and Pandemics

2.1 Introduction

Pandemics are for the most part disease outbreaks that become widespread as a result of the spread of human-to-human infection. There have been many significant disease outbreaks and pandemics recorded in history, including Spanish Flu, Hong Kong Flu, SARS, H7N9, Ebola, Zika, and these pandemic related crises have been associated with enormous negative impacts on health, tourism, travel and trade. As well, they have caused significant political and social disruption (Rewar et al., 2015) (Maurice, 2016).

This chapter introduces the concept and history of pandemics; summarizes seven key features of a pandemic, and contextualizes the challenges associated with health emergency management. These include: wide geographic extension, disease movement, novelty, severity, high attack rates and explosiveness, minimal population immunity, infectiousness and contagiousness. The chapter also discusses the negative impacts of pandemics and disease outbreaks on health, economy, social and global security.

2.2 Definition of a pandemic

The word pandemic comes from the Greek pan meaning “all” and demos meaning “the people”, and is commonly taken to refer to a widespread epidemic of contagious disease throughout the whole of a country or one or more continents at the same time (Honigsbaum, 2009). In the past two decades, the term has not been defined by many modern medical texts. Even authoritative texts about pandemics such as comprehensive histories of medicine, classic epidemiology textbooks, or the Institute of Medicine’s influential 1992 report on emerging infections, do not
list it in their indexes. (Morens, Folkers, & Fauci, 2009).

The internationally accepted definition of a pandemic as it appears in the *Dictionary of Epidemiology* is straightforward and well-known: “an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people” (Harris, 2000). This classical definition includes nothing about population immunity, virology or disease severity. By this dictionary definition, pandemics can be said to occur annually in each of the temperate southern and northern hemispheres, given that the definition of the term is so wide. In common usage an “epidemic” implies a prevalence of disease which is somewhat higher than normal. “There is a temporary increase in the prevalence of an infectious disease of such extent and course as to indicate a definite change in the balance of forces controlling the occurrence of the disease in the population” (Frost 1976). Seasonal epidemics cross international boundaries and affect a large number of people. However, seasonal epidemics are not considered pandemics. Modern definitions include “extensive epidemic”, “epidemic… over a very wide area and usually affecting a large proportion of the population”, and “distributed or occurring widely throughout a region, country, continent or globally”, among others (Morens et al., 2009). In the case of influenza, biologists also require that pandemic strains undergo key genomic mutations, known as antigenic shift. For WHO to pronounce a level six pandemic alert there has to be sustained transmission in at least two regions at the same time. WHO’s standard definition of pandemic influenza refers to a situation in which a new and highly pathogenic viral subtype, one to which no one (or few) in the human population has immunological resistance and which is easily transmissible between humans, establishes a foothold in the human population, at which point it rapidly spreads worldwide (WHO, 2011a).
2.3 Pandemics through history

There have been a number of significant pandemics recorded in human history, including smallpox, cholera, plague, dengue, AIDS, influenza, SARS, West Nile disease and tuberculosis. Influenza pandemics are unpredictable but recurring events that can have severe consequences on societies worldwide. Influenza pandemics have struck about three times every century since the 1500s, or roughly every 10-50 years. In the 20th century, there were 3 large influenza pandemics: “Spanish flu” in 1918-1919, “Asian flu” in 1957-1958, and “Hong Kong flu” in 1968-1969 (Table 1). Each of these harmed human life and economic development. For example, the influenza pandemic of 1918-1919 killed more than 20 million people in the world and has been cited as the most devastating epidemic in recorded world history (WHO, 2011b).

Table 1 Characteristics of the three influenza pandemics of the 20th century

<table>
<thead>
<tr>
<th>PANDEMIC DATE AND COMMON NAME</th>
<th>AREA OF EMERGENCE</th>
<th>INFLUENZA VIRUS SUBTYPE</th>
<th>ESTIMATED REPRODUCTIVE NUMBER</th>
<th>ESTIMATED CASE FATALITY RATE</th>
<th>ESTIMATED ATTRIBUTABLE EXCESS MORTALITY WORLDWIDE</th>
<th>AGE GROUPS MOST AFFECTED (SIMULATED ATTACK RATES)</th>
<th>GDP LOSS (PERCENTAGE CHANGE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1918-1919 “Spanish flu”</td>
<td>Unclear</td>
<td>H1N1</td>
<td>1.5-1.8</td>
<td>2-3%</td>
<td>20-50 million</td>
<td>Young adults</td>
<td>-16.9 to 2.4</td>
</tr>
<tr>
<td>1957-1958 “Asian flu”</td>
<td>Southern China</td>
<td>H2N2</td>
<td>1.5</td>
<td>&lt;0.2%</td>
<td>1-4 million</td>
<td>Children</td>
<td>-3.5 to 0.4</td>
</tr>
<tr>
<td>1968-1969 “Hong Kong flu”</td>
<td>Southern China</td>
<td>H3N2</td>
<td>1.3-1.6</td>
<td>&lt;0.2%</td>
<td>1-4 million</td>
<td>All age groups</td>
<td>-0.4 to (-1.5)</td>
</tr>
</tbody>
</table>

(Source: WHO 2011)

Recent years have seen at least six large-scale disease outbreaks including, but not limited to, influenza. They are hantavirus pulmonary syndrome, SARS, H5N1 influenza, H1N1 influenza, Middle East respiratory syndrome, and Ebola virus (Gostin et al., 2016). The influenza H1N1 2009 virus (A/2009/H1N1) was the first pandemic influenza of the 21st century. It affected the whole world and caused more than 18,000 deaths (Rewar et al., 2015). According to World Bank calculations, Ebola killed more than 11,000 people and cost the world more than USD $2
billion (Maurice, 2016). Currently Zika virus is still spreading and threatens the health of people in 34 countries (Troncoso, 2016). These outbreaks make scientists and governments worry about a repeat of the devastation of the Spanish flu of 1918 (L. Lin, McCloud, Bigman, & Viswanath, 2016).

As well as these large scale outbreaks, other emerging and re-emerging infectious diseases or agents during the period from 1990 to 2015 are documented and their distribution is provided by Kern in Figure 1. The diseases or agents in the black boxes with the white dots show those which occurred between 2010 and 2014 (Kern, 2016).

![Figure 1: Emerging and re-emerging infectious diseases (1990 to 2015)](Source: Kern 2016)

2.4 Features of a pandemic

Although the term “pandemic” has not been defined by many medical texts, certain key
features of a pandemic help us to better to understand the concept and provide insights into the needs and challenges for emergency management. They are:

- **Wide geographic extension** - The term pandemic usually refers to diseases that extend over large geographic areas—for example, the 14th-century plague (the Black Death), cholera, influenza, and human immunodeficiency virus HIV/AIDS. In a recent review of the history of pandemic influenza, pandemics were categorized as trans-regional and global (Taubenberger & Morens, 2009). There were 178 countries involved during the H1N1 outbreak in 2009 (Rewar et al., 2015).

- **Disease movement** - In addition to geographic extension, most uses of the term pandemic imply unexpected disease movement or spread via transmission that can be traced from place to place. Examples of disease movement include widespread person-to-person spread of diseases caused by respiratory viruses, such as influenza and SARS, or enteric organisms, such as Vibrio cholera, or by vectors, such as dengue. In the case of pandemic influenza A (H1N1), there was widespread transmission in both hemispheres between April and September 2009. This was early in the influenza season in the temperate southern hemisphere but out of season in the northern hemisphere (Barrelet, Bourrier, Burton-Jeangros, & Schindler, 2013). This out-of-season transmission is another factor that characterizes an influenza pandemic.

- **Novelty** - The term pandemic has been used most commonly to describe diseases that are new, or at least associated with novel variants of existing organisms—for example, antigenic shifts occurring in influenza viruses, the emergence of HIV/AIDS when it was recognized in the early 1980s, and historical epidemics of diseases such as plague. Novelty is a relative concept, however. “There have been 7 cholera pandemics during the past 200 years, presumably all caused by variants of the same organism” (Morens et al., 2009). Not all of these were necessarily novel organisms. In the 21st century, SARS
and avian influenza are two new infections with pandemic potential that arose from Asia.

- **Severity** - The term pandemic has been applied to severe or fatal diseases (e.g., the Black Death, HIV/AIDS and SARS) much more commonly than to mild diseases. There is no immunity for human populations when a virulent new viral strain affects the world and this leads to high mortality and morbidity (Rewar et al., 2015). Severity is estimated by the case fatality ratio (Donaldson et al., 2009). Most Ebola cases die within 10 days of their initial infection, with the disease having a mortality rate of 50–90% (WHO 2003). The outbreak of H7N9 has caused more than 600 human infections, with nearly 30% mortality (Su & He, 2015). Thus these outbreaks are classified as pandemics.

- **High attack rates and explosiveness** - Pandemics are characterized by high rates of attack and by explosive spread. Examples are influenza H1N1 and Ebola. However, if the transmission is non-explosive, even if it is widespread, this is not classified as a pandemic. For example, West Nile virus spread to the Middle East and Russia, and the Western Hemisphere in 1999, but the transmission was slow and the attack rate was low, so it is not classified as a pandemic. Diseases with low rates of transmission or low rates of symptomatic disease are rarely classified as pandemics, even when they spread widely. However, diseases of low or moderate severity, such as Acute Hemorrhagic Conjunctivitis (AHC) in 1981, and cyclic global recurrences of scabies also have been called pandemic when they exhibit explosive (AHC) or widespread and recurrent geographic spread (Donaldson et al., 2009).

- **Minimal population immunity** – Pandemics arise when populations have little immunity (Fangriya, 2015; WHO, 2013b). So it is easy for a large part of a population to be infected. For example, since H7N9 was a new variant of the influenza virus, the population had no immunity, so there were many cases worldwide in a short time
Although pandemics often have been described in partly immune populations, it is obvious that in limiting microbial infection and transmission, population immunity can be a powerful anti-pandemic force (Taubenberger & Morens, 2009).

- **Infectiousness and contagiousness** - The term pandemic has less commonly been used to describe presumably non-infectious diseases, such as obesity, or risk behaviors, such as cigarette smoking, that are geographically extensive and may be rising in global incidence but are not transmissible. Pandemic diseases are infectious, so they are transmitted from one person to another person. This transmission can be direct (person to person) or indirect (person to vector to person) (Morens et al., 2009). For example, the SARS virus was transmitted from person to person by persons in close quarters, while H7N9 was often spread through contact with living poultry (Su & He, 2015). The significance to human health of H7N9 and other influenza strains lies in their potential to mutate into a form capable of sustained person-to-person transmission.

The following section describes further the health, economic, social and security impacts of pandemics providing documented historical examples from documented pandemics.

### 2.5 Impact of pandemics

Infectious disease outbreaks can easily cross borders to threaten economic and regional stability, as has been demonstrated by the HIV, H1N1, H5N1, and SARS epidemics and pandemics (Verikios et al., 2015). Beyond the debilitating, sometimes fatal, consequences for those directly affected, pandemics have a range of negative social, economic and political consequences (Davies, 2013). As an example, “The impact of pandemic influenza H1N1 in 2009 was not just on mortality, but also on health-care systems, animal health, agriculture, education, transport, tourism and the financial sector. In short, a pandemic event threatens all
aspects of the economic and social fabric” (Drake, Chalabi, & Coker, 2012). Other examples include SARS in 2003 and the Ebola pandemic in 2015, which disrupted the economies and social order in China and West Africa respectively as well as causing death and illness. Ebola and other pandemics have reduced the life quality of families and communities, and Ebola has disrupted essential services such as education, transport, and tourism, reduced the West African economies, and isolated populations, which had impacts beyond Africa too due to the global effort of containing the outbreak (Nabarro & Wannous, 2016).

2.5.1 Health impacts

Pandemics have infected millions of people, causing wide-spread serious illness in large populations and thousands of deaths. For example, in the 14th century, the ‘Black Death’ plague killed half the population of Europe (Allen G. P Ross, Remigio M. Olveda, & Yuesheng Li, 2014;). In the 20th century, there were three major pandemic: 1) Spanish flu in 1919-1920, which caused 20-40 million deaths (Taubenberger & Morens, 2009); 2) Asian flu in 1957-1958 which caused about 2 million deaths, and 3) Hong Kong flu in 1968-1969 which caused 1 million deaths (Landis, 2007; Wildoner, 2016).

Infectious disease disasters, including pandemics and emerging infectious disease outbreaks, have the potential to cause high morbidity and mortality in the world, and in fact they may account for a quarter to a third of global mortality (Verikios et al., 2015). In developing countries, both pandemics and infectious diseases have the potential to kill many people, and the likelihood of death is five to ten percent (Kern, 2016). During the SARS outbreak in 2003, there were more than 8000 infected individuals, with over 700 deaths (almost 9% ) worldwide in just 6 months (Wong & Leung, 2007).

Influenza is one of the most serious pandemic diseases. Influenza outbreaks can result in
considerable morbidity and mortality. Influenza pandemics are characterized by high incidence and fatality rates and rapid and wide-spread transmission (WHO 2004). Recent influenza pandemics have killed significant numbers of people worldwide, and contributed to an estimated 8,870–18,300 deaths in 2009–2010 (Prager, Wei, & Rose, 2016). For example, May 2009 saw the emergence from Mexico of a new H1N1 virus capable of human-to-human transmission (Verikios et al., 2015). WHO reported 182,166 laboratory confirmed cases of influenza A/H1N1 in 178 countries up to August 13, 2009 (Rewar et al., 2015). During the peak H1N1 season (April 2009 to April 2010), there were 43–89 million cases, 195–403 thousand hospitalizations, and 8,870–18,300 deaths estimated by US Centers for Disease Control and Prevention (US CDC) in the United States (Bhandari, Hartley, Lindsley, Fisher, & Palmer, 2013).

Over the past several years, the threat of a human influenza pandemic has greatly increased. For example, H5N1 has repeatedly managed to infect humans in several Asian and European countries (Fangriya, 2015). There were 387 confirmed cases of human H5N1 infection across 15 countries from late 2003 to late 2008, including 245 deaths, with an average case-fatality rate of around 63% globally. (Enemark, 2009). H5N1 could easily become another major pandemic. With the emergence of the zoonotic influenza A (H7N9) virus in China, there have also been renewed concerns about the potential for a pandemic to arise from an avian influenza strain. The outbreak of H7N9 viruses caused more than 600 human infections, with nearly 30% mortality (Su & He, 2015), and the H7N9 virus is considered to have pandemic potential (Tanner, Toth, & Gundlapalli, 2015).

Other major threats in recent times have been pandemics of dengue and Ebola. The incidence of the severe and fatal form of dengue has increased dramatically in developing countries. The 2015–2016 dengue epidemics were the worst in the history of Latin America. The first Dengue
cases were recorded in Brazil in May 2015 and caused more than 1.5 million cases up to December 2015, and at least 34 countries were involved in March 2016 (Troncoso, 2016). A total of 45,171 dengue cases were reported from 21 districts of Guangdong Province in 2014 (Cheng et al., 2016).

The Ebola outbreak in West Africa was an unprecedented public health emergency of international concern. In October 2015, WHO reported that there were 28,581 Ebola Virus Disease (EVD) confirmed, probable and suspected cases, with 11,299 deaths in West African countries (Liberia, Guinea, Sierra Leone). More than 11,000 people died in nine countries as the response to the Ebola zoonotic ‘spillover’ was delayed (Ross, Crowe, & Tyndall, 2015). The estimated Ebola case fatality proportion was 40% (Nabarro & Wannous, 2016).

As well, some known infectious diseases, such as tuberculosis, have re-emerged in vulnerable populations (Colwell, 2016). Some diseases may lead to long-term physiological effects on people, which affect their ability to earn a living. For instance, the Zika virus in Brazil leaves a generation of children born with neurological disorders that may impose severe lifelong limitations (Ribeiro & Kitron, 2016).

2.5.2 The economic impacts

As pandemics are characterised by high rates of attack and by explosive spread, they hit tourism and its related industries, and hence restrict international and domestic travel, representing a serious threat not only to the population of the world, but also to its economy. The impact of economic loss can result in instability of the economy. The impact is through direct costs, long term burden, and indirect costs.

The direct costs of dealing with a disease outbreak can be very high. For example, the Ebola outbreak has seriously undermined the economy throughout West Africa. The Ebola outbreak
in Sierra Leone in 2015 cost USD 6 billion in direct costs (hospitals, staff, medication), and these direct costs alone amount to 3 years of funding for WHO, and are well over 20 times the cost of WHO’s emergency response cuts in its 2014–15 budget (Gostin & Friedman, 2015). The Global Health Risk Framework for the Future (GHRF) Commission estimates that every year on average infectious disease outbreaks cost the world about USD 60 billion in direct costs (Maurice, 2016).

The long term burden is also severe. One of the main burdens is from the loss of earnings of those who have died. The predictions for long-term economic costs vary widely. Prager, Wei et al (2016) have estimated that economic losses from a pandemic influenza in the USA would be USD 90 – 220 billion, and of that, 80% would come from the value of expected future lifetime earnings of those who would die (Prager et al., 2016). However McKibben and Sidorenko (2006) estimated that the world-wide economic cost of an influenza pandemic would range from USD 374 billion for a mild pandemic to USD 7.3 trillion for a severe pandemic (MacKellarSource:, 2007).

Indirect costs can be also be very significant. They include everything that contributes to a decline in GDP. The 2003 SARS outbreak caused losses of USD 12.3-28.4 billion (Lee and McKibbin 2004) and an estimated decrease in GDP of 1% in China and 0.5% in South-east Asia (MacKellar, 2007). The New Zealand treasury estimate that a pandemic with a 40 percent attack rate and a 2 percent case-fatality rate, would reduce GDP by 5-10% in that year (MacKellar, 2007). Some sectors of the economy may be more heavily affected than others. For instance, Prager et al (2016) estimate that the air transport industry would suffer a loss of almost 20% or USD 7.9 billion, if US residents cut down on travel. Thus, pandemics have both immediate and long-term effects that can damage the economic life of a nation for many years following the pandemic (Prager et al., 2016).
2.5.3 Social impacts

The social impacts of pandemics are severe. They include restrictions on travel, and closures of schools, markets and sporting events. All these are a likely reality should a pandemic with true potential for high morbidity and mortality emerge.

With the rapid development in worldwide aviation over the last two decades, the risk of global pandemics has escalated with increased passenger traffic. Population mobility facilitates the spread of disease. With modern and efficient air travel, SARS, which originated from southern China was rapidly transmitted to more than 30 countries in early 2003 (Wong & Leung, 2007). In a pandemic, travel is therefore often discouraged or restricted. For instance in the Ebola outbreak in West Africa, roads were closed, and military check points stopped vehicles. (Folayan & Brown, 2015). In the SARS outbreak in China, airports were closed. These actions helped slow down the spread of diseases. However they also split families and hindered the movement of goods to market, which harmed the local economy (E. X. Fan, 2003).

School closure is often considered the first non-pharmaceutical intervention for implementation in a pandemic, as students are effective in spreading the virus. Timely school closure and cancellation of public gatherings was significantly associated with reduced mortality related to influenza epidemics during the 1918 influenza epidemic in the United States (W.-C. Chen, Huang, Chuang, Chiu, & Kuo, 2011). During the spring wave of the 2009 pA(H1N1) pandemic, more than 1300 public, charter, and private schools in 240 communities across the United States closed (Navarro, Kohl, Cetron, & Markel, 2016). However, school closure raises a range of ethical and social issues, particularly since families from underprivileged backgrounds are likely to be disproportionately affected by the intervention (Cauchemez et al., 2009).
Closing markets has been tried for some outbreaks, especially for zoonotic diseases. Closure of wholesale and retail live poultry markets in China was associated with cessation of zoonotic outbreaks of H5N1 and H7N9 (J. S. M. Peiris, Cowling, Wu, & Feng, 2016). However this caused disruption of the food supply in the cities. People could not find necessary food, because markets and shops were closed. This also caused a long-lasting change in people’s diet. After the occurrence of avian influenza, the consumption of poultry products fell by more than 80% on average in the markets of Jilin province in China (K. Zhang & Liu, 2016), and affected the income of many farm workers.

Other places where people gather are also often closed. Public games including sporting events are often cancelled. Workplaces also facilitate transmission of the disease. In the 2009 H1N1 pandemic, enforced close contact at work and household crowding were related to a higher incidence of self-reported influenza-like illness H1N1. Some work-places were closed. However, closing workplaces has strong negative effects on the local economy and the well-being of workers (Kumar, Quinn, Kim, Daniel, & Freimuth, 2012). Tradeoffs between the social costs of interventions and the cost of uncontrolled spread of the virus are involved in any decisions to mitigate pandemic outbreaks (Prieto & Das, 2016).

2.5.4 Security impacts

Pandemics are no longer simply the domain of public health and clinical medicine, but are a social issue, a development issue, and a global security issue (Castillo-Chavez et al., 2015). Global security is threatened by pandemics, in terms of lives and economic stability (Maurice, 2016). Kern, writing in the “The Neglected Dimension of Global Security – A Framework to Counter Infectious Disease Crises”, said “pandemics cause devastation to human lives and livelihoods much as do wars, financial crises, and climate change. Pandemic prevention and response, therefore, should be treated as an essential tenet of both national and global security –
not just as a matter of health” (Kern, 2016) (P4).

In the past, security threats were most likely related to conflict and war, but now they can also come from reemergence of infectious diseases outbreaks. For instance, during the Ebola crisis in West Africa in 2014, law and order broke down in some places, gangs ruled the country-side, and police even attacked the public for breaking curfews (Horton & Das, 2015). In September, 2014, when the UN assumed leadership in the Ebola response as the WHO floundered, the Security Council declared the outbreak a “threat to international peace and security” (Gostin et al., 2016) (P4).

The security impacts of pandemics include impacts on military readiness. For instance, when SARS broke out in China in 2003, the military resources used to control disease were fewer as the military hospitals were closed, which limited the resources to protect the country. When the outbreak of Ebola virus in West Africa was declared by the WHO to be a public health emergency of international concern, the UK Government deployed a Joint Inter Agency Task Force (JIATF) comprised of civil servants and a military element of some 800 personnel from all three services in Sierra Leone (Tuck, Williams, & Doyle, 2016). The effect of framing pandemic influenza as a threat to national and international security has been profound both in terms of measures undertaken and the global spread of responses.

2.6 Conclusion

There have been many significant pandemics recorded in human history, which have caused enormous negative impacts on health, economies, and even national security in the world. The term “pandemic” has not been defined by many medical texts, but there are several key features of a pandemic which help us to understand what pandemics are and highlight potential issues and needs for effective management. These features include wide geographic extension,
disease movement, novelty, severity, high attack rates and explosiveness, minimal population immunity, infectiousness and contagiousness.

Emergency management is a critical task of governments to deal effectively with a pandemic. An effective and efficient emergency response can reduce avoidable mortality and morbidity and reduce the economic, social and security impacts. The next chapter will introduce public health emergency management (PHEM) including the development of the concept, preparedness and response elements and some of the documented challenges associated with effective PHEM.
Chapter Three  Public Health Emergency Management

3.1 Introduction

Effective public health emergency management can reduce avoidable mortality and morbidity and reduce the economic and social impacts of pandemics and disease outbreaks. Public health crises caused by pandemics are characterized as unpredictable and widespread, making preparedness and response plans critical. Preparedness and response refers to a series of activities to make effective utilization of the human and medical resources in a time of crisis, leading to minimal casualties and reducing the possibility of a second crisis. Emergency preparedness and response requires a multi-sectoral approach. In many processes and plans, there are still barriers to effective cooperation and benefit sharing despite the number of reports emphasizing the importance of this key facet of pandemic preparedness.

This chapter explores the concepts of emergency management and in particular public health emergency management, and discusses the principles of emergency preparedness and response, and associated challenges of collaboration, information sharing and risk communication for public health emergency management.

3.2 Concepts and roles of emergency management

An emergency refers to a sudden but serious event which may bring great harm to society and that requires immediate action. Examples are a natural disaster, an accident, a public health event or a security event (K. Zheng, Shu, & Yuan, 2010). Emergencies are always beyond people’s expectations and can usually exert a devastating effect on human beings (Song, Ge, Duan, & Qiu, 2016). There are several definitions of public emergency. Haubrich (2006) suggests that a public emergency is a situation that threatens the life of a nation, indicating revolution or a civil war as example (Haubrich, 2006). Another definition is that a public
emergency is any incident that occurs suddenly, may cause human injury or illness, and property loss, or environmental harm, potentially jeopardizing the stability of society and endangers public safety (Nelson, Luri, Wasserman, & Zakowski, 2007). For the purpose of this thesis, a public emergency is defined as an event that happens unexpectedly and has huge negative impacts on human health, the economy and social stability.

Emergency management can reduce vulnerabilities and enhance capacities to withstand emergencies as well as cope with and recover from their impacts. The elements of emergency management include preparedness, humanitarian assistance, training, emergency response, planning, disaster medicine, recovery and rehabilitation (Seyedin & Jamali, 2011). Many organizations, agencies and disciplines are involved in emergency management and communication and cooperation between these different stakeholders before, during and after a disaster are critical to reducing the impacts of the incident.

Public Safety Canada (2012) gives an excellent description of an all-hazards approach to emergency management. In this description, effective public emergency management includes “four interdependent, but integrated functions: mitigation/prevention, preparedness, response and recovery” (Public Safety Canada, 2012) (P1) as illustrated in Figure 2.
The goal of prevention/mitigation activities is to eliminate or reduce the risks of disasters or emergencies in order to protect lives, property, the environment, and reduce economic disruption. Preparedness activities refer to being ready to respond to a disaster and manage its consequences through measures taken prior to an event such as emergency plans. Emergency response encompasses activities during or immediately before or after a disaster to manage its consequences; and recovery refers to the repair or restoration of conditions to an acceptable level through measures taken after a disaster (Public Safety Canada, 2012).
3.3 Public health emergency management

Public health emergencies can be defined as unexpected events which threaten human health with severe injury mortality and morbidity, and which have impacts on the economy and the security and stability of the society, and which exceed the community’s capacity to deal with them (Glik, 2007). Examples include outbreaks of infectious diseases, natural and man-made disasters, food contamination, environmental pollution, or occupational illnesses. The important idea is that these events have an impact on human health and that they are beyond the community’s normal capacity to deal effectively with them. This wide definition enables a community to prepare itself for a wide range of risks and to develop its capabilities to deal with them effectively (C. Nelson, Lurie, Wasserman, & Zakowski, 2007).

In the past decade, a succession of public health emergencies has challenged preparedness and response capacities of government agencies, hospitals and clinics, and public health agencies around the world. Figure 3 shows events from 2003-2016 highlighting the diversity and frequency of events that can be expected to occur in the foreseeable future (Tang, 2015).
Each of these events has significantly challenged public health systems and impacted on the health and wellbeing of affected people. For example, the epidemic of SARS not only challenged the health system’s capacity to respond but also directly affected health workers with consequential effects on the capacity of the health services to function.

3.4 Public health emergency preparedness and response

Effective preparedness and response are very important in reducing the impacts of all public health crisis emergencies (Yasmin et al., 2015). Constant preparedness and response capacity are required in the management of public health crises (H. Y. Lee, Oh, Park, Chu, & Son, 2013). There has been substantial attention to and investment in emergency preparedness and response capacity for emergencies with health impacts for more than a decade. The importance of robust emergency preparedness and response systems for health emergencies is highlighted by recent incidents such as the Ebola outbreak in West Africa and the emergence of Middle East Respiratory Syndrome Coronavirus (Yasmin et al., 2015).

With respect to infectious diseases, the Communicable Disease Surveillance and Response unit of the WHO Western Pacific Regional Office has conceptualized a Framework for Action. The core components of an effective response to an infectious disease event are shown in Figure 4.
Figure 4  WHO framework for action for an infectious disease outbreak response

Source: Craig, et al. (2010)

This simple framework can be used more widely to convey the concept of comprehensive and integrated public health response structures, and identifies core needs to develop public health capacity development to deal with emergencies related to all hazards. There are five core components of a response: surveillance, healthcare response, public health intervention, communication and command. Each component needs to be able to meet the requirements of all related stakeholders. To develop an effective response, it is necessary to prepare by setting up mechanisms to support coordination, communication and collaboration between stakeholders.

This phase-based planning approach is a global framework to guide countries to define goals, identify national priorities and direct preparedness and response actions by functional area for each phase. The majority of plans in most countries organize planning and response actions by pandemic phases or periods, although some plans are organized by the WHO five functional areas: planning and coordination, disease monitoring and assessment prevention and containment, health system response and communication. Further elucidation of activities in
each of the five functional areas improves the comprehensiveness of response planning and can lead to a more coordinated, efficient response (WHO, 2011b).

Public health emergency preparedness has been a focus of public health policy for much of the last decade. This is a programme of long-term activities of emergency preparedness. Their aims are to strengthen the overall capacity and capability of a country or a community to manage efficiently all types of emergencies and bring about an orderly transition from relief through recovery and sustainable development (WHO 2011). Preparedness for the diversity of events that may impact health is described as an ‘all-hazards’ approach, highlighting the importance of ensuring the system is prepared for a variety of potential threats (Yasmin et al., 2015).

Preparedness for the context of public health emergency encompasses a series of activities in planning, preparation, education, and training to enhance the capabilities of public health personnel. Effective preparedness requires that emergency plans be developed, personnel at all levels and in all sectors be trained, and communities at risk be educated, and that these measures be monitored and evaluated regularly (WHO 2011). While there are multiple sectors with responsibilities for emergency preparedness and response, actions taken to prepare and respond to the population health consequences of emergencies depend on strong public health emergency preparedness (Yasmin et al., 2015).

As an example, WHO’s guidelines for pandemic preparedness and response, include six pandemic phases and advice for action (Table 2).
Table 2  Summary of actions recommended by WHO for pandemic preparedness

<table>
<thead>
<tr>
<th>PREPAREDNESS COMPONENTS</th>
<th>PHASES</th>
<th>POST PANDMIC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PLANNING AND COORDINATION</strong></td>
<td>1-3</td>
<td>4</td>
</tr>
<tr>
<td>Develop, coordinate and periodically review national and international pandemic preparedness and response plans.</td>
<td>Direct and coordinate rapid pandemic containment activities in collaboration with WHO to control or delay the spread of infection.</td>
<td>Provide leadership and coordination to multisectoral resources to mitigate the societal and economic impacts.</td>
</tr>
<tr>
<td><strong>SITUATION MONITORING AND ASSESSMENT</strong></td>
<td>Develop robust national surveillance systems in collaboration with national, regional and international public health authorities, and other relevant sectors.</td>
<td>Increase surveillance, monitor containment operations, share findings with WHO and the international community.</td>
</tr>
<tr>
<td><strong>REDUCING THE SPREAD OF DISEASE</strong></td>
<td>Promote beneficial behaviours in individuals for self protection. Plan for use of pharmaceuticals and vaccines.</td>
<td>Implement rapid pandemic containment operations and other activities; collaborate with WHO and the international community as necessary.</td>
</tr>
<tr>
<td><strong>CONTINUITY OF HEALTH CARE PROVIDER</strong></td>
<td>Prepare the health system to scale up.</td>
<td>Activate contingency plans.</td>
</tr>
<tr>
<td><strong>COMMUNICATIONS</strong></td>
<td>Complete communications planning and communications activities to communicate real and potential risks.</td>
<td>Promote and communicate recommendations to prevent and reduce population and individual risk.</td>
</tr>
</tbody>
</table>

(Source: WHO 2011)

Response in the context of health emergencies refers to a series of activities to make effective utilization of the national human and medical resources in a time of crisis, leading to minimal casualties and reducing the possibility of a second crisis. Events such as the West Nile virus outbreak of 1999, the anthrax attacks of 2001, the SARS outbreak in 2003, the 2004-2005 influenza vaccine shortage, the aftermath of Hurricane Katrina in 2005, and the 2009 H1N1 influenza pandemic have all pointed to a need for a strong public health capacity to respond to emergencies (Cantey et al., 2013).
Despite significant improvements in public health emergency management systems in many parts of the world, since the year 2000, a succession of public health emergencies has challenged preparedness and response capacities of government agencies, hospitals and clinics, public health agencies, and academic researchers globally.

3.5 Challenges for effective emergency management

The effectiveness of an emergency response is based on the amount of information that is available at any given time, and effective emergency communication and coordination among partners is crucial. The massive numbers of public, non-profit, and private organizations involved in catastrophic disaster emergencies need to have horizontal as well as vertical communication and coordination. Recent infectious disease outbreaks, such as the influenza pandemic in 2009 and the Ebola outbreak (2015) in West Africa highlight the fact that current risk communication, governance and structural approaches to preparedness and response planning for infectious disease outbreaks are not adequate to prepare for, or adequately engage with, the public and various stakeholders (Dickmann, Apfel, & Gottschalk, 2016).

These categories of challenges, including collaboration and coordination, information sharing and communication, are explored further in the following sections.

3.5.1 Collaboration and coordination

Many scholars agree that emergency preparedness and response requires multi-sectoral cooperation and coordination (Cool et al., 2015; Heymann, Mackenzie, & Peiris, 2013; McCloskey, Dar, Zumla, & Heymann, 2014). Pandemic preparedness requires collaborative multi-sectoral planning to ensure an organized and coordinated response. Emergency response to a pandemic requires a coordinated effort among multiple levels of government and the private sector (Cantey et al., 2013). Responses to disasters may require multiregional
collaboration; and catastrophes that lead to destruction of critical community infrastructures necessitate national and international interventions. The provision of public health services depends on the preparedness of other sectors such as: law and order, transport and communications, essential services such as water and electricity and public works, search and rescue and fire services, social services and housing (WHO, 2007). For example, to decrease mortality and morbidity following an earthquake, planning authorities need to manage land use and housing design to reduce damage as well as the expected medical and health care.

Researchers as well as practitioners assert that it is necessary for governments to build an environment that facilitates collaboration (Nohrstedt, 2013). Efforts to control SARS in 2003 were eventually successful, but only when there was a concerted effort by many different sectors of government (Heymann et al., 2013). A multi-sectoral approach to preparing for and responding to an outbreak of an infectious disease offers two main benefits:

1) **Sharing information:** Every sector needs up-to-date information from other sectors to plan its own response.

2) **Coordination of efforts:** A single sector cannot accomplish the job alone. Different sectors must work together. (Rondy, Van Lier, Van de Kassteele, Rust, & De Melker, 2010). For example, mass immunization in schools needs the Education Department and Health Department to collaborate. Likewise the control of Zika by isolating patients/families requires collaboration of the Transport Department, Security Units and the Health Department (Cool, Claravall et al. 2015);

Because of the multifaceted response of an infectious disease outbreak, and the impact of the outbreak on many sectors of society, a well-defined command and control structure with strong leadership is required to coordinate the response, allocate resources appropriately, and ensure
the dissemination of consistent information in a timely matter (Araz and Jehn 2013). One approach to collaboration and coordination is the WHO’s whole-of-society approach to pandemic influenza preparedness (Figure 5) (WHO, 2009).

![Diagram](image)

**Figure 5** Whole of society approach to pandemic preparedness

Source: WHO (2009)

This approach particularly emphasizes the significant roles played not only by the health sector, but also other sectors, individuals, families, businesses and communities, in mitigating the effects of a pandemic. Developing capacities for mitigating the effects of a pandemic, including robust contingency and business continuity plans is at the heart of preparing the whole of society for a pandemic. Activities such as capacity development, planning, coordination, and communication are cross-cutting and require action by all parties (WHO, 2009).

In the international sphere, governments, WHO, United Nations(UN) agencies, humanitarian
response systems, non-governmental organizations (NGOs), and civil organizations all have unique roles as well as overlapping ones. These need to be clarified, negotiated, communicated and acted on well before an emergency (Gamhewage, 2016).

Despite global efforts to promote collaboration across sectors, effective and efficient coordination and collaboration is still a challenge for public health emergency preparedness and response (Kern, 2016). In some countries, government ministries tend to work in isolation from each other, and it is difficult for groups to work together or share information. These difficulties in working together may relate to a poor mechanism for collaboration. A good mechanism (for example, permanent regular meetings of different departments) must be established before a pandemic outbreak and must continue after an outbreak. Further responsibilities need to be clear in all plans, so that different sectors can avoid causing unnecessary work or duplication of effort (Robey, Edwards, & Murphy, 2014; WHO, 2011b).

3.5.2 Information sharing

Developing appropriate preparedness and response to a public health emergency requires extensive information sharing and collaboration among a variety of loosely coupled stakeholder organizations (Ipe, Raghu, & Vinze, 2010). Effective data and information collection and quick communication of information, which is an essential resource that translates into supplies, logistics and cooperation, are keys to success (Zhang, 2002). But there are still many obstacles in practice.

Information is not always clear, or it may be ambiguous, and it is often constantly changing. This presents a challenge for stakeholders. For example, a review of the Toronto critical care experience of SARS highlighted that inaccurate information increased fear, anxiety and even chaos (Hawryluck, Lapinsky, & Stewart, 2005). However, there are difficulties inherent in
dealing with unclear and evolving information. For example, during the response to Typhoon Haiyan, it was challenging to ensure alignment with both national and international partners, and to provide essential public health information to the affected population (Cool, Claravall et al. 2015). During a public health emergency crisis, data are often not clear, and they aren't related to the problem; uncertainties are everywhere. The local decision makers cannot use this information, as it is unavailable at a scale suitable for them (Roberts & Wernstedt, 2016).

Communication of accurate and relevant information is also a challenge. Data may be owned by a large number of organizations. Gathering the information and making sure that the relevant stakeholders can all access that information is not easy. The Toronto review of SARS responses mentioned that the inability to provide the right information to the affected people resulted in increasing their fears (Hawryluck et al., 2005). In Hurricane Katrina, the lack of appropriate procedures for sharing information among state and local authorities limited the exchange of information vital for coordinating response actions (Comfort & Haase, 2006). These problems require strong management of communication and information. This means that there must be defined and practical information gathering and reporting procedures (Pou, 2008).

In addition, information management requires skill in data collection and strong technology for data analysis and dissemination (Roberts & Wernstedt, 2016). A study by the Central American Network for Disaster and Health Information showed that despite the recognition that access to information is essential to disaster preparedness, inadequate information technology, lack of training for skills necessary to find and manage information, and lack of awareness about what information is available often prevent or delay access to vital information by governments, health professionals, and communities before, during, and after emergencies (Seyedin & Jamali, 2011).
For most emergencies, when most sectors require exact analysis and estimation of the development of the emergency, some methods often do not meet demands very well. Although researchers wish to access better more information about emergencies to analyze their development patterns towards improving practice, it is difficult to collect such information in most cases. Experiments cannot be conducted on emergencies to obtain useful information (Song et al., 2016).

Information systems for public health emergency preparedness are emerging as powerful tools to address the information intensive nature of emergency preparedness and response. As part of this, identifying what information different groups wish to receive remains an important task in any future infectious disease outbreak (Dickmann et al., 2011).

### 3.5.3 Communication

The goal of communications before and during a pandemic is to provide and exchange relevant information with the public, partners, and stakeholders to allow them to make well informed decisions and take appropriate actions to protect health and safety (WHO 2011). Communicating with the public is a core part of an emergency response, and established communication channels can also be used to convey routine health information.

Information and communication problems have been identified in several studies in the past. Poor communication can make it difficult to put together a clear, accurate picture of the damage and what is happening. Research in the field of emergency response indicates that communication between responding agencies is a major shortfall in effective emergency responses and that this failure of communication between organizations is not unique to developing countries (Seyedin & Jamali, 2011). For example, during the spring 2009 wave of the H1N1 influenza pandemic in thirty US cities, there were some notable instances of
interdepartmental communication breakdown. Health departments didn’t develop good communication methods with the public, or work closely with education officials to better understand the complexities involved in closing schools (Navarro et al., 2016).

Interventions to communicate health risks and promote disease control measures depend upon increasing coordination among governments and different professional sectors and community leaders, and on the development and dissemination of formal guidance, resources, and implementation tools by multi-lateral international organizations and other relevant stakeholders (Schiavo, May Leung, & Brown, 2014). Professional stakeholders should be enabled to access reliable information rapidly through re-established channels; emphasis should be placed on establishing sustainable cooperation between experts and the media; and measures to improve trust in health authorities, such as the transparent communication of uncertainties, should be encouraged (Cloes, Ahmad, & Reintjes, 2015).

Risk communication is an interactive process of exchange of information and opinion among individuals, groups and institutions for risk management (Covello & Sandman, 2001). The effectiveness of risk communication practices is in helping stakeholders achieve three major communication objectives: providing the knowledge needed for informed decision making about risks; building or rebuilding trust among stakeholders; and engaging stakeholders in dialogue aimed at resolving disputes and reaching consensus (Covello, R. G. Peters, J. G. Wojtecki, & R. C. Hyde, 2001). Risk communication has been identified as a core competence for guiding public health responses to infectious disease threats (Cool et al., 2015).

Yet recent outbreaks (influenza 2009, Ebola 2015) have shown that communication skills have not always been adequate (Dickmann, Apfel, et al., 2016). Local health departments need to maintain close working relationships and communication with other agencies in preparing for and responding to both natural and man-made all-hazards events (Shah, Newell, & Whitworth,
2016). Risk communication coordination between and during outbreaks and health emergencies is essential. Enhancing capacities to support needed behavior changes through the use of collaborative risk communication approaches can also help strengthen public health systems on all levels of governance, from the local to global (Dickmann, Apfel, et al., 2016).

3.6 Conclusion

Public emergencies have caused human injury or illness, and property loss and environmental harm in the past, and they continue to jeopardize the stability of society and endanger public safety. To manage public emergencies in order to reduce their impacts, effective preparedness and response are very important. However, there are some important challenge for preparedness and response that need to be overcome to improve the success of public health emergency management.

Developing appropriate preparedness and response to a public health emergency requires extensive information sharing and collaboration among a variety of loosely linked stakeholder organizations. Communication between responding agencies is a major challenge in effective emergency response. Effective and efficient coordination and collaboration, and information sharing are still challenges for public health emergency preparedness and response.

Emergency management is a key priority of the Chinese government’s health management system. The next chapter will provide an overview of the public health emergency management system in China, focusing on its organizational structure, legal framework, and management system. The chapter will also identify the challenges for the system.
Chapter Four  Public Health Emergency Management in China

4.1 Introduction

Emergency management is one of the priorities of the Chinese government’s health system (Hu, 2012). Historically, health emergency management in China can be divided into two phases. The first phase was from the early days of establishment of the nation (1949) to 2002, and the second phase is from the outbreak of the SARS epidemic in 2003 to the present day. Gradually the core content of plans, the system of organization, mechanism, and legal framework for the emergency response system has been built (Q. Jin, J. Xu, B. Xu, & X. Sun, 2012).

The SARS outbreak in 2003, in particular, served as a wake-up call for China to re-examine and revamp its national emergency management policy. In the years since the SARS crisis, China’s central government (the State Council) has established a new National Emergency Management System (NEMS), including emergency management offices, national and local contingency plans, emergency response mechanisms, and emergency response laws (Lu & Xue, 2016). This chapter provides an overview of the public health emergency management (PHEM) system in China, focusing on the organizational structure, legal framework and management system, and identifying challenges for the system.

4.2 Organizational structure for public health emergency management

China’s early emergency management system originated from the former planned economic system. All the tasks were carried out by different departments depending on the type of crisis. There was no permanent body to coordinate crisis management. However China’s emergency management has changed from one of unilateral governance, to a stakeholders' co-governance system. The Emergency Response Law of the People's Republic of China considers public interest as the priority and puts more emphasis on stakeholders' rights (Y. Chen, 2013).
The PHEM system has developed very fast in the decade following SARS (M. Xu, 2015). Figure 6 shows the organizational structure of the public-health emergency management system in China. The relationships between different organizations highlighted in figure 6 are denoted as administrative, coordinating, technical instructive and mobilization relations.

Figure 6  China’s organizational structure for public health emergency management

Source: Adapted from Chinese Health Emergency 10 Years (2014)

At the national level, the State Council is the highest executive entity for state emergency
management, and the agencies responding to an emergency include the Security Production Committee and the Chinese International Disaster Reduction Committee, which guide and coordinate emergency management in the related departments. At the local level, a single sub-sector of disaster emergency mode is used, and the local command centers in response to a special emergency are established by the local government according to the emergency management model chosen by the State Council (J. Hu, A. Z. Zeng, & L. Zhao, 2009). When there is an emergency infectious disease outbreak the State Council sets up a temporary emergency command center to coordinate and command the various departments (W. Yang, 2014).

Technical agencies such as medical care agencies, disease prevention and control agencies, health supervision departments, and border inspection and quarantine departments are responsible for investigation, analysis, diagnosis and treatment, emergency response and control, health supervision and accident assessment. An inter-agency and cross-region mechanism for joint prevention and control has been put in place, including departments from Ministry of Transportation, Ministry of Public Security and Ministry of Civil Affairs (Li et al., 2014).

As shown in Figure 6, there is a vertical management structure. However there is no clearly defined mechanism of responsibility and collaboration between the various departments and the relative health bureaus. Collaboration depends on a friendly relationship between individual or organizational units. As a result, coordination can be a challenge (J. Hu et al., 2009).

4.3 Legal framework of public health management

Public health crises like the SARS epidemic of 2003 had a deleterious effect on China’s
international reputation due to the government’s problematic response to it. However since then, emergency planning has received unprecedented attention in China. In order to more effectively respond to public health emergencies and prevent bioterrorism, China has revised and promulgated a series of laws, regulations and measures in recent years. These are provided in Table 3.

Table 3   Public health emergencies laws, regulations and measures in China 2003-2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>National Public Health Emergencies Statute</td>
</tr>
<tr>
<td>2003</td>
<td>Regulations on Preparedness for and Response to Emergent Public Health Hazards</td>
</tr>
<tr>
<td>2004</td>
<td>Law of the People's Republic of China on the Prevention and Treatment of Infectious Disease</td>
</tr>
<tr>
<td>2005</td>
<td>Regulations on Biosafety Management in Laboratories Handling Pathogenic Microorganisms</td>
</tr>
<tr>
<td>2006</td>
<td>The National Contingency Plan for Public Health Emergencies</td>
</tr>
<tr>
<td>2007</td>
<td>Emergency Response Law of the People's Republic of China</td>
</tr>
<tr>
<td>2009</td>
<td>Amendment III to the Criminal Law of the People's Republic of China</td>
</tr>
<tr>
<td>2010</td>
<td>Border Health and Quarantine Law of the People's Republic of China</td>
</tr>
<tr>
<td>2011</td>
<td>Law of the People's Republic of China on Penalties for Administration of Public Security</td>
</tr>
</tbody>
</table>

The Law of the People's Republic of China on the Prevention and Treatment of Infectious Disease (2004) clarified the responsibilities and timelines for reporting cases of infectious diseases, including newly emergent diseases. This is the basis for subsequent laws regarding infectious disease outbreaks, which have been enacted in order to prevent, control and put an end to the spread of infectious diseases and to ensure the health of the people and public sanitation.

Since 2003, most local governments in China have developed their own emergency plans for
managing public health emergencies according to the requirement of article 10 of the National Public Health Emergencies Statute (2003) (Hu, Rao, Sun, & Sun, 2007). In Article 3 of the Emergency Response Law of the People’s Republic of China (2007), emergencies are defined to include natural disasters, calamitous accidents, public health accidents and public security incidents, which occur abruptly and cause or may potentially cause serious social harm and for which measures for handling emergencies need to be adopted (China’s State Council, 2007).

4.4 The management system for public health emergencies

The National Overall Emergency Response System was established in 2003 focusing on cumulative health risks and environmental disasters, including public health emergencies (such as SARS or avian influenza), extreme weather events/disasters (such as floods or earthquakes), major incidents (such as major traffic accidents or coal mine accidents), and incidents threatening national security (such as terrorist attacks) (Lu & Xue, 2016). According to the incident type, severity, controllability, and scope, the response is divided into four grades: level I (particular), level II (major), level III (large), and level IV (general) (Kou, 2007).

The emergency response system has also been developed and promoted. China’s National Committee for Disaster Reduction (NCDR) was established in 2005 as the state inter-agency coordination body. It comprises 34 ministries and departments, as well as military agencies and non-governmental groups such as the Chinese Medical Association (S. Zhong, Clark, Hou, Zang, & FitzGerald, 2014).

In addition to the National Overall Emergency Response System, there is also the National Public Health Emergency Response System (Wang, Wang, Liao, Yang, & Li, 2016). This system was founded after the SARS outbreak in 2003 and comprises 4 sub-offices: The Comprehensive Coordination Office, Prediction and Early Warning Office, Emergency
Guidance Office, and Emergency Response Office; and the Health Emergency Center of China CDC. The system aims at coordinating health emergency preparation and response-related affairs and providing health emergency technical instruction or support to the National Health Ministry and district CDC. The National Public Health Emergency Response System includes the National Public Health Emergency Lead Group which is responsible for the Command Center (The Chinese National Health Emergency Office) (Wang et al., 2016).

The public health emergency response procedures shown in Figure 7 were established by the Emergency Response Law (2007). Public health emergencies are divided into 3 levels identified as yellow, orange, and red alerts according to the character, the hazard degree, and the scope of the emergencies. As can be seen from Figure 7, for a yellow alert, the provincial health emergency response prepares for the response; for an orange alert, the national and provincial levels are all involved; and for the red alert, the national health response starts (Wang et al., 2016).
In the event of a public health emergency, any actions related to surveillance, public notification, field response, logistics, and others are taken by different levels of health sectors and other sectors. Such actions include prevention, control implementation, and medical response to reduce harmful effects on public health as well as on political and economic stability.

Since the 2003 SARS crisis, the government has also acted in other ways to improve the prevention and management of infectious diseases. These initiatives include the establishment of a national infectious disease surveillance system and independent infectious disease hospitals; improved isolation facilities in hospital emergency departments; the upgrading of isolation wards; improved training and monitoring of hospital staff in infection-control procedures; and improved compliance with the use of personal protection equipment (S. Zhong et al., 2014).

More broadly, the central Chinese government has also become more active in the construction of the public health system, especially in regards to the medical emergency response system. One major effort involved a 11.4 billion RMB investment in local governments to initiate the construction of regional public health emergency medical treatment systems (X. Li, Huang, & Zhang, 2008).

The Chinese government has also established a national microbiological surveillance system since 2003. This system is comprised of a web-based disease reporting system and the National Infectious Diseases Monitoring Information System Database, and it enables public health authorities to quickly collect information and make effective decisions to combat potential and
ongoing outbreaks. These resources have helped to strengthen infectious disease prevention and control strategies in China. Thus, the outbreaks of H1N1 influenza in 2009 and H7N9 influenza in 2013 were swiftly detected and effectively controlled (B.-k. Bai, Xu, & Shen, 2015).

By June 2011, China had a framework for health information system development to build a health information platform composed of national, provincial and prefectural levels, including five applications (public health, medical care, health insurance, drug management and integrated management) and two databases (resident electronic health records and hospital electronic medical records). At the national level, this framework seems to be working well. However, the development of a regional health information system platform has been slow, as there is a lack of resource integration and information sharing (WHO, 2011c).

China has also built a national communicable disease and public health emergency direct online reporting system (see Figure 8). It helps to identify and report new cases effectively. It also contributes to improving the capacity to detect and respond to outbreaks and public health emergencies and to manage and monitor major communicable diseases in China (MOH, 2013).
The operations of the Chinese management system for PHEM can be categorized into 4 key areas (J. Hu et al., 2009):

(1) **The epidemic control and prevention system.** China CDC, which was founded in January 2003, is a government-funded institution working in the field of disease control and prevention, public health management, and provision of relevant services (Chinese Ministry of Health, 2007). There are three layers in this system – National, Provincial and Prefecture, and County CDCs.

(2) **The laboratory network system (LRN).** The LRN is divided into four levels – national, provincial, city, and county. The national LRN includes China CDC and related national laboratories, the Chinese Academy of Military Medical Sciences, the Chinese Academy of Sciences, universities, and hospitals and provincial Centers for Disease Control and Prevention.
Laboratories (Chinese MOH, 2007). The province-level laboratory network is made up of the provincial laboratories for disease control and prevention and their affiliated scientific and research agencies, universities, and some hospital pathogenic biological laboratories. The city-level laboratory network is made up of the city laboratories for disease control and prevention hospitals in their affiliated areas, and the laboratories of universities. The county-level laboratory network is made up of the county laboratories for disease control and prevention and hospitals in their affiliated areas (Hu, A. Z. Zeng, & L. Zhao, 2009).

(3) The medical rescue system. In 2003, the Committee of National Development and Reform and the Chinese Ministry of Health started implementation of the “Construction plan of the medical rescue system for public health emergency”. The key components of the plan include medical institutions, information networks, and professional technical teams. This system has been operating since 2003.

(4) The epidemic prevention information network. China CDC has developed an information system for disease control and prevention, which includes an information reporting management system for disease inspection, an information management system for public health emergency reporting, and a basic information system for disease control and prevention. The system is classified into national, provincial, prefecture and county levels. Each Centre for Disease Control and Prevention communicates information and provides feedback to the health authority at every level.

Through this system, China CDC can receive disease information detected and provided by the provincial, prefectural and county CDCs. If a local hospital finds a suspect case, it reports its information to the county CDC. Then the county CDC records the case in its epidemiological survey and confirms the diagnosis. If the county CDC confirms the suspect case, it sends the information to the local hospital, and to the prefecture CDC and county Health Department.
Then the case is reported to the prefecture CDC, provincial CDC, China CDC, and Ministry of Health level by level. Using the internet, this process takes about 12 hours. If the Ministry of Health considers the case is important, it notifies the provincial Health Department and China CDC. These Departments and CDC, then notify the prefectural Health Department and CDCs etc. down to the lowest local levels. Any level of Health Department may also require some action from relevant lower-lever organizations, such as CDCs, hospitals, or other health occupational organizations. Feedback from these organizations flows back up the chain as required (J. Hu et al., 2009).

4.5 Challenges in the emergency management system in China

Although China’s PHEM has greatly improved in the past few years, there are still improvements that can be made. One key challenge is that there is no comprehensive evaluation indicator system for the China Public Health Emergency Events Surveillance System, which could affect the management quality (Hong, Ni et al. 2015). Several other weaknesses are also apparent.

Most provincial and municipal governments have developed plans for public health emergencies. However, the quality of the plans remains uncertain, because many were written rapidly by a few persons who failed to follow strict plan development processes (G. Hu, Rao, Hu, & Sur, 2007). One study found that the quality of existing public health emergency plans is not adequate, and more than 50% of municipalities lack regulations for emergency plans (Hu et al., 2007). If an effective plan of risk communication cannot be developed, it will be difficult for the risk management strategy and policy planning to be completed (A. Lin & Wu, 2010).

Another issue is that the responsibility and authority of the different levels of government, the army facilities, and non-governmental organizations are not clearly defined within the law or
plan (L. Zhang et al., 2012). The public health emergency institutions which are set up by the Chinese State Council at various levels are isolated in terms of information transfer and sharing. As a result, resources can be wasted and the operational process for emergency disaster relief is inefficient. In addition, there is no centralized group that coordinates the public health resources, the disease prevention and control procedure, the medical supply and supervision system, and other healthcare agencies (J. Hu et al., 2009).

The joint response mechanism has been built at national level and some provinces. However, most of the district level emergency rescue systems are independent of other emergency units such as transportation, fire protection, and media, and there is no platform to integrate these entities. In most regions, pre-hospital emergency services lack effective cooperation with the fire and police departments. A lack of cooperation may result in the loss of precious rescue time for advanced pre-hospital medical care (S. Zhong et al., 2014).

With the current network for transmitting disease related information, the information is collected and reported through many layers. All CDCs are run by local governments and clinics and hospitals are owned and operated by a diverse set of institutions, including state-owned enterprises, military establishments, private investors and local cooperatives. Thus they are often isolated and reluctant to share information. As a result, the transmission of disease related information is not fast, smooth, accurate or timely enough (H. Lin, Sun, & Wang, 2012). The communication between laboratories across the LRN is missing. Although an integrated LRN exists on paper, the research institutions in the network are isolated and independent so that there is a lack of communication between them (Hu et al., 2009). Therefore, the existing LRN cannot efficiently cope with large-scale public health emergencies.

In many parts of China, there is a widespread lack of the knowledge and skills required for emergency preparedness and self-rescue (L. Li, Yu-Bo, Yan, Yan, & Jun-feng, 2013).
Grass-roots emergency public health personnel (GEPHP) are responsible for dealing with a large number of public health emergencies in the early stages and their capabilities directly affect the occurrence of emergencies and their impact on society. GEPHP have been unable to update their professional knowledge in a timely manner and they have limited emergency response capabilities, and this situation has changed little since 2003 (W. Xu, 2016).

More broadly in China, some local governments lack risk awareness and have inadequate preparations for dealing with risks (Lin & Wu, 2010). Therefore, within the advent of a risk, they miss the best opportunity to deal with the risk so that the risk extends and spreads, which not only affects the credibility of government, but also affects social stability. The SARS crisis exposed a lot of problems that the Chinese government has in health emergency management, especially health emergency risk awareness and risk decision-making.

4.6 Conclusion

Public health emergency incidents have been characterized as sudden, mass, or serious harm incidents, which pose a great threat to health, economic development, and social stability (Hou, Lv et al. 2016). Public health emergencies have a significant impact on the health of citizens, the local economy, and society as a whole. High performing emergency management systems and coping mechanisms can greatly mitigate the adverse consequences of public health emergencies (DONG, HAO, & WU, 2013).

Since SARS, China has revised and promulgated a series of laws, regulations and measures to develop a public health emergency management system. The China PHEM system has developed very fast, and China’s emergency management has greatly improved, but the emergency network in China is still not efficient enough: the information collection and dissemination process is slow, and emergency resources remain dispersed. The response
standards for major accidents and emergencies are not adequately unified, the joint response mechanisms are weak, and ongoing communication and cooperation among the departments associated with all types of emergencies are problematic.

To improve cooperation, sharing of resources, policy making and strategy development, international experience shows that risk communication is an important tool (Gamhewage, 2016). The next chapter will discuss the definitions of risk and risk communication; describe the purpose and theories of the risk communication, and the practices of risk communication in public health. It will also examine the evolution of risk communication practice in China.
Chapter Five  Risk Communication in Public Health

5.1 Introduction

In pandemic crises, an effective and efficient emergency management can reduce avoidable morbidity and mortality, and the negative impacts on society, the economy and national security. But the management of public health crises involves many uncertainties, and responding processes need to collect data from various sources and from multidisciplinary fields. Therefore developing an appropriate response to a public health emergency requires extensive information sharing and collaboration among all stakeholders.

The literature indicates that it can be difficult for stakeholders to collaborate and share knowledge in response to a disease outbreak and pandemic crisis. Initial research in the field of emergency response indicates that communication between responding agencies is often a major shortfall in an effective emergency response. In China, the joint response mechanism is weak, largely because communication and cooperation among the departments associated with all types of emergencies are too weak for an effective response, and collaboration is often ineffective (S. Zhong et al., 2014).

Risk communication should be a multi-level and multi-faceted process which aims to help stakeholders define risks, identify hazards, assess vulnerabilities and promote community resilience, thereby promoting the capacity to cope with an unfolding public health emergency. Risk communication helps to improve the communication of risk information and improve the effectiveness and efficiency of multi-sectoral collaboration, and therefore can be an ideal tool for experts and the public to improve the management of public health events including disaster and emergencies.

This chapter explores concepts of risk and risk communication, explains the purpose and
theories of risk communication, and examines its roles, principles, and practices and the problems of risk communication in public health. There are a vast number of guidance documents in the literature, outlining principles, rules or elements of effective risk communication. An analysis of these guidelines and the challenges for risk communication for PHEM is also provided. And the evolution of risk communication practice in China is examined.

5.2 Concepts of risk and risk communication

There are many definitions of risk proposed by different researchers and organizations. Renn (1991) defined risk as a possibility that arises from human behavior or events and has negative impacts on humans (Renn & Levine, 1991). Manuele (2003) defines risk as “the potential for realization of unwanted, negative consequences of an event” (p. 59) (Ferrante, 2010). Hubbard linked risk to uncertainty and compared the two terms uncertainty and risk. He pointed out that uncertainty is the existence of more than one possibility and the outcome value is not known. However, risk is a state of uncertainty where some of the possibilities involve a loss, catastrophe, or other undesirable outcome (Hubbard, 2009). Risk also has been defined as the probability of undesired effects (or health outcomes) arising from exposure to a hazard. It is often expressed in the form: Risk = Probability x Consequence. Jaeger (2013) defined risk as ‘a situation or event in which something of human value (including humans themselves) has been put at stake and where the outcome is uncertain’ (Jaeger, Webler, Rosa, & Renn, 2013) (p.17). The scientific risk definition refers to experience and scientific evidence, and the concept of risk refers to the future development, which cannot be foreseen.

What these definitions all have in common is that risk is a kind of possibility which may cause damage. Uncertainty is at the core of the understanding of risk. The uncertainty includes not only the question of when damage will occur, but also about what type of damage should be
expected (Balicer, Omer, Barnett, & Everly, 2006; Richard D. Smith, 2006).

The field of risk communication has its roots in the United States, as the term was first used in 1970 by William Ruckelshaus, the first administrator of the Environmental Protection Agency (EPA) (Covello, Peters & McCallum, 1997). The theories and the roots of the risk communication process come primarily from the environmental arena and from working with the public and other stakeholders. In recent years, however, the concept has been successfully used to deal with any type of hazardous situation or disaster (Ferrante, 2010; Pamela, 2010).

Risk communication is a science-based approach for communicating effectively in high concern situations (Covello & Sandman, 2001). The National Research Council of the USA (1989), and the U.S. Department of Health and Human Services (2002) suggest that risk communication is an interactive process of exchange of information and opinion among individuals, groups and institutions; that it often involves multiple messages about the nature of risk or expressing concerns, opinions or reactions to risk messages or to legal and institutional arrangements for risk management (Bennett, 2010).

For public health emergencies, risk communication includes the range of communication capacities required through the preparedness, response and recovery phases of a serious public health event to encourage informed decision making, positive behaviour change and the maintenance of trust (WHO, 2009). Risk communication is an ongoing process that helps to define a problem and solicit involvement and action before an emergency occurs.

Covello and Sandman (2001) divided the evolution of risk communication into four historical stages (Covello & Sandman, 2001): ignoring the public, explaining risk data to the public, building around dialogue with the public, and integrating the public. Risk communication is understood in this context as serving a double role: risk communication should prepare for
Some approaches to risk communication continue to build on the traditional one-way communication process where a source sends a message using a certain channel to a receiver. Others view the process as two-way and less linear. For instance, the social constructionist approach puts forward the idea that the flow of information travels both ways between the scientific community and the stakeholders, as the scientific community has inherent values, beliefs, and emotions and the stakeholders have a store of technical knowledge, both of which affect the communication process (Obregon, 2012). This approach recognizes that social context and culture affect beliefs and actions and emphasizes that giving due attention to the context can aid in the exchange and flow of information, attitudes, values, beliefs and perceptions between the stakeholder and the source of the information, leading to better “risk decisions” (Lundgren and McMakin, 2009).

5.3 Purpose of risk communication

One purpose of risk communication is to inform the public and other bodies about certain large-scale risks. In its most fundamental form, risk communication’s purpose is to recognize potential risks and to take steps designed to avoid crisis situations (Sellnow & Sellnow, 2010). However this view assumes that experts are informing non-experts, and ignores the expertise of other stakeholders. The fundamental goal of risk communication is to provide meaningful, relevant and accurate information, in clear and understandable terms targeted to specific audiences. It may not resolve all differences between parties, but may lead to a better understanding of those differences.
It may also lead to more widely understood and accepted risk management decisions. Evaluation studies have consistently demonstrated the effectiveness of risk communication practices in helping stakeholders achieve three major communication objectives: providing the knowledge needed for informed decision making about risks; building or rebuilding trust among stakeholders; and engaging stakeholders in dialogue aimed at resolving disputes and reaching consensus (Covello et al., 2001).

Effective risk communication is increasingly seen as crucial to the prevention and cooperative management of health risks; indeed, communication expertise has been recognized as at least equally essential to outbreak control as epidemiological training and skill in laboratory analysis (Infanti et al., 2013). It should facilitate a higher degree of consensus and support by all interested parties for the risk management options being proposed. The most basic goal in educating and communicating health and safety information is to promote greater knowledge and understanding by all parties involved of the particular risks, the possible solutions, and the accompanying issues and concerns (Oleckno, 1995).

Communication of technical information between scientists, policy makers and risk managers is also another important basic form of risk communication to inform decision making. The benefits of communication among experts is that it enables more comprehensive decision-making and enhances collaboration and coordination. If risk communication is poor, negative consequences are likely. For example, the government might lose the public’s trust if they release contradictory information or are perceived to hide information. This will lead to difficulty in implementation of future policy which can protect the public health or in the short-term lead to people or agencies ignoring critical advice that might save lives. The public might be misled by inappropriate information or suggestions and might even adopt some unhealthy choices (Balicer et al., 2006; Humphreys & Solarsh, 2008).
5.4 Theories of risk communication

This section offers an overview of the literature on four theoretical models of risk communication: risk perception, mental noise, negative dominance and trust determination (Covello & Sandman, 2001).

The first model is the **risk perception model**. This model holds that there are a myriad of factors affecting how individuals perceive risk. McInnes identifies the factor of ‘agency’ as particularly essential to shaping perceptions of risk, referring to whether there is a feeling that something can or cannot be done to control exposure to the risk (McInnes, 2005). In turn, these factors alter emotional, cognitive and behavioural responses to risk information and influence individual and collective levels of concern, worry, anger, anxiety, fear, hostility and outrage. Perceptions of risk, therefore, present significant challenges for risk communication efforts and understanding these perceptions can assist in designing an appropriate risk communication approach. People tend to overrate the probability of rare, serious events and underrate the probability of more common, but less serious events. People also have difficulty understanding cumulative risk and cannot always understand risk if framed in alternative ways. Yet it is perceptions of risk, not actual risk, that determine how people respond to hazards (Glik, 2007). For example, Petts & Niemeyer report the findings of a study of information strategies that parents use to make sense of health risk issues, particularly the combined measles, mumps and rubella vaccination (MMR). They identify that it is very important for parents to reinforce understandings and beliefs with their social networks (Petts & Niemeyer, 2004).

The second theoretical model of risk communication identified by Covello et al. in 2001 is the **mental noise model**. This theory seeks to understand how individuals process risk information in conditions of stress. This theory holds that when people are stressed, they are attending to a great deal of internal “mental noise” and are less able to attend to externally generated
information (Covello et al., 2001). For bioterrorism or pandemic events, given the dread and uncertainty surrounding them, the likelihood is high that people will respond emotionally (V. T. Covello, 2003). However, if they have a conceptual map or mental model to help them understand the risk, the information provided by risk communicators is more likely to be understood and accepted. Glik et al. illustrate how this process works in theory with the following example: ‘Although there may be resistance to information in crisis risk communication scenarios because of stress and high arousal states, information linking ... a new illness that fits an infectious disease prototype will be more easily understood or assimilated if a person already has a mental model of how an infectious disease is transmitted’ (Barry, Sixsmith, & Infanti, 2013). For example, a new illness that fits an infectious disease prototype will be more easily understood or assimilated if a person already has a mental model of how an infectious disease is transmitted (Glik, Drury, & Cavanaugh, 2005).

The negative dominance model is based on a central theorem of modern psychology: when people are upset they put greater value on losses and other negative information or outcomes than on gains or positive information and outcomes. Practically, for risk communication, this means that negative messages should be counterbalanced by a larger number of positive or solution-oriented messages or, more specifically, risk communications are most effective when they focus on what is being done rather than what is not being done (Covello et al., 2001). Recent field experiments after 9/11 suggest that different types of emotional response also impact outlook: Those experiencing anger are generally more optimistic than are those experiencing fear and dread (Lerner, Gonzalez, Small, & Fischhoff, 2003).

Finally, the need to establish trust between all stakeholders is fundamental to the effectiveness of risk communication messages and strategies. However, trust determination theory maintains that when people are upset they commonly do not trust authority. Trust, therefore, must be
established well in advance of an actual crisis event. Research indicates that proactive community outreach is one of the most effective means for achieving this goal (Santos, Covello, & McCallum, 1996). Important factors in trust determination and development are the perception of agreement among experts; coordination among the various risk management organizations; sensitivity by risk managers to the need for effective dialogue and public participation; a willingness to honestly acknowledge risks; a willingness to disclose or share information; and responsibility in fulfilling risk management requirements (Ferrante, 2010). For example, during the events of September 11, 2001, people were “glued” to their television sets, and most voiced a high degree of trust in what they read and saw—this finding runs contrary to public perceptions about news media in non-crisis situations where distrust tends to be high (Glik, 2007). Table 4 provides a summary of these four theoretical models of risk communication.

Table 4  Four theoretical models of risk communication

<table>
<thead>
<tr>
<th>Theoretical Model</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Perception theory</td>
<td>▪ Relates to how risks are perceived by people</td>
</tr>
<tr>
<td>Mental noise theory</td>
<td>▪ People who are under stress have difficulty hearing and understanding the messages</td>
</tr>
<tr>
<td></td>
<td>▪ clarity and simplicity is critical</td>
</tr>
<tr>
<td>Negative dominance theory</td>
<td>▪ People under stress see the world in negative ways</td>
</tr>
<tr>
<td>Trust determination theory</td>
<td>▪ People who are upset distrust the messenger</td>
</tr>
<tr>
<td></td>
<td>▪ Trust is critical</td>
</tr>
</tbody>
</table>

(Source: Covello et al 2008)

Since 2001, when Covello et al. identified these four theoretical models discussed, there has been a general shift in focus towards models emphasising the importance of social and cultural
factors for public acceptance of risk messages and assimilation of risk information. The factors to keep in mind, in terms of acceptance of risk messages, include environmental, social and cultural characteristics; language preferences, such as the appropriateness of the language used, translation, and cultural sensitivity; and differing health beliefs, past experiences and attitudes toward health professionals and health interventions (Infanti J & F., 2013). These theories, along with knowledge of other psychological cognitive processes that underlie risk-related behavior, will help to understand how people react during a crisis, and therefore, how to communicate effectively with them.

Another approach suggests that risk in the community could be viewed as having both a potential hazard and an outrage component. Sandman (2003) has written extensively about risk and crisis communications. His “Risk = Hazard + Outrage” theory is widely quoted and deserves elaboration in order to understand the theoretical foundations of risk and crisis communications. He suggests that the success of risk and crisis communications rests on the communicator’s clarity of the theory and how to apply it to the situation at hand. Hazard is the actual event addressed by the communication. Outrage refers to the emotions and behaviors of message receivers given their perceptions of the hazard level presented to them. Like hazards, the level of outrage exists on a continuum from high to low. This approach recognizes the danger or the hazard in the actions as well as the emotions people attach to their actions. So, while the hazard is the technical or scientific aspect of the risk assessment, the outrage is the emotional and nonscientific aspect of the information or assessment as experienced by the average person. The value addition of this approach is that it goes beyond the technicalities of the information and stresses that audiences require their feelings and concerns to be addressed through the communication response in addition to presentation of the facts about a health threat (Covello and Sandman, 2001). Therefore risk communication approaches need to carefully consider the potential for outrage for a given situation and acknowledge and plan for
this. An example is the reflective view of the crisis communication efforts preceding Hurricane Katrina. Although many residents heeded the calls to evacuate, certain groups were unwilling to do so. Some of those who stayed, not because they could not leave but because they chose to stay, died because their outrage level was not sufficient to move them to a desired action (Ferrante, 2010).

Although the four theoretical models of risk communication and Sandman’s “Risk = Hazard + Outrage” theory focus on emphasizing the factors explaining public acceptance of risk messages and assimilation of risk information, and on how to handle the media and public, there is still a lack of cooperation by different stakeholders for decision making in emergency events.

5.5 Risk communication in public health emergency management

5.5.1 The role of risk communication in public health

Since the turn of the century, the WHO has documented a historically unprecedented number of outbreaks of emerging infectious diseases, and lessons drawn from their management have confirmed the critical importance of effective communication. Communication is as critical to outbreak control as laboratory analyses or epidemiology (WHO, 2004). An important part of communication is communication about risk. The aim of risk communication is “to help stakeholders define risks, identify hazards, assess vulnerabilities and promote community resilience, thereby promoting the capacity to cope with an unfolding public health emergency” (WHO, 2011).

Risk communication plays a central role in the management of infectious disease. It is central to epidemic and pandemic control (Gamhewage, 2016). Risk communication is involved in preventing disease, disability, and even mortality, and it has been identified as a core
competence for guiding public health responses to infectious disease threats under the International Health Regulations (Cool et al., 2015). The International Health Regulations (2005) call for all countries to build capacity and a comprehensive understanding of health risks before a public health emergency in order to allow systematic and coherent communication, response and management (Dickmann, Abraham, et al., 2016). At times of emergencies, effective risk communication can empower nations or local communities to preserve their socioeconomic and political stability, and even prevent the loss of people’s trust in public health authorities by enabling health officials to address people's concerns and needs so that relevant and acceptable advice can be communicated to the public (WHO, 2015).

Risk communication in public health is not the same as communication in a clinical setting, for example between doctors and patients. The application of risk communication in the public arena often involves events of interest to the whole society, and poor risk communication may even lead to mass panic such as happened with the epidemics of SARS, avian flu and Ebola (Suwantarat & Apisarnthanarak, 2015).

Governments and health agencies have responded to the need for effective risk communication to prevent public health crises with the rapid development of risk communication plans and guidelines, the vast majority locating risk communication as an essential component of the larger processes of risk analysis and management. Health Protection Scotland’s guidance document for communicating with the public about health risks contains an illustrative model in this respect (Health Protection Scotland 2008). The role that risk communication plays in the risk management process is evident (Figure 9).
5.5.2 Practices of risk communication in Public Health

Risk communication is central to epidemic and pandemic control. It has been practiced widely in the past but with varying levels of success (Gamhewage, 2016). In recent years, risk communication has emerged at the intersection of crisis, risk, and public health emergency communication (Zimmerman, DiClemente, Andrus, Hosein, & Society for Public Health, 2016). After the SARS outbreak in 2003, governments around the world took action to revise, update and create new guidance documents for risk communication specific to the prevention and control of communicable disease (Reynolds & Seeger, 2005). The WHO, UNICEF, and many other international organizations have compiled a number of resources and guidelines on health risk communication. There are a vast number of guidance documents in the literature, outlining principles, rules or elements of effective risk communication. These are presentenced in Table 5.
<table>
<thead>
<tr>
<th>Guidance Document</th>
<th>Organization</th>
<th>Year</th>
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<tbody>
<tr>
<td>Crisis and Emergency Risk Communication</td>
<td>US CDC</td>
<td>2014</td>
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<tr>
<td>Crisis and Emergency Risk Communication</td>
<td>US CDC</td>
<td>2012</td>
</tr>
<tr>
<td>Outbreak Response and Communication Guide</td>
<td>USAID/Global Health</td>
<td>2011</td>
</tr>
<tr>
<td>Creating a Communication Strategy for Pandemic Influenza</td>
<td>Pan American Health Organization</td>
<td>2009</td>
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<tr>
<td>Outbreak Communication Planning Guide</td>
<td>WHO</td>
<td>2008</td>
</tr>
<tr>
<td>Communicating with the Public About Health Risks</td>
<td>Health Protection Scotland</td>
<td>2008</td>
</tr>
<tr>
<td>Crisis and Emergency Risk Communication: Pandemic Influenza.</td>
<td>US CDC</td>
<td>2007</td>
</tr>
<tr>
<td>Strategic Risk Communications Framework</td>
<td>Ministry of Health Canada</td>
<td>2006</td>
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<tr>
<td>WHO Outbreak Communication Guidelines</td>
<td>WHO</td>
<td>2005</td>
</tr>
<tr>
<td>WHO global influenza preparedness plan: the role of WHO and recommendations for national measures before and during.</td>
<td>WHO</td>
<td>2005</td>
</tr>
<tr>
<td>The Crisis and emergency risk communications toolkit</td>
<td>California Department of Health Services</td>
<td>2005</td>
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<tr>
<td>Outbreak Communication: best practices for communicating with the public during an outbreak</td>
<td>WHO</td>
<td>2004</td>
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<tr>
<td>Risk Communication with the media during a public health crisis</td>
<td>Public Health Preparedness at Saint Louis University</td>
<td>2003</td>
</tr>
<tr>
<td>Crisis and Emergency Risk Communication: Guidelines for Public Officials and Human Services</td>
<td>US CDC</td>
<td>2002</td>
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</table>
Most of these documents have been developed by government agencies and international organizations. Most focus on risk communication in crisis or emergency situations and include information such as definitions, principles, tips and exercises for practitioners, planning and delivering risk communication, stress and organizational development, message development, audience research, audience relations, message delivery and media relations. (Gamhewage, 2016).

A number of common best practices or elements of effective risk communication in the field of public health can be identified across these documents. Good risk communication engages with and responds to the communities it intends to reach. Good risk communication involves stakeholder involvement, including pre-testing of risk messages and tailoring for specific audiences, which is essential for the efficacy and impact of risk communication; to communicate effectively about risks to the health of the public, working relationships amongst all parties involved must be strengthened and mutual trust promoted. Risk communication is an integral component of a larger framework for risk management.

A multipronged approach to risk communication with focus on evidence based communication strategies is the most effective way of ensuring that people adopt practices. This multi-pronged approach is successful in getting people to adopt practices that help break the transmission of the disease. Effective risk communication ensures clear objectives, consistent messages, and transparent and credible decision-making (Infanti J & F., 2013).

Some risk communication strategies have been applied with successful outcomes in disease outbreaks in the past. For example, in China in 2013, a study showed that risk communication that promoted people’s perceived risk of avian influenza associated with live poultry markets (LPMs) and the effectiveness of LPM closure in control of avian influenza outbreaks improved
support for permanent closure of LPMs (Liao et al., 2016).

Recent reflection on the Ebola crisis have highlighted the importance of risk communication for successful control of disease outbreaks (Schiavo, 2014). In 2015 in Nigeria, media partnerships and engagement, development of risk communication products, house to house inter-personal communication, community and mass mobilization campaigns, sensitization meetings, and knowledge transfer for key message multipliers, were implemented for Ebola virus disease prevention and control (Maduka et al., 2016).

In risk communication processes, considerations must be given to the unique character of the hazards. For example, the current fears about the spread of Zika virus and its suspected complications such as microcephaly and the many unanswered questions from experts and the public alike requires a very different risk communication response than the outbreak of a known disease such as cholera (Gamhewage, 2016).

Despite the advice in the guidance documents, and the availability of various planning tools for pre-crisis event risk communication and readiness efforts, studies on how countries actually respond to emergency situations involving communicable diseases reveal that many still need to concentrate on advanced planning at all levels of public health. Problems of risk communication practice include the variety of hazards, the variety of target audiences (e.g. pregnant women, elderly, and children), lack of engagement with stakeholders and lack of trust or relationship between stakeholders. National and international preparedness planners have started examining how underlying systems and structures contributed to the Ebola outbreak response failures in West Africa. Problems related to one-directional communication, lack of trust and relationship building between providers and people and between relevant professional sectors and stakeholders have been identified as high priority issues needing attention (Dickmann, Apfel, et al., 2016).
### 5.5.3 Principles of risk communication in public health

Based on analysis of some important guideline documents and best practice studies, eight key principles have been distilled as being essential for comprehensive risk communication for outbreak management: developing trust; being transparent; making announcements early; listening well; planning well; being honest and open; being empathetic and caring; accepting and involving the public as a partner. A summary of the principles and their guidelines source is provided in Table 6.

**Table 6  Principles of effective risk communication for outbreak management**

<table>
<thead>
<tr>
<th>Organization/Researcher</th>
<th>Year</th>
<th>Guidelines/Plan</th>
<th>Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pan American Health Organization</td>
<td>2009</td>
<td>Creating a Communication Strategy for Pandemic Influenza</td>
<td>• Accept and involve the public as a partner.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Plan carefully and evaluate your efforts</td>
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<td>• Listen to the public's specific concerns</td>
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<td></td>
<td>• Be honest, frank, and open.</td>
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<td></td>
<td>• Work with other credible sources</td>
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<td>• Meet the needs of the media.</td>
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<td></td>
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<td></td>
<td>• Speak clearly and with compassion</td>
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<tr>
<td>WHO</td>
<td>2008</td>
<td>World Health Organization Outbreak Communication Planning Guide</td>
<td>• Trust</td>
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<td></td>
<td></td>
<td></td>
<td>• Announcing early</td>
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<td></td>
<td></td>
<td></td>
<td>• Transparency</td>
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<td></td>
<td></td>
<td></td>
<td>• Listening</td>
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<td></td>
<td></td>
<td></td>
<td>• Planning</td>
</tr>
<tr>
<td>Health Protection Scotland</td>
<td>2008</td>
<td>Communicating with the Public About Health Risks</td>
<td>• Empathy and caring</td>
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<td></td>
<td></td>
<td></td>
<td>• Competence and expertise</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Transparency and openness</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Planning for communications</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Early communication</td>
</tr>
<tr>
<td>U.S. Department of Health and Human Services</td>
<td>2002</td>
<td>Crisis Emergency Risk Communication</td>
<td>• Accept and involve the public as a legitimate partner</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Listen to the audience</td>
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<td></td>
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<td></td>
<td>• Be honest, frank, and open</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Coordinate and collaborate with other credible sources</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Meet the needs of the media</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Speak clearly and with compassion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Plan carefully and evaluate performance</td>
</tr>
<tr>
<td>FAO/WHO</td>
<td>1998</td>
<td>The Application of Risk Communication to Food Standards and Safety Matters</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>- Know the audience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Involve the scientific experts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Establish expertise in communication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Be a credible source of information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Share responsibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Differentiate between science and value judgement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Assure transparency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Put the risk in perspective</td>
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</tbody>
</table>

**5.5.4 Risk communication problems in public health**

There are many factors that cause problems in risk communication. They include lack of transparency (hiding information, giving false information), inaccurate information, giving information late, not listening to other stakeholders, and lack of collaboration and coordination, even lack of planning (Maduka et al., 2016).

In today’s interconnected world and its high tech-information society, social media are developing quickly, and this increases the complexity of the operating environment for risk communication in epidemics and pandemics. The modern risk communication principle of listening, transparency and trust, together with operational strategies, such as first announcement and planning which evolved as a result of the painful lessons learnt from the SARS response in 2003, should not be taken for granted (Gamhewage, 2016). Wang suggests that during the SARS outbreak, the Chinese government's inadequate disclosure of information was due in part to a lack of capacity to collect disease information (Y. Wang, 2013). In the case of SARS, inaccurate information about the virus caused hospitals to provide the wrong medication and inappropriate prevention measures. Further, inaccurate statistics caused distrust. People in China in 2003 did not trust government reports and did not take proper prevention measures (R. D. Smith, 2006).
Another common problem is that communications are often one way rather than two way. Regulatory agencies use web portals as their primary instrument to reach outside audiences. Too often this leads to data dumping or one-size-fits-all communications that confuse patients and are not sufficient to build trust (Bouder, 2015). Lack of trust was identified as a problem in the Ebola outbreak in West Africa (Dickmann, Apfel, et al., 2016).

Against the advice of risk theorists, persuasion often remains the stakeholder’s main goal. Communications often seek to educate the public about the agency’s view, rather than to engage in a two-way communication process. Problems related to one-directional communication, lack of trust and relationship building between service providers and people and between relevant sectors and stakeholders are being identified as higher priority issues needing attention (Dickmann, Apfel, et al., 2016). This means that the resources that are needed are often far larger and the time required much longer than many risk managers anticipate (Kasperson, 2014).

Effective risk communication requires sustained effort throughout the risk deliberation process, with learning along the way. In public health emergencies, because of the large number of stakeholders involved, a health department's decision making is not a simple process. It needs interagency information communication and various forms of support and cooperation. For example, communication difficulties between local governments, scientific experts and the local citizens were a major concern during the early SARS response in China. The successful identification of the SARS virus and control of the SARS pandemic depended on international collaboration, thus highlighting the importance of that collaboration (Wong & T. F. Leung, 2007).

In current practice, public health service agencies lack the awareness and means of risk communication, bringing varying degrees of negative effects to the prevention and control of
public health emergencies (Cope, Frost, Richun, & Xie, 2014). For example, research in north-western China in 2014 suggested that there is a shortage of knowledge about emergency risk communication, a lack of positive attitude toward it, and a lack of capability of health emergency response staff (L. Tang et al., 2016).

Further, there is a lack of integration of theoretical approaches into risk communication planning and supportive environments (Dickmann, Abraham, et al., 2016). Even though risk communication has been designated as a core capacity for WHO and all related states by the International Health Regulations (IHR), it has yet to be routinely implemented into public health organization planning, its risk assessment, or management procedures. For example, before Typhoon Haiyan, the WHO Representative Office in the Philippines had no social media presence for sharing timely, relevant public health information (Cool et al., 2015).

5.6 The practice of risk communication in public health in China

The outbreak of SARS in 2003 can be thought of as the beginning of risk communication in China's public health system. Before the outbreak of SARS, the Chinese government was reluctant to publicize bad news. In order to maintain national stability and avoid social unrest caused by the lack of information disclosure, in August 1994, the General Office of the Communist Party of China Central Committee and the General Office of the State Council issued the Foreign Reporting Work Notice on Domestic Emergencies. The notice stipulated that emergency reports should be reported by the Central Propaganda Office with unified coordination and management, and released by the state Xinhua News Agency. Without authorization, other news media were not allowed to report such news.

To some extent, these rules ensured the unity of public opinion, but affected the public's right to know, and this became one of the factors of people’s dissatisfaction. Not publicizing the early
situation of SARS also caused social panic (L. Sun & Ma, 2012). During this period, risk communication was released unilaterally by the relevant government departments, which relied on mass media and professional media to do one-way transmission from top to bottom. The public had not yet formed any communicative interaction with the government (L. Sun & Ma, 2012).

Since SARS, China has gradually started to attach importance to the practice of risk communication in emergency management. In 2006, the Ministry of Health compiled an internal course, The Tutorial of Emergency Risk Communication for Public Health Emergencies. In 2007, the Ministry of Health and the United States National Center for Disease Control wrote risk communication materials and offered training across the country, which became the start of risk communication practices and applications in government departments (Zhu & Yang, 2011).

On April 24, 2007, The Regulation of Government Information Disclosure stipulated the scope, ways and procedures for disclosure of government information, which improved the transparency of government work and enhanced China’s emergency news system. In 2008 the Ministry of Health and WHO jointly organized a seminar on risk communication and crisis communication. The same year, the Ministry of Health prepared the Emergency Health and Risk Communication books, and conducted media management and media training for the national health administrators at the provincial level. At the end of 2008, the Ministry of Health, for the first time, wrote health risk communication into a document, the 2009 Notice of Health News Propaganda of the Department of Health. For the first time, a government document recommended that government officers should strengthen risk communication and crisis communication, fully understand risk communication in daily work and understand the importance of dissemination of information in emergencies (Yan, 2012).
During the 2009 worldwide H1N1 outbreak, and before HIN1 cases happened in China, the Information Office of the Ministry of Health made China's First HIN1 Case Information Dissemination Plan. Based on this, there was a clear division of responsibilities and monitoring of public opinion. The Ministry of Health and many other sectors set up a joint control mechanism and activated the emergency response mechanism for epidemic prevention and control. As part of its prevention and control activities, the Ministry of Health developed the Risk Communication Guidelines for the first time, which marks the improvement of organization, planning and openness in society. The Information Office of the Ministry of Health adopted a series of measures designed to help understanding of public opinion and attitudes, dispatched specialists to take charge of the media reports, network monitoring and analysis of public opinion. Meanwhile, the public health hotline daily submitted public ‘hot topics’, summarized changes in various questions, focused on public concern, and grasped the development trend of public opinion (L. Sun & Ma, 2012). The emergence of interactive channels such as public opinion surveys, and telephone hotlines, proved that the government had begun to recognize the importance of audience awareness and public demand. However, apart from the actual content, the understanding of the various types of stakeholders was not sufficient. During this period the government only recognized the importance of public perception and demands, but did not give it priority (Tong, 2013).

The crisis risk communication strategy of the Chinese Government focused more and more on the public, and the satisfaction of the public became an important criterion for evaluating the government’s response to a crisis. When dealing with H7N9, the government attached great importance to developing channels of communication with the public through various media and communication channels. It also strengthened two-way exchanges and communication with the public (S. Wang, 2014). The Control Programme of People Infected with H7N9 Avian Influenza compiled by the Ministry of Health in 2013 clearly proposed: to actively carry out
public opinion monitoring, actively publicize information and conduct risk communication that targeted the public’s concerns, guided and promoted good habits. Especially it aimed to strengthen health education and risk communication work with people who were engaged in live poultry farming, and slaughter, marketing and transport. In the course of the outbreak, the government collected information from multiple channels and communicated with government departments promptly and regularly (NHFPC 2013. Furthermore, it reported to the World Health Organization, Hong Kong, Macao and related countries, published information within the country and disseminated scientific knowledge about prevention and control through expert interviews.

In dealing with MERS, Zika and other emerging infectious diseases in recent years, international risk communication theory and principle has been gradually applied in practice. The development of risk communication in China reflects the Government’s shift in focus on risk communication. It also suggests that the important of risk management has been recognized by the public. With the power of modern communication, China has participated in the development of risk communication norms (L. Sun & Ma, 2012).

From SARS to H7N9, China’s experiences of emergency management for epidemics have varied. The development of risk communication in China reflects the Government's progress in developing risk communication. Thus, in contrast to the poor response to SARS in 2003, the H7N9 response in 2013 was considered successful. Risk communication probably played a very important role.

**5.7 Conclusion**

Risk is the “potential for harm”, and the probability of danger. There is always uncertainty involved. Risk communication is the communication of information about risk among groups.
The functions of risk communication, such as dealing with the uncertainty, increasing trust and improving the collaboration among stakeholders, make it a useful tool to help overcome the problems in collaboration and cooperation. The fundamental goal of risk communication is to provide meaningful, relevant and accurate information, in clear and understandable terms targeted to specific audiences.

There are four theoretical models of risk communication: risk perception, mental noise, negative dominance and trust determination and Sandman’s “Risk = Hazard + Outrage” theory. They help to understand how people react during a crisis, and therefore, how to communicate effectively with them. However, they both focus on how to handle the media and public, but are not involved in stakeholders’ decision making.

Risk communication plays a central role in the management of infectious disease. It has been identified as a core competence for guiding public health responses to infectious disease threats under the International Health Regulations. Many guides have been developed by government agencies and international organizations. Based on analysis of some important guideline documents and best practice studies, eight key principles have been distilled as being essential for comprehensive risk communication for outbreak management. They are trust; announcing early; transparency; listening; planning; honesty, frankness and openness; empathy and caring; and accepting and involving the public as a partner.

Although some risk communication strategies have been applied with successful outcomes in disease outbreaks in the past, there are many factors that cause problems in risk communication. They include lack of risk awareness, lack of transparency, lack of openness, weak planning, giving information late, not listening to other stakeholders, and lack of collaboration and coordination.
The outbreak of SARS in 2003 can be thought of as the beginning of risk communication in China's public health system. The development of risk communication in China reflects the Government's progress in developing risk communication. However little systematic analysis of the role of risk communication has been undertaken.

As the final chapter of Part I: Literature Review, this chapter has discussed risk and risk communication; described the purpose and theories of the risk communication, and the practices of risk communication in public health. These features will be examined in the case study of this research. The next section of this dissertation, Part II: Research Methodology and Key Results and Findings, will identify and discuss the details of the research design and methodology, and the key findings that appeared from these methods. The next chapter provides the research conceptual framework and methodology used to answer the research question.
Part II: Research Methodology, Findings and Discussion

Chapter Six  Research conceptual framework and methodology

6.1 Introduction

In the previous chapters, the literature on pandemics, emergency management, risk communication and PHEM in China were reviewed. From SARS to H7N9, the overall capacity of the national disease prevention and control system in China greatly improved, but the contribution of risk communication is not clear, and there is a lack of applied research about risk communication in pandemics, particularly examples of how theory is applied. Following from this, the question for this research therefore is “What are the roles and strategies for risk communication implemented for the prevention and control of SARS and H7N9 in China?”

This chapter presents the research framework and methodology for this study in order to address these research questions.

This chapter shows how the research question was developed based on the research background and rationale, presents a conceptual framework for the research, and provides an overall picture of the study design and the rationale for the particular methods used. The chapter then describes the data collection and analysis process, and ends with a discussion of issues of study rigor and ethics.

As the case study is a research approach that is used to generate an in-depth, multi-faceted understanding of a complex issue in its real-life context, it can be used to explore an event or phenomenon in depth and in its natural context (Crowe, Cresswell et al. 2011). It has been chosen in this research as research approach to answer the research questions.

For this research, I chose the SARS and H7N9 events in China in order to conduct comparative case study research. I first systematically analyzed and compared the SARS and H7N9 events,
6.2 Research aim, research question and focus questions

The aim of this research is to compare the strengths and weaknesses of the risk communication approach and processes used in the SARS and H7N9 prevention and control programs in China in order to inform risk communication strategy development to improve emergency management of pandemics in China.

The research question therefore is:

What are the roles and strategies for risk communication implemented for the prevention and control of SARS and H7N9 in China?

To answer the research question, five focus questions were posed:

1. What are the features and negative impacts of disease outbreaks and pandemics?
2. What are the effective public health emergency responses and what are the issues for public health emergency management of pandemics and disease outbreaks?
3. What are the roles and good practices of risk communication that should be applied to emergency management of pandemics?
4. What are the case profiles of SARS and H7N9, and what are the strengths and weaknesses of the risk communication used in the SARS and H7N9 events in China?
5. What lessons can be learnt from the analysis and comparison of the SARS and H7N9 events in order to inform risk communication strategy development and to improve...
emergency management of pandemics in China?

6.3 Contextual fields and conceptual framework

6.3.1 Contextual Fields

This research draws upon four contextual fields, namely, pandemics, emergency management, risk communication and public health emergency management (PHEM) in China. These contextual fields are theoretically and practically linked and they guide and inform the research. Pandemics have caused huge negative impacts on health, the economy, national and even international security, and require effective management. Thus, emergency management for pandemics requires different stakeholders to collaborate and share information, which can be difficult. International experience shows that risk communication is an important means to enable different stakeholders to cooperate and share information in public and environmental health crisis. China’s emergency management of epidemics demonstrates both success and failure, and a comparison of two disease outbreaks can help to develop and promote successful risk communication for emergency management of pandemics in China.

6.3.2 Framework

The conceptual framework for this study was developed through the research rationale. It presents the contextual fields for consideration, the relationships among them, and how each field of information is linked to the research question. The details of the conceptual framework are illustrated in Figure 10.
This conceptual framework provides an overview of the 4 key topics that underpin this research. The first section on pandemics provided definitions, features, history and impacts of pandemics, and highlighted the negative impacts on health, economy and national and international security. The second section on emergency management conceptualized and defined public health emergency management, emergency preparedness and response, and problems that have been identified over time as agencies around the world respond to pandemic crises. The third section addresses public health emergency management in China. This section provides an overview of the public health emergency management system in China, focusing on the organizational structure, legal framework, management system and identifying challenges for the system. The fourth section analyzes risk communication.
including the concepts of risk and risk communication, purposes and theories of risk communication, and risk communication in public health emergency management. Risk communication is needed in the whole process of emergency management, and has been proven to be an effective tool to facilitate communication among stakeholders during such a process. A comparison of the two cases (SARS and H7N9) will be used to explore factors that promoted effective risk communication in order to improve emergency management of pandemics in China.

6.4 Research design and methodology

Research design is the argument for the logical steps which should be taken to link the research question and issues to data collection, analysis and interpretation in a coherent way (Hartley, 2004). Yin (2009, p. 26) stated that a research design is a “logical plan” for getting from the “initial set of questions to be answered” to “some set of conclusions (answers) about these questions”. Between the “questions” and “answers”, there are a number of major steps, including the collection and analysis of relevant data. The research design guides the investigator in the process of collecting, analyzing, and interpreting observations (Frankfort-Nachmias & Nachmias, 2008).

The aim of this section, and an important starting point for all research, is to develop a research method for this study. This section describes the processes of the research design and discusses the theory and rationale of methods chosen in this research. The research design details the stages of the study, including qualitative techniques, data collection methods in each phase of fieldwork, and data analysis techniques. The research methodology explains why and how the methods in this research were chosen.

6.4.1. Research design
Figure 11 illustrates the methodology framework for the research. It includes three stages: literature review, data collection and data analysis. Each stage represented on the left side of the flowchart is supported by further details on the right side of the chart. In the first stage, the literature review provides an understanding of the four contextual fields of the research. In the second stage, the research uses qualitative methods to collect data. A case study method was used for focusing the collection of data and to provide a basis for analysis. Data collection methods included in-depth interviews and focus group interviews, and document analysis. In the third stage the analysis of the qualitative data provided ground for further discussion and recommendations.
6.4.2. Research methodology

Social scientific research involves qualitative and quantitative data. Interpretive qualitative research attempts to develop an understanding of social phenomena. It involves the collection and synthesis of a variety of empirical evidence (Neuman, 2011a). This research first systematically analyzed and compared the SARS and H7N9 prevention and control in China from a risk communication perspective. This allowed for a more comprehensive assessment of the use of risk communication theory and practice in emergency management by using a qualitative case study approach, including document analysis, in-depth interviews, and focus groups.

Grillham (2000) defines a case study as a unit of human activity embedded in the real world. The case can be an individual, an institution, a large-scale community, or multiple cases (Gillham, 2000). Case studies can be used to explain, describe or explore events or phenomena in the everyday contexts in which they occur. In collective or multiple case studies, a number of cases are carefully selected. This offers the advantage of allowing comparisons to be made across several cases. Choosing a “typical” case may enable the findings to be generalized to theory (i.e. analytical generalization) or enable a theory to be tested by replicating the findings in a second or even a third case (Crowe, Cresswell et al. 2011).

This research has chosen the SARS and H7N9 events in China to conduct comparative case study research, because they represent two major disease outbreak events with different outcomes. This research aims to determine the factors that promoted or hindered better risk communication in order to seek better outcomes for these types of events in the future. In the case study research, I used multiple sources of evidence to address the research question. These sources include document review, in-depth interviews, and focus group interviews.
6.4.3 Data collection techniques

Data collection techniques allow systematic collection of information about objects of study (people, objects, phenomena) and about the settings in which they occur (Chaleunvong, 2013; Merriam, 1997; Pickard, 2013). This study collected data from the following sources: peer-reviewed literature, secondary statistic data, face-to-face interviews and focus group discussions. Stakeholder analysis was conducted prior to data collection.

6.4.3.1 Literature and documentary review

A literature review can be an effective way of defining a problem and finding the current thinking on a subject (Dwyer, et al., 2004). This research reviewed relevant literature and documents for the four contextual fields underpinning this research. The review gave a wider understanding of pandemics, emergency management and risk communication and analysed the results of recent studies, providing a framework for establishing the importance of this research, as well as a benchmark for comparing the results with other findings. It was also particularly important for analysing official documents used in emergency management of the SARS and H7N9 events and reviewing media reports to better understand the broader views expressed in the community.

The review drew on a wide range of data sources, including books, journal articles, government documents, policy reports and conference papers. Most books were searched for in the Griffith University library catalogue. Journal article searches were made from the library catalogue, and reference lists of retrieved articles and textbooks, and electronic literature databases, such as: ScienceDirect, PubMed, Medline, Health and Medical Complete (ProQuest) and Web of Science. All sources were searched for the period covered by the databases up to the present. Publications in all languages were sought, although for
non-English-language publications, only abstracts in English or Chinese were evaluated. Google Scholar was used to search for sources from the Internet. The Internet web sites of international organisations and governments including China NHFPC, European Centre for Disease Prevention and Control, Health Canada, Health Protection Agency (UK), Centres for Disease Control and Prevention (US), and WHO, as well as any of their relevant documents were accessed. Websites in English and Chinese were accessed. Documents and reports regarding China were of particular interest. Google was also used to search for Chinese documents. Unpublished papers or oral reports, presentations, and technical documents which come from Chinese formal and informal academic conferences and government meetings, and other types of grey literature were also reviewed. The key search words varied depending on the topics of different contextual fields. The search keywords included pandemic, communicable/infectious disease/outbreak, emergency management, risk/crisis communication, China.

The initial research produced hundreds of sources related in some way to the research. All the sources were first screened for relevance from their titles and abstracts. The relevant articles were then evaluated for their content from the introduction and conclusion sections to decide whether they were worth selecting for further study. Only sources that addressed some aspects of this research were included.

6.4.3.2 Secondary data

Secondary data is data which has already been collected and possibly also analyzed by someone else. The most common forms are official statistics collected by governments and government agencies (Hughes, Blaxter et al. 2010). Throughout my field work I collected and reviewed a wide range of documents and existing data.
In this research, statistics of SARS and H7N9 cases, deaths and costs were collected from the government reports from the national and local Centers for Disease Control and Prevention, government departments, and published research literature.

### 6.4.3.3 In-depth interviews

An in-depth interview is a qualitative research technique that involves intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program, or situation (Boyce & Neale, 2006). The aim of in-depth interviews, as Liamputtong (2009, p. 43) suggested, is ‘to elicit rich information from the perspective of a particular individual and on a selected topic under investigation.

In this research, in-depth interviews using a semi-structured style, were conducted with key stakeholders including officers from WHO, FAO, NHFPC, MOA, as well as the experts from local health departments, agriculture departments, CDC, hospitals and journalists who have experience of SARS and/or H7N9 in Beijing, Shanghai, Guangzhou and Hangzhou (Refer to Table 7).

Based on the literature review, the research and focus questions, I developed the questionnaires and interviewed the key informants about their experience of and reflections on the emergency management of the SARS and H7N9 events, and problems and suggestions concerning risk communication for emergency management of disease outbreaks and pandemics. The officers and experts for in-depth interviews were identified through the stakeholder analysis and contacted via informal networks of colleagues, existing organizations and networks and consultation with key informants.

There were 5327 SARS cases in China in 2003, 48% of them in Beijing and 28% in Guangdong (MOH 2004). In 2013, there were 139 H7N9 cases in China, 50 cases in Zhejiang
and 33 cases in Shanghai (MOH 2014). Most cases of SARS and H7N9 were reported in 4 cities in China: Beijing, Shanghai, Guangzhou and Zhejiang and hence these cities were chosen as the main focus of data collection for this study. The details of data collection are provided in Table 7.

Table 7  In-depth interview key informant details

<table>
<thead>
<tr>
<th>Participants</th>
<th>Beijing</th>
<th>Shanghai</th>
<th>Guangzhou</th>
<th>Hangzhou</th>
<th>National organizations</th>
<th>International organizations</th>
<th>In total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Officers of Health and Family Planning Commission</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Officers of Agriculture Department</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Experts from CDC</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Experts from the designated hospital</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Major Media Journalists</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Officer of WHO</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Officer of FAO</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>In total</strong></td>
<td><strong>5</strong></td>
<td><strong>5</strong></td>
<td><strong>5</strong></td>
<td><strong>5</strong></td>
<td><strong>4</strong></td>
<td><strong>2</strong></td>
<td><strong>26</strong></td>
</tr>
</tbody>
</table>

The in-depth individual interview questions are provided in Appendix 1 (English version) and Appendix 2 (Chinese version).

6.4.3.4 Focus group discussion

A focus group discussion is a qualitative research methodology in which a small group of
participants gather to discuss a specified topic or an issue to generate data (L. P. Wong, 2008). It is a special qualitative data gathering technique in which people are informally interviewed in a group-discussion setting (Burton & Sage Publications, 2000). In a focus group, the researcher explores the perceptions, experiences and understanding of a group of people who have some experience in common with regard to a situation or event. (Walliman & Ebook Corporation 2006). Focus groups are used to obtain information about the feelings, opinions, perceptions, insights, beliefs, attitudes, and receptivity of a group of people concerning an idea or issue (McKenzie, Neiger, & Thackeray, 2013).

In this research, based on the literature review, research and focus questions, I developed questions for the 7 focus groups (3 groups of local residents in Beijing who had experience of SARS and 4 groups of local residents in Guangzhou who had experience of SARS and H7N9), which were conducted to investigate the views about control and prevention of SARS and H7N9 events in China (Table 8). The focus groups were used to collect data about the perceived performance of the emergency management, social impacts and public expectations of SARS prevention and control in China. Each group consisted of 6 to 8 people. The participants were organized by Beijing and Guangdong CDC, using informal networks of local health community health centers and facilitated by myself.

Table 8  Focus group interview key informants details

<table>
<thead>
<tr>
<th>City</th>
<th>Group</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beijing</td>
<td>Group 1: Local residents who had experience of SARS</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Group 2: Local residents who had experience of SARS</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Group 3: Local residents who had experience of SARS</td>
<td>7</td>
</tr>
<tr>
<td>Guangzhou</td>
<td>Group 1: Local residents who had experience of H7N9</td>
<td>8</td>
</tr>
</tbody>
</table>
The focus group questions are provided in Appendix 4.

### 6.4.4 Data Analysis Techniques

In general, data analysis refers to a search for patterns in data—recurrent behaviors, objects, phases, or ideas. Data analysis involves examining, sorting, categorizing, evaluating, comparing, synthesizing, and contemplating the coded data as well as reviewing the raw and recorded data (Neuman, 2011a, p. 517). Qualitative analysis requires the researcher to read and reread data notes, to reflect on what is read, and to make comparisons based on logic and judgment (Neuman, 2006). The key point is to maintain neutrality between the researcher’s viewpoint and the data collected. I tried to analyze this data as objectively as possible in order that my personal views not affect the results analyzed. Conclusions were drawn after talking with colleagues and supervisors.

Creswell (2009) developed a general procedure and proposed the steps for qualitative data analysis (Figure 12). For this research, I analysed qualitative data using the following steps: 1) transcribing interviews, listening to recordings, typing up field notes; 2) reading through all the data and coding to generate a small number of themes or categories. These themes are the ones that appear as major findings and are used to create headings in the findings sections of the research. 3) using a narrative passage to convey the findings of the analysis; 4) making an interpretation or meaning from the data.
In my research, all interviews and the focus group discussions were recorded with a digital recorder and then relayed through a USB port to the computer. The in-depth interviews and group discussions were transcribed and downloaded electronically into my personal laptop. The transcription includes everything that was said during the interviews and focus group discussions, including my own questions and probes, and everything the respondents said. Key sub-themes were identified following the interview transcripts.

I followed the general processes to code qualitative data: Open Coding which examines the data to condense them into preliminary analytic categories or codes; Axial Coding which organizes the codes, links them, and discovers key analytic categories; and Selective Coding that examines previous codes to identify and select data that will support the conceptual coding categories that were developed (Neuman, 2011a).

Almost all information and data were managed and analyzed during the fieldwork. The key

Source: Creswell (2009, p. 185)
information was translated from Chinese to English. In this study, the analysis of data from the interviews and focus group discussions included the following steps:

- Before analysis the data was transformed into a format amenable to manipulation and analysis. This involved transcribing audiotaped interviews, or entering text and audio data into qualitative analysis software Nvivo 10 and MindManager. Key quotations from the transcripts were translated to English.
- The first analysis step was to determine what the codable units of data were, and then to identify those units within the data.
- The next step was to understand the meaning of what was said, observed, or read.
- Based on the meanings, a discovery process of grouping data with similar meanings to form categories was used. At this time naming of groups/categories was determined.

After the categories were reasonably well established, definitions of the categories were developed and relationships between them identified. This research analyzed the results against criteria for good risk communication practice from the literature, and analyzed the SARS and H7N9 responses with the theoretical framework / concepts (eg. 8 risk communication principles etc.) from the literature to compare the cases to identify strengths and weaknesses.

MindManager, a commercial team collaboration software application developed by the company Mindjet, was used in qualitative data analysis in this research. This software provides ways to visualize information via the creation of mind maps (Kelly, 2012). I used this software to manage qualitative data and analyze the themes of perceptions and information from different interviewees.

The computer software program QSR NVivo 10.0 was used to speed up the analysis and facilitate the coding process. NVivo, which is the most popular computer aided quantitative analysis tool internationally, can manage information from documents, PDF, and audio, and
analyzes and finds data quickly and efficiently. With Nvivo10.0, using the data encoding, data analysis and statistical functions, I conducted theme coding and hierarchical coding and analyzed the explicit and implicit relationships between data.

Table 9 Provides a summary of the research aim, questions, design, data collection techniques and analysis methods.
Table 9  Summary of research aim, questions, design, data collection techniques and analyses

<table>
<thead>
<tr>
<th>Aim</th>
<th>Research Question</th>
<th>Focus Questions</th>
<th>Research design</th>
<th>Data collection techniques</th>
<th>Data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>To compare the strengths and weaknesses of risk communication in SARS and H7N9 prevention and control and inform future risk communication strategies development to improve emergency management of pandemics in China.</td>
<td>What are the roles and strategies for risk communication implemented for the prevention and control of SARS and H7N9 in China?</td>
<td>What are the features and impacts of disease outbreaks and pandemics?</td>
<td>Qualitative</td>
<td>Literature review In-depth interview Secondary data collection</td>
<td>Taxonomy analysis Descriptive analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>What are the effective public health emergency responses and what are the issues for public health emergency management of pandemics and disease outbreaks?</td>
<td>Qualitative</td>
<td>Literature review In-depth interview Group discussion</td>
<td>Content analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>What are the roles and good practices of risk communication that have been applied to emergency management of pandemics?</td>
<td>Qualitative</td>
<td>Literature review</td>
<td>Content analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>What are the case profiles of SARS and H7N9, and what are the strengths and weaknesses of the risk communication used in the SARS and H7N9 events in China?</td>
<td>Qualitative</td>
<td>Literature review In-depth interview Focus Group</td>
<td>Content analysis Taxonomy analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>What lessons can be learnt from the analysis and comparison of the two SARS and H7N9 events to inform risk communication strategy development and to improve emergency management of pandemics in China?</td>
<td>Qualitative</td>
<td>In-depth interview Focus Group</td>
<td>Content analysis</td>
</tr>
</tbody>
</table>
6.5 Issues of rigor

Rigor refers to the issues of reliability and validity (Liamputpong, 2009; Liamputpong & Ezzy, 2005). Reliability refers to the ‘stability of findings’ and validity the ‘truthfulness of findings’ (Neuman, 2011a). Neuman (2011) concludes that reliability means dependability or consistency; it suggests that the same thing is repeated or recurs under the identical or very similar conditions. Validity suggests truthfulness and refers to the match between a construct, or the way a researcher conceptualizes the idea in a conceptual definition, and a measure. It refers to how well an idea about reality “fits” with actual reality (Bryman, 2012).

Reliability

Reliability for research purposes is commonly measured by replicating the measurement and evaluating the degree of agreement (Dawson & Trapp, 2001). In the research, I tried to get a high degree of participation from a wide population. All participants had been directly involved in the responses to the diseases, so they were knowledgeable from their own experience. In this research, the key informants came from varied organizations with different backgrounds. The participants generally took an earnest attitude in the interview, so their comments can be trusted. I evaluated the methodology with supervisors and with expert researchers in China to make sure of the reliability of the questions. All interviews were recorded so that they can be checked.

To ensure the reliability of the focus group analysis in this research, I held group data-analysis sessions to listen to the audio-recordings to make conclusions. To ensure the reliability in qualitative research, I emphasized to participants that all the data being taken were anonymous and asked them to say what they really thought and did. I tried to ensure I talked about the issues with the participants in a relatively informal way. I also analyzed the data with my
supervisors to ensure reliability in interpretations.

Validity

Validity is concerned with the integrity of the conclusions that are generated from a piece of research (Bryman, 2012). The core of the concept is truthfulness. It refers to the bridge between a construct and the data (Neuman, 2011a). Two types of validity in qualitative research are identified: internal validity (by which we mean whether there is a good match between the researchers’ observations and the theoretical ideas they develop) and external validity (the degree to which findings can be generalized across social settings) (Bryman, 2012; Neuman, 2011a). I used a variety of data collection techniques – document reviews, focus groups, and in-depth interviews – to ensure validity. All questions were informed by literature and the key concepts and issues identified in the literature, and all the information came from real cases.

Internal validity

Internal validity means there is no error within the design or the framework of the research (Neuman, 2011b). In this study, the interview guidelines were designed by a research group including experts from the four field cities to try to avoid an attitude bias and to reduce mistakes or vague items. Several pre-tests were implemented prior to interviews and these helped to revise the interview questions. The interview results were returned to all participants who wished to see them and final conclusions were drawn after feedback about transcription accuracy was incorporated.

External validity

External validity addresses the question whether, if something happens within a group in a
particular location within the research, this finding can be generalized to other locations or globally (Neuman, 2011b). In this study, I gave full information about the purpose and condition of their involvement and made clear that their participation was entirely voluntary, and tried to acquire the full cooperation and trust of the participants. On all occasions, I emphasized that all the responses given would be anonymous, and asked the participants to say what they really thought and did.

6.6 Ethical issues

Ethics is a set of moral principles that aim to prevent research participants from being harmed by the researcher or the research process (Neuman, 2011a). Ethics defines “what is or is not legitimate to do, or what ‘moral’ research procedure involves” (Neuman, 2011a, p. 143). Ethical issues arise from the kinds of problems social scientists investigate and the methods used to obtain valid and reliable data. These may emanate from the research problem itself, the setting in which the research takes place, the procedures required by the research design, the method of data collection, the kinds of persons serving as subjects and the type of data collected (Frankfort-Nachmias & Nachmias, 2008).

This study is based primarily on in-depth interviews, focus group interviews and secondary data analysis. Informed consent, privacy, and confidentiality are basic ethical tenets of scientific research on people. All the ethical issues there are relevant for their participation. (Kayser-Jones & Koenig, 1994; Kenchington, Stocker, & Wood, 2012). These ethical issues were considered in my study in these ways:

1. Informed consent: Interviews among participants were carried out only when informed consent was obtained from the respondents. The informed consent forms were accompanied with a brief explanation using understandable language on the purpose of the research,
benefits of the study, the right to have feedback and particular follow-up procedures, and the right to withdraw at any time and the confidentiality aspect. Participants were free to withdraw or refuse to answer any question at any time and could say ‘no’ to the use of a tape-recorder. The information sheet and the consent form for in-depth interviews and focus groups are attached in Appendix 1 and Appendix 2.

2. Specially for the focus group and in-depth interviews, an ethics protocol was developed and shared with members/informants prior to commencement. This was to ensure that participants were aware of their rights and the need for confidentiality. Participation was entirely voluntary.

3. All the information gathered from the participants remains confidential and individual’s names were coded and separated from electronic data to ensure anonymity. In the thesis and any subsequent publication of results, material will be presented in such a way that individuals cannot be identified.

4. Promises and reciprocity: The issue here is what interview participants get in return for sharing their time and insights in this study. I promised to share the research results with them. The result of this research will be sent to all those who requested a copy.

5. Ethical approval is necessary for all research involving humans. The research design, the research methods, the interview and questionnaire guidelines were approved by the Griffith University Human Research Ethics Committee (HREC) on Human Research Ethics (Protocol Number ENV/63/14/HREC) (Appendix 5).

6.7 Conclusion

This chapter has presented the research study design and methodology through explanations of the research’s rationale, question, and objectives, which led to the conceptual framework for the research. The description of the data collection methods and details of the data
analysis then followed. At the end of this chapter, issues of rigor and ethics were discussed. The ultimate goals of this research are to compare the strengths and weaknesses of the risk communication approach and processes used in the SARS and H7N9 prevention and control programs in China in order to inform risk communication strategy development to improve emergency management of pandemics in China.

The following two chapters will focus on the findings of this research. By comparing the SARS and H7N9 prevention and control processes in China with a focus on risk communication, the research identifies and analyzes risk communication issues related to barriers and strategy development of risk communication strategies in order to improve emergency management of pandemics in China.
Chapter Seven  Case Study – Prevention and control of SARS and H7N9 in China

7.1 Introduction

SARS and H7N9 have both had a great impact on China in the 21st-century, causing significant negative impacts on health, the economy, and even global security. SARS in particular, highlighted global connectedness and the great threat that pandemics present. Since the SARS outbreak in 2003, China has established and strengthened national and local surveillance systems to prevent and control diseases and has also expanded its laboratory capacity. Additionally, China’s collaboration and communications with WHO and international scientific communities have increased and strengthened. Though the control efforts for SARS were heavily criticized, the H7N9 response, 10 years later was acknowledged to be much better.

This chapter will explore the epidemiological characteristics, historical events, impacts, and emergency management of SARS in 2003 and H7N9 in 2013, and explore the information and communication problems within the emergency management system as they relate to the response to these pandemics. This chapter importantly provides a platform for the next, which focusses on the risk communication challenge more broadly in the health emergency management system.

7.2 Prevention and control response for SARS in China in 2003

7.2.1 Epidemiological characteristics

The emerging infectious disease SARS has been one of the most serious public health problems in China in the 21st-century. On November 16, 2002 in Guangzhou, a southern
Chinese province, a new type of pathogen was identified for the first time. This pathogen was responsible for severe acute respiratory symptoms. The pathogen was later named SARS-CoV (Anderson et al., 2004).

The early cases of SARS in Guangdong reportedly occurred in restaurant workers handling wild mammals as exotic food (Guan et al., 2003). Studies conducted previously on animals sampled from live poultry markets in Guangdong indicated that masked palm civets (Paguma larvata) and two other species had been infected by SARS-CoV (W. Li et al., 2005). This led to a large-scale culling of civets to prevent further SARS outbreaks. Further research proved that bats were actually the original host animals of SARS-CoV, and the spread of SARS-CoV did not need civets or other intermediate hosts. There was still the possibility that it was directly transmitted from bats to humans (Ge et al., 2013).

A probable case of SARS was defined by the WHO to have three criteria: (i) a suspect case with radiographic evidence of infiltrates consistent with pneumonia or respiratory distress syndrome (RDS) on chest Xray; (ii) a suspect case of SARS that is positive for SARS-CoV by one or more assays; and (ii) a suspect case with autopsy findings consistent with the pathology of RDS without an identifiable cause (Anderson et al., 2004). Most patients presented with an acute febrile illness and respiratory system symptoms after an incubation period of 2–10 days (Sampathkumar, Temesgen, Smith, & Thompson, 2003). The commonest symptoms at presentation were fever, myalgia, dry cough, headache and dizziness (N. Lee et al., 2003).

At the time of the outbreak, there was no specific treatment available for SARS. In the absence of a vaccine or effective therapies, the options for intervention within the country were limited to public health measures. These include management of supportive care and appropriate infection control measures to prevent spread (Anderson et al., 2004). There were no specific antiviral drugs or vaccines (H. Gao, Yao, Yang, & Li, 2015), although Ribavirin, a broad
spectrum antiviral agent, was widely used (G. Wong & Hui, 2003).

SARS-CoV is mainly spread in two ways: close contact or through inhalation of respiratory droplets, making the capacity for transmission from human to human very strong. The propagation speed is fast, causing super spreading events around world. Six months after the original case, this became a serious threat to global human health (N. Zhong et al., 2003).

By 11 July 2003, the virus had spread to 29 countries and regions, with a cumulative number of confirmed cases of 8096 people, 774 people deaths and an average death rate of 9.6%. There was no dominant gender susceptible, 3778 (46.7%) cases were male, 4272 (52.8%) were female (WHO, 2003). WHO has estimated that the case fatality rate of SARS ranged from 0% to 50% depending on the age group affected: less than 1% in persons aged 24 years or younger, 6% in persons aged 25-44 years, 15% in persons aged 45-64 years, and greater than 50% in persons aged 65 years or over (M. Liu et al., 2006). These figures imply that the elderly population are most vulnerable to dying from the disease.

7.2.2 Chronology of the SARS epidemic in China

7.2.2.1 The initial stage of the breakout (November 16, 2002 - February 2003)

On November 16, 2002, the first SARS patient suffered from sudden symptoms of fever, headache, dry cough and fatigue, and was sent to the emergency department of Shiwan hospital, in Chancheng district, Foshan. By the end of 2002, other SARS cases were also confirmed in Qingyuan district in Guangdong province and in Guangzhou, the capital of Guangdong province. On January 17, 2003, the Guangzhou military general hospital had received about 10 SARS cases from Zhongshan, Qingyuan and Shenzhen. Then, a second hospital affiliated to Sun Yat-Sen University admitted eight SARS patients from Shunde, Dongguan and Fangcun districts of Guangzhou (J. He, 2013; J. Peiris, Guan, & Yuen, 2004).
During this period, the health emergency response by the government was slow. With the rapid development of the disease in the province, social panic escalated quickly, coinciding with the Guangdong provincial government department’s silence on the issue. On the morning of February 12, 2003, the Guangzhou municipal government held a press conference and made announcements about the SARS outbreak in Guangzhou. Similar conferences were held in Foshan and Zhuhai in the afternoon. In these press conferences, both the province and the city levels of government acknowledged the SARS outbreak for the first time. They also provided information on identification of SARS cases in parts of Guangdong province, including case numbers (305), numbers who had recovered (59), and the numbers of medical care personnel who had the disease (105). They also reported the number of deaths (5) (X. Yang, 2013). Over one month later, on March 17, 2003, the Guangzhou municipal government issued a report of the epidemic indicating that the local epidemic had eased (X. Zhu, 2003). However during March, 2003 the outbreak further developed in Guangdong province, the number of cases increasing by 400. After that, the SARS crisis developed into the spread phase.

7.2.2.2 Spread stage (Late February - April 2003)

On February 21, 2003, a doctor in Guangzhou who had been involved in treatment of SARS patients and had symptoms of fever, went to Hong Kong for a wedding. He stayed in an international hotel and spread the virus to six people from different nations (Tracing the source of SARS, 2003). Following his visit, the disease was introduced to Vietnam, Hong Kong, and Canada, triggering a global outbreak.

As several serious SARS infections were detected in Hanoi, a doctor in Vietnam identified this as a serious contagious disease, and on February 28, 2003, informed the WHO Western Pacific Region office. WHO headquarters in Geneva immediately took the first steps towards
declaring a state of emergency. On March 12, the WHO issued global warnings, and the US CDC also issued a health warning (Xiu, 2003). On March 15 2003, WHO indicated that SARS was an “atypical pneumonia” originating from Guangdong province and other regions in China, and based on its potential to spread through air travel, WHO announced that SARS presented a threat to the whole world and issued a travel warning. Then WHO developed a global response plan, which included a case definition and the governing principles for hospitals’ diagnosis and control. It mobilized the Global Outbreak Alert & Response Network (GOARN) partners.

On March 26, the Xinhua news agency announced that SARS had been effectively controlled in Beijing, and had not spread to the broader society. They also indicated there were no new cases of SARS locally. This was the first official report about SARS in Beijing.

One day later, on March 27, WHO announced that Beijing was an epidemic area, and sent out travel warnings all over the world, including advice for screening at certain airports (M. Li, 2003). Already with modern and efficient air travel, SARS had been rapidly transmitted to more than 30 countries on five continents (Feng et al., 2009; G. W. Wong & T. F. Leung, 2007).

On March 31, The Beijing Youth Daily in the ninth edition published a report that “gauze masks these days were out of stock” (Z. Zhang, Huo, & A, 2003). However, it took 4 days for the Beijing media to finally break the silence about the truth of the epidemic.

On April 2, the Health Minister had an interview with the national TV broadcaster CCTV and disclosed China's epidemic for the first time. He indicated that as of March 31, there were a total of 1190 cases in mainland China: 934 cases had been discharged and there had been 46 deaths. He also indicated that 12 infectious cases were identified in Beijing, though they were not primary cases (Chang, 2003). Upon questioning by the international community, the minister indicated that the etiology of SARS had not been identified and the exact pathogen
was not known.

On April 4, the Deputy Director of the China National Tourism Administration provided a briefing that was attended by foreign travel agents and civil aviation enterprise in Beijing. He indicated that traveling to China was secure despite the SARS epidemic (Xiang, 2003). On the afternoon of April 6, the MOH and Beijing municipal health bureau held a joint news conference. Officials indicated that an International Labor Organization (ILO) officer had died of SARS in Beijing on April 5, and revealed that there were still only 19 imported SARS cases in Beijing (Hao, 2003). On April 10, the deputy health minister reported at a news conference that there were 22 new SARS patients in Beijing and 4 cases had died. He indicated that these numbers included all confirmed cases from the local and military hospitals (L. Ma, 2003).

On April 15, the MOH announced that there were 1435 reported cases in mainland China. This was 145 cases more than 5 days before, and of them 64 had died (MOH, 2003). This information was more accurate and revealed that outbreak numbers had grown. The MOH explained that this was because the MOH had modified and enacted the SARS clinical diagnosis standard, and had sent expert working groups to suspected patients diagnosed in the past.

April 20 is considered to be the key turning point for the Chinese government’s response to SARS. At the press conference held by the State Council Information Office on that day, the Vice Minister of the MOH confirmed 339 cases of SARS in Beijing, with an additional 402 suspected cases. The Vice Minister admitted that there had been major omissions in the epidemic statistics, and the outbreak had not been accurately reported, because the relevant departments' procedures were not sound, and there were some problems with inaccurate statistics, inaccurate test reports and incomplete tracking work. Since poor management had
resulted in significant negative impacts of SARS in China, on the same day the Central Committee of the Communist Party of China decided to remove the health minister and the mayor of Beijing from office, and this was announced by Xinhua News Agency that same day (Tan, 2010).

After April 20, China's SARS information release began to become more transparent. The authorities began to take an attitude of active cooperation with the international community, relevant prevention and control measures were accelerated and the media was “allowed” to release the information about the epidemic situation. This series of measures reflected the transition in management behavior of the Chinese government to deal with the SARS crisis, and also contributed to quickly controlling the outbreak.

7.2.2.3 The later period (post - May 2003)

In the early stages of the epidemic, people witnessed a sharp rise in the numbers of SARS patients and there was panic and rumors. This was followed by the determination of the government to contain the epidemic situation. International cooperation, official accountability, media supervision, expert guidance of response and a series of stricter management measures helped improve the situation. This stricter management of measures did not trigger a greater social panic, but rather inspired people to more orderly efforts to control the epidemic, and this quickly achieved results.

In China, in the first week of May, 166 suspected cases per day were reported, but this declined to an average of 90 cases per day in the second week, an average of 27 cases per day in the third week, and in the fourth week only 16 cases per day were identified. By May 17, Guangdong finally reported zero new cases.

The most serious outbreak in Beijing also had begun to significantly decline (Department,
2003; Tong, 2013). On May 23, WHO removed the travel warning for Guangdong. On May 29, Beijing also finally reported no new cases. And there were no more new cases except on 30 May. On June 20, China's last 18 SARS patients were discharged from hospital (H. Chen, 2003). At this point, China's SARS outbreak was officially over, and there was a return to normal social order. A chronology of the events described in 7.2.2 is provided in Table 10.

Table 10  Chronology of events related to SARS, pertinent to China

<table>
<thead>
<tr>
<th>Stage</th>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>The initial stage of the breakout</td>
<td></td>
<td>First known case of atypical pneumonia occurred in Foshan City, Guangdong Province, China, but was not identified until much later</td>
</tr>
<tr>
<td></td>
<td>16 November 2002</td>
<td>A 64-year-old medical doctor from Guangzhou arrived in Hong Kong and checked an international hotel.</td>
</tr>
<tr>
<td></td>
<td>21 February 2003</td>
<td>WHO issued a global alert about cases of severe atypical pneumonia following mounting reports of spread among staff at hospitals in Hong Kong and Hanoi, Singapore and Toronto</td>
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<td></td>
<td>28 February</td>
<td>A doctor in Vietnam notified the WHO office in Manila. WHO headquarters moved into a heightened state of alert</td>
</tr>
<tr>
<td></td>
<td>12 March</td>
<td>WHO issued a rare travel advisory as evidence mounted that SARS was spreading by air travel along international routes. WHO named the mysterious illness after its symptoms: SARS and declared it ‘a worldwide health threat.’ WHO issued its first case definitions of suspect and probable cases of SARS. WHO further called on all travelers to be aware of the signs and symptoms, and issued advice to airlines.</td>
</tr>
<tr>
<td></td>
<td>15 March</td>
<td>China reported a cumulative total of 792 cases and 31 deaths in Guangdong Province from 16 November 2002 to 28 February 2003. Officials had previously reported 305 cases and 5 deaths from mid-November to 9 February</td>
</tr>
<tr>
<td>The spread stage</td>
<td></td>
<td>WHO announced that Beijing was an epidemic area, and issued more stringent advice to international travelers and airlines, including recommendations on screening at certain airports.</td>
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<tr>
<td></td>
<td>27 March</td>
<td>Chinese authorities announced updated figures of 361 new SARS cases and 9 deaths in Guangdong Province for the reporting period 1 to 31 March.</td>
</tr>
<tr>
<td></td>
<td>2 April</td>
<td>The WHO laboratory network announced conclusive identification of the SARS causative agent: an entirely new coronavirus</td>
</tr>
<tr>
<td></td>
<td>16 April</td>
<td>The mayor of Beijing and the minister of health, both of whom had downplayed the SARS threat, were removed from their Communist Party and government posts</td>
</tr>
</tbody>
</table>
7.2.3 Impacts of SARS

Health effects

The SARS outbreak infected thousands of people, causing widespread serious illness in a large population and many deaths. According to WHO, from Nov 1, 2002, to July 31, 2003, 648 of the 8082 probable cases of SARS in mainland China and Hong Kong died. Worldwide in just 6 months, there were more than 8000 infected individuals, with over 700 deaths (almost 9%) (G. W. Wong & T. F. Leung, 2007). The psychological impact of SARS was also very serious. The distress was more prominent among the groups of nurses who were working with patients with SARS (Y. Bai et al., 2004). Studies show that the SARS outbreak also fostered negative impacts on people’s mental health (Lau, Yang, Tsui, Pang, & Wing, 2006). As mentioned by two hospital doctors:

These SARS cases caused extreme emotional sadness. Psychologically it is entirely possible that an event destroyed a person. They needed psychological counselling (D1).

When the SARS cases lived in the hospital, they could not see their family, and feared the treatment. They developed a mental disorder (D4).

Social impacts
SARS caused a very large impact on society, particularly in China. During the early period of the SARS outbreak, tension surged in the community. Due to a lack of trustworthy official information, folk tales about the epidemic situation spread through word of mouth, mobile phone short messages, social media transmission and other ways. The spread of all kinds of rumors exacerbated the spread of social panic, reflected in an escalation of panic buying of drugs in Guangdong province (R. Ma, 2008). One rumor was that Banlangen (*Radix isatidis*) and vinegar could prevent and control SARS, but whether they were effective for SARS was not scientifically established at this time. In early January 2003, the first wave to rush to purchase anti-viral drugs occurred in Heyuan city. After half a month, a drug purchasing spree had spread to Zhongshan city, then the buying spree gradually spread through Guangdong province (Han, Song, & Zhang, 2012) (F. Chen, Cao, Xin, & Luo, 2013). As mentioned by a community resident:

> “Everybody was panic buying Banlangen (*Radix isatidis*). Banlangen was completely sold out” (FG1).

In February 2003, people were wearing masks everywhere on the streets in the Guangzhou. Panic was also spreading from Guangzhou to Shenzhen, Zhuhai and other areas, and then spread to Hainan, Fujian, Jiangxi, Guangxi, Hong Kong and other adjacent areas. A media journalist said:

> “During SARS, we were more likely to panic. I had the impression that Banlangen (*Radix isatidis*) was sold out. Like every family, I also went to buy Banlangen (*Radix isatidis*) and vinegar, which they thought can cure SARS. Now I think that was a very funny thing to do” (J4).

By the middle of March, because the epidemic was spreading but no information had been
officially confirmed, people began to believe the rumors, and the panic and purchasing of antiviral drugs that had appeared in Guangdong also began in Beijing. As mentioned by an international officer:

“During SARS, I was working in a unit outside of Beijing. Beijing was in a panic. When I arrived at Beijing, (My colleagues) gave me a box mask and they made me wear a mask. To tell the truth, I felt a bit nervous” (I2).

The lack of understanding of SARS by authorities or the media caused a number of experts to become dissatisfied. For example, a 72-year-old retired surgeon from the People's Liberation Army 301 hospital, wrote to the media, criticizing the health department for hiding the SARS epidemic situation. On April 12, he also wrote a letter to the MOH, urging them to publish accurate numbers as soon as possible. On the same day, an academic from the Chinese Academy of Engineering, the leader of the prevention and cure SARS guide team in Guangdong province, also questioned the information provided by government about the control of the epidemic. He questioned whether SARS really was under control. These published questions brought the attention of the SARS epidemic situation in China to the international community (Tong, 2013).

The economic impacts

The SARS epidemic brought great harm not only to peoples’ physical and mental health, but also to the economy. It was estimated that Asian states lost USD 12–18 billion as the SARS crisis depressed travel, tourism and retail sales (Wishnick, 2010). SARS hit tourism and its related industries, and due to the spread of SARS, the population movement in China and many counties decreased. Families reduced their demand for food, clothes, travel and entertainment, and the numbers of guests in hotels declined sharply. As observed by officers from the
Agricultural and Health Departments:

“I think it was certainly panic at beginning, as it was not clear what SARS was. I remember (there were) almost no people in a restaurant when I had dinner. And the tourism had few people too” (A4).

“During SARS in Shanghai, there were not many people on the street and almost no people in entertainment clubs, restaurants and gymnasiums, which caused a very large impact on the whole social and economic life” (H2).

After WHO announced that Beijing was an epidemic area, and issued more stringent advice to international travelers and airlines, including recommendations on screening at certain airports, the tourism, transport and business sectors were seriously affected. For example, the mid-April Chinese enterprise summit in Beijing, hosted by the World Economic Forum, was delayed and the Rolling Stones concert planned for Beijing was cancelled. As observed by an international officer and a media journalist:

“During SARS, it was very obvious to see the status of Beijing which became a ghost city. We all know that Beijing has traffic jams every day, but [then] you worried whether you were speeding. It's never been seen before” (I2).

“During SARS, you could find that Beijing traffic was so good, (there were) not many people on the road. There were no traffic jams, and you felt great to take the bus (with few people) in Beijing. But I was deeply impressed that when I took a bus, and a man behind had a cough, I was scared and I got off quickly at the next stop” (J1).

The global macroeconomic impact of SARS was estimated at USD 30–100 billion or around USD 3–10 million per case (Smith, 2006). The 2003 SARS outbreak caused losses of USD
12.3-28.4 billion (Lee and McKibbin 2004) and an estimated decrease of 1% in GDP in China and 0.5% in South-east Asia (MacKellar, 2007). The social burden of SARS in Guangzhou meant less income and spending, with a rough estimate of the total social burden of 11 billion yuan (Du et al., 2006).

The influence of SARS also spread to the manufacturing industry. It was reported that in Asia's largest manufacturing base, Dongguan in Guangdong province, because of the reduced orders from Hong Kong, the shipments from Dongguan to Hong Kong decreased by one third (Zhang, 2003).

At the same time personnel exchanges were reduced for fear of infection, and income decreased. There was also increased spending on prevention and health care, which had negative economic impacts on families. Interviews with 71 households in Qinling Mountain in Shaanxi Province indicated that in the second quarter of 2003, SARS caused the average annual household income to decline to US$175.44, a 22.36% reduction in what was expected (Zeng, Carter, & Lacy, 2005).

7.2.4 Emergency management of SARS

The first SARS case was noticed in Guangdong in November 16, 2002. Initially, the government did not recognize the severity of the SARS epidemic and did not inform the public promptly, and SARS patients and their close contacts were not isolated, enabling the virus to spread quickly (P. Wei et al., 2016). At the start of the outbreak, in order to maintain local social stability and to guarantee local economic development, the Guangdong government took its traditional approach of management of a crisis event: the real epidemic information was kept confidential, even though the health department management had taken action internally.

On January 2, 2003, the day the Guangdong provincial health department received the Heyuan
report, it sent the deputy director of the medical school from Guangzhou Institute of Respiratory Diseases, to lead an expert panel to investigate. On the second day, the investigation team wrote reports, identifying a local outbreak of unexplained pneumonia with certain infectivity. After half a month, Zhongshan city began to report patients with fever of unknown etiology in three hospitals in the city, and medical staff became infected. The Guangdong province organized the same expert panel to investigate again. The same team leader, wrote a report of the unexplained pneumonia survey in Zhongshan city on January 21. He named the disease “SARS”, indicating an unknown etiology and high rate of infections (Fei Huang & Gan, 2003). This report proposed prevention measures and isolation in hospital for suspected cases.

As indicated in 7.2.2, in March 2003, the outbreak spread outside Guangdong Province to Beijing, Hong Kong, Hanoi, and Toronto. WHO issued a global warning, and the WHO and other international organizations also took action, instigating global mobilization and action. The Chinese government began to face pressure to make a more commensurate response, but lacked adequate recognition of the severity of the epidemic situation. It still responded only passively and did not inform the public of the real domestic epidemic situation.

By April 20, the Chinese government was dealing with the SARS crisis and instigated more active prevention and control measures. The Premier of China warned against the covering up of SARS cases and demanded the accurate, timely, and honest reporting of the SARS situation (E. Zhang & Benoit, 2009). The government utilized its administrative control of local cadres, improved its gathering of information from localities and the disclosure of that information, improved its control measures, and actively coordinated bureaucracies and local administration in SARS management. Under the unified leadership of the State Council, it established an epidemic reporting system. This allowed the central emergency leading group to obtain timely
and accurate SARS epidemic information, and to deal with the questions more effectively (W. Wang & Ruan, 2004). At the same time, prevention and control measures were released through the mass media, and the media began to widely report relevant epidemic prevention and control information. Communication pathways between the government and the public were established, and information collection was unobstructed outside the system, which led to improved control. Gradually social order recovered and panic subsided (Ding, 2009). This largely constructive change in the interaction between the center and localities helped China to bring SARS under control within two months.

7.2.5 Problems with the emergency management process for SARS

The SARS epidemic of 2003 had a deleterious effect on China’s international reputation due to the government’s problematic response to it. The poor handling of SARS exposed serious information communication problems in the then emergency management system processes.

Governments at all levels in China had been used to keeping information regarding disasters and serious incidents secret, and this practice resulted in misjudgement of the situation and erroneous decision making (Jinqiu, 2003). In the early part of the outbreak in 2003, just after the Spring Festival in Guangzhou, there had been rumors about the disease and citizens had panicked and hoarded white vinegar and the drug *Radix Isatidis*. But officials didn't release any authoritative information, and even though some media were aware of the pandemic, they strictly abided by the requirements of Chinese news reporting and considered that they mustn’t take the liberty oft reporting SARS unless given permission to do so. Delays of more than two months in reporting the first cases of SARS caused distrust and an inadequate response. As mentioned by one media journalist:

“*The Propaganda Department controlled and did not allow us to have an interview. We*
Despite the rapid development of the SARS epidemic, formal authoritative information release was limited, leading to gossip circulating. The pressure on local government was immense. On February 11, Guangzhou, Foshan, Zhuhai government and health authorities had to hold a press conference, when they provided simple reports about the situation. However the theme of the press conferences was that the epidemic had been brought under control – “you don't need to panic” was the message. Information such as infection pathways, clinical characteristics and treatment was not widely communicated. Following this, when the local media began to report on the development of the SARS epidemic situation, the main point of this communication was that the epidemic situation was under control. At that time, SARS had been identified in Hong Kong, but Guangzhou media was required not to report the information by the publication administration department of Guangdong Province.

The NHFPC still claimed that “China is safe” at a news conference on April 2. The lack of an information disclosure system had significant consequences for Beijing and other provinces, as targeted measures were not taken to prevent its spread. As a result SARS spread out of Guangdong, to Beijing and all over China.

There was only one source of information for the SARS incident – via press conferences, through traditional media such as newspapers and television. At the beginning of the outbreak, some local governments failed to communicate with the public, leading to panic and loss of government credibility. In early 2003, Guangdong people started buying up Radix Isatidis. There were scattered local reports about buying the drug in Heyuan, Zhongshan and other places, but then the local government denied rumors through the local media. Further, the Health Bureau Disease Control officials of Guangdong province said that they had not received any reports on this pneumonia outbreak, and that the observed increase in the number of colds
was due to the weather.

As the government reporting of the epidemic situation was not transparent, and local governments hid the truth (Gong, 2003), the health sector couldn't truly grasp the dynamics of the epidemic situation, and could not prepare adequately for SARS. The timeliness of the reports of the epidemic situation and disease monitoring was inadequate. In the early stages of the SARS event, individual cases took an average of 8 ~ 9 days from their onset to be reported. This delay led directly to the slow response and enhanced the transmission. The outbreak escalated after March, and even though the MOH released epidemic information in early April, subsequent investigation found that the epidemic information provided was still not accurate. Further, some army medical institutions in Beijing had not reported case information to the local health administration department, which meant that the MOH was working without comprehensive epidemic information.

7.3 Prevention and control response for H7N9 in China in 2013

7.3.1 Epidemiological characteristics

H7N9 Avian Influenza is another infectious disease that has caused severe illness and death in humans in China. The first human infection with avian influenza virus of H7N9 was found in China in 2013. This infectious disease has a high fatality rate (S. Liu et al., 2013).

In poultry and wild birds, the virus is associated with multiple symptoms from respiratory disease to severe sepsis caused by an A-type influenza virus. Human infection by the influenza virus of H7N9, is associated with symptoms such as nasal congestion, sore throat, nausea and systemic muscle aches (Li et al., 2014).

The epidemiological investigation and analysis of the virus sequence identified that the H7N9
virus is from poultry and wild birds (Zhao et al., 2014). All kinds of birds are the main source of the human infection. Prior to this epidemic, the population had no immunity to the virus, and hence was easily infected after contact with it (K. Xu & Bao, 2015). Most epidemic cases were believed to result from exposure to infected live poultry or contaminated environments. In China, it is common to buy live poultry for consumption at home. Although no evidence of sustained person-to-person spread of H7N9 has been found, there is some evidence pointing to limited person-to-person spread under specific circumstances such as poultry handling (Qi et al., 2013). The genic recombination with high frequency inside the virus as well as the appearance of a strain with resistance to drugs indicates the great risk of a human pandemic by the further transmission of the H7N9 virus (R. Gao et al., 2013).

Based on the Chinese guidelines for control and prevention of human infections with H7N9 avian influenza, contacts were defined as (i) those who did not wear personal protective equipment when diagnosing and treating suspected or confirmed cases or otherwise taking care of the patient; (ii) those who lived together or were in close contact with a suspected or confirmed case within 10 days of illness onset; (iii) those the epidemiologist determined as close contacts (E. Chen et al., 2013).

No vaccine for the prevention of influenza H7N9 infection is currently available and thus, for high-risk groups, the only effective method to reduce morbidity and mortality is to obtain antiviral treatment as soon as possible (S. Liu et al., 2013). China NHFPC recommends an influenza A H7N9 clinic program in which supporting therapies include oxygen therapy, antipyretic therapy, and cough and phlegm relief and medicinal therapy with antiviral drugs such as oseltamivir and zanamivir (Chen et al., 2013).

By November 13 2015, a total of 681 laboratory-confirmed cases of human infection with H7N9, including at least 275 deaths were reported to WHO. The case fatality rate of H7N9 was
Analysis of 130 cases of H7N9 between Feb 19, 2013 and May 3, 2013 in China shows that 93 cases (72%) of infection were in residents of urban areas. In urban areas, the viruses were more common in men—the male-to-female ratio for H7N9 was 2.9:1. In rural areas, the male-to-female ratio was 1.6:1 for H7N9. More than half (55%) of the cases of infection with H7N9 were in people aged 60 years or older (Cowling et al., 2013), suggesting that the elderly were more at risk.

[Updated: May 2017]

Smaller outbreaks of H7N9 continue. According to Disease Outbreak News issued by the WHO on February 22, 2017, a total of 1223 laboratory-confirmed cases of human infection with avian influenza A (H7N9) virus had been reported since early 2013. The number of human cases developing since October 1, 2016 accounted for nearly one-third of all human cases of H7N9 infection reported since 2013. As of February 23, 2017, at least 425 cases had been reported during the fifth outbreak in China, which began in October and spiked suddenly in December in 2016. This increase in the number of new cases of H7N9 infection has caused domestic and international concern (Shen 2017). This disease will need continued monitoring.

7.3.2 Chronology of the H7N9 epidemic in China

7.3.2.1 The initial stage of the breakout (the end of March, 2013)

On February 19, 2013, a patient in Shanghai (later identified as the primary case) presented with RTI (Respiratory tract infection) symptoms of fever and cough, and other respiratory symptoms. This case was treated and discharged by the Fifth People's Hospital of Shanghai on February 20 and the case was reported to the Center for Disease Control and Prevention of Minhang district of Shanghai by the hospital early in the morning of February 26. From
February 26 to March 22, the Shanghai Municipal Center for Disease Control and Prevention and the Public Health Clinical Center of Shanghai City carried out screening in the laboratory and eliminated the possibility of the novel coronavirus SARS, A/H1N1 and human infection of H5N1. Further analysis on March 22 found that the patient might be infected with H7 influenza, and the relevant samples were sent to the China CDC. On the afternoon of March 29, three further cases were diagnosed by experts convened by the newly established NHFPC (H. He & Zhang, 2015). On March 31, the NHFPC published a notice of the three cases of human infection with H7N9 avian influenza. They were two cases from Shanghai and one case from Anhui. This was the first time in the world that the H7N9 virus had been found to infect humans (Y. Zhang, Yu, Tang, Chen, & Zang, 2013).

The NHFPC also published a “Questions and Answers” of the disease characteristics and control measures for human infection with H7N9 avian influenza on its official website. On the same day, the Shanghai municipal government decided to implement a class three response according to its emergency plan for an influenza epidemic, starting from April 2. It designated two authoritative hospitals in Shanghai city as the fixed-point hospitals for the diagnosis of H7N9 avian influenza and clearly demanded that medical institutions should not delay the treatment of H7N9 patients for any financial problems. Subsequently, emergency monitoring was launched all over the country in order to quickly deploy prevention and control of avian influenza. The NHFPC required provinces where cases were confirmed to start a daily reporting system of information for the health department (J. Chen, Mao, Hu, & Wu, 2013).

7.3.2.2 Spread stage (April to May, 2013)

On April 3, Jiangsu province confirmed its first H7N9 patient. On April 4, the first H7N9 patient was diagnosed in Zhejiang province. Until April 13, a total of 38 cases (and 10 deaths) were confirmed in three provinces (Anhui, Jiangsu, Zhejiang) and the city of Shanghai. On
April 14, confirmed cases in Beijing and Henan were reported, indicating that the virus had broken out of the Yangtze River Delta region and moved north (P. Yang et al., 2013). By April 19, 87 cases (17 deaths) were confirmed in the 6 provinces and cities above. On April 25th, one case was confirmed in Shandong, and the cumulative total cases was over 100. Jiangxi and Hunan provinces reported new confirmed cases on April 26 and April 28 respectively. By May 14, a total of 130 patients were identified, but new cases were significantly fewer. By May 31, the total number of reported cases was 131 (Z. Yang, 2014).

The government attached great importance to the control of H7N9 avian influenza, and took effective measures in a timely manner. For example, Jiangsu, Shanghai and Zhejiang started to close trading of live-birds on April 6, April 7, and April 15, 2013 respectively. After April 4, Jiangsu Bureau of Traditional Chinese Medicine promoted that Banlangen Granule and Radix Astragali oral liquid could be used for the prevention of avian influenza of H7N9 (Notice on the Technical Scheme of Preventing and Curing H7N9 Avian Influenza in Traditional Chinese Medicine in Jiangsu Province (1st edition, 2013), 2013), contributing to a shortage of Radix Isatidis Granule in local pharmacies (Z. Jiang et al., 2014).

From April 6, Shanghai suspended all transactions in its live poultry markets, temporarily closed the live poultry markets, and stopped pigeon competition activities. Subsequently, large and medium-sized cities in the affected provinces took measures to close live poultry markets and restrict live poultry trading.

On April 7, the National MOA issued The Emergency Monitoring Programme for the H7N9 Avian Influenza of Animal and The Emergency Disposal Guidelines of the H7N9 Avian Influenza of Animals. These guidelines highlighted the key issues for control and prevention in poultry, and provided guidance on how to comprehensively investigate the epidemic situation of the poultry and monitoring of the virus in the poultry population. The National Influenza
Center of the National Center for Disease Control provided 409 national network laboratories for influenza surveillance and eight national key laboratories for infectious diseases with detection reagents and methods and also offered detection methods to the WHO, Hong Kong and Taiwan (Zong, 2013).

On April 24, the NHFPC reported that, in the previous 24 hours no new cases of human infection with H7N9 avian influenza had been reported in mainland China, that the cases were sporadic and that no evidence for human to human transmission had been found. From April 24, reports of people infected with H7N9 avian influenza outbreak information were downgraded from daily to weekly. By this point, H7N9 avian influenza had been effectively controlled, and the event had gradually moved into a stage of calm (H. He & Zhang, 2015).

7.3.2.3 The later period (past June, 2013)

The epidemic decreased in the summer. From June to September, only three new cases were confirmed and no new cases were found in June across the whole country. Two cases were confirmed in South China: Hebei and Huizhou, on July 22 and August 12 respectively. China CDC declared in related meetings on September 28 that by that date, 134 cases of human infection with H7N9 avian influenza had been reported in the whole country with 45 deaths. Of the 70 counties of the 12 provinces or cities where the disease was detected in humans, the cases reported in the three provinces and city of Zhejiang, Shanghai, Jiangsu accounted for 80% of the total cases (Z. Yang, 2014). By 7 November 2013, 139 confirmed cases of human infection with H7N9 including 45 fatal cases had been reported in mainland China in 10 provinces and two cities (X. Huo et al., 2016). Until December 3, 2013, a total of 148 cases of H7N9 avian influenza were confirmed on the Chinese mainland, Taiwan and Hong Kong area, among whom 48 died, with a case fatality rate of 32.43% (H. Jiang, Bao, Xu, & Jiang, 2015) (Figure 13).
7.3.3 Impacts of H7N9

Health effects

The H7N9 avian influenza outbreak caused many deaths in two months. As of 30 September 2015, there had been a global total of 680 H7N9 cases with 657 in China, 2 in Canada, 16 in Hong Kong, 1 in Malaysia and 4 in Taiwan (Reperant, MacKenzie, & Osterhaus, 2016). Today, there is no H7N9 vaccine available, although some vaccine manufacturers have entered clinical evaluation of H7N9 vaccine. However infection of humans by this virus remains a serious concern (Zheng et al., 2016).
The influenza H7N9 virus remains a large threat due to its virulent nature in poultry. The major factors that influence the pandemic potential of an influenza virus, including its ability to cause human disease are the immunity of the population to the virus, and the transmission potential of the virus. As the population had little immunity to H7N9, the virus was easily transmitted. There remains still significant concern over whether H7N9 could be the next pandemic strain of influenza (Tanner et al., 2015)

**Social impact**

Although there were rumors that people can be infected with H7N9 from with eating chicken, and that pickled peppers and onions can prevent H7N9 (Zong, 2013), compared with SARS, the H7N9 epidemic did not lead to large-scale social panic, and the management of the problem satisfied both the Chinese and international community. As mentioned by one CDC expert:

> "There were no impacts on the city life in Beijing during H7N9. The only [impacts] was to further strengthen the poultry market management" (C5).

The National 12320 Management Center carried out an opinion survey regarding the government’s response to the H7N9 event from April 27th to May 4 through the 12320 Health Hotline, which was reported in *Guangming Daily* in May 2013. In it, more than 80% of respondents expressed satisfaction with the government's prevention and control of human infection with H7N9 avian influenza, thought the government announced the information regarding the epidemic situation in a timely manner, expressed satisfaction with the government's release of knowledge of prevention and control measures and felt confident in the government's ability to fully control the epidemic. More than 50% of the respondents believed that the prevention of human infection with H7N9 avian influenza had changed their health habits, indicating that the release of the knowledge of prevention and control of human
infection with H7N9 avian influenza was effective (H. Wei & Zhang, 2015). From these figures, we can draw a conclusion that the communication strategy of the Chinese government in dealing with H7N9 was very successful. As identified by an officer of an international organization:

“I knew the characteristics of H7N9. The government management of the health and agriculture sectors was completely open, so I completely believed them and I felt no panic. There wasn’t any influence on my personal life during H7N9” (I2).

Comparing the H7N9 avian influenza and the SARS crisis, most interviewees thought that SARS was more serious and life threatening. Because SARS was characterized by person-to-person transmission, and at that time, the government did not have the system or experience to deal with public health emergencies, the disease was transmitted quickly and social panic ensued. The fast and effective countermeasures by Chinese authorities to H7N9 avian influenza was not only highly considered by the inspection mission of WHO, and World Organization for Animals, but also presented a model to the world. The Associated Press (an American news agency) praised “China’s new openness to deal with bird flu”; Nature claimed in an editorial entitled “the battle against bird flu” that: “Currently, China reports on the epidemic every day and the media discussion is also quite open and frank”. The country's research personnel cooperated with their counterparts across the world and published detailed analyses of the virus quickly in academic journals (Gu, Lu, Yu, Wei, & Hu, 2014).

The economic impacts

The economic impact of SARS the outbreak was more serious than H7N9. Studies show that the direct medical costs of hospitalization of a patient with H7N9 was estimated to be ¥ 71 060, which is more than a year’s income for a person in a rich province in China (X. Huo et al.,
In April 2013, the H7N9 avian influenza epidemic caused the price index of meat and poultry and their products to fall to 101.5 on a year-on-year basis. As a result of the outbreak, China's poultry industry suffered a loss of more than 40 billion RMB (Fengjiao Huang, Fang, Zhou, Sun, & Chen, 2015). However there were no more international notable impact on the economy. The H7N9 outbreak also became a food culture issue. The closure of live poultry markets (LPMs) caused some changes in the Chinese food culture of eating freshly killed chickens. As mentioned by a community resident:

“Most families did not buy live poultry and were careful about their health habits during H7N9” (FG5).

This number of deaths changed the attitude of the public towards chickens and it became apparent that few cared for chickens in the market. Many places closed their live poultry trading, while the virus resulted in serious economic losses to farmers. At the same time, consumers’ confidence in poultry products declined, which had an important influence on meat and poultry prices. As mentioned by a CDC expert:

“During H7N9, like everyone else, the consumption of poultry was indeed reduced in my family” (C4).

7.3.4 Emergency management of H7N9

After the outbreak, the NHFPC and the China CDC collected a wide range of epidemic and related information through a variety of channels, organized military and local health departments and agricultural and forestry experts to carry out health risk assessments and enhanced the prevention and control measures of the implementation of pneumonia monitoring with unknown cause, epidemiological investigation and etiology of the management of treating and analyzing patients and close contacts. These combined measures effectively prevented the
spread of the epidemic.

Provinces also carried out risk assessments of the epidemic situation following the outbreak. This timely disclosure of risk assessments helped medical workers to understand the epidemic situation. Risk warnings and risk management advice played a positive role in guiding professional staff.

The outbreak of H7N9 was regarded as a public health emergency event in China in 2013. As the isolation and treatment and medical observation of the close contacts are important measures to control and prevent the epidemic, isolating patients and tracking close contacts of cases were the most important tasks for all levels of government, hospitals or CDCs. Epidemiological investigations of human cases of the avian influenza H7N9 virus showed that most patients had a history of recent exposure to poultry or a visit to a live poultry market (C. Wang et al., 2014). This risk factor was established early in the epidemic, and hence an important measure was to close the live poultry trading markets. After the compulsory implementation of these shutdown measures, the spread of the virus was quickly controlled (Su & He, 2015). Shanghai, Jiangsu, Zhejiang and other cities closed their live poultry markets in a timely manner, which played a significant role in the control of the epidemic. After the epidemic spread to Guangdong and other provinces, the local governments enacted disinfection measures and closure of the live poultry markets, which further hindered the disease spread. Following Shanghai closing the city's live poultry market on April 6, the number of new cases declined rapidly and no new cases occurred after April 14. This coincided with the time when the rest of the nation was at the peak of the epidemic.

The CDC sequenced the genes of the virus on March 19, soon after the first confirmed case. All suspected cases in China were diagnosed by March 30, and the WHO was informed of all Chinese cases on March 31, 2013. From the first recognition of the outbreak, WHO
collaborated with China’s NHFPC in national risk assessments and press conferences (Vong, O'Leary, & Feng, 2014).

The Chinese preference for fresh ingredients in the diet and the habit of buying and butchering live poultry at the market increased the chance of being exposed to the virus and provided favorable conditions for the spread of avian influenza virus. To this end, the government strengthened health education and the dissemination of related knowledge, in order to reduce the chance of population exposure. As mentioned by a CDC expert and a journalist:

“*It was clearer for us to know the dangers of H7N9 than SARS*” (C1).

“The information of the H7N9 was announced relatively promptly, so it was relatively smooth for us to do some work” (J5).

7.3.5 Problems with the emergency management process for H7N9

Great progress had been made in information disclosure and epidemic surveillance by the Chinese government as shown by the management of H7N9 avian influenza in 2013. Compared to SARS ten years earlier, the government’s response was more timely and transparent and the public behaved more rationally. However, some problems and deficiencies in the epidemic prevention and control were identified by the interviewees and the literature reviews.

The release of the information of the epidemic situation was still a problem which the H7N9 event exposed. In order to reflect the commitment to strengthen supervision the local governments by the central government, “a mechanism of step-by-step reporting and release by the nation” was implemented in the delivery of information in public health events (Qiu et al., 2016). Local governments tend to be more careful about accuracy when reporting to higher
The timeline for the beginning of the outbreak of H7N9 is presented in Figure 14.

Figure 14  Timeline from first hospitalization of a case to confirmation and notification of H7N9 in 2013

Although the government departments, hospitals and CDCs at all levels completed the disclosure and announcement of the epidemic information within the time limits prescribed by law, there was a delay of 39 days from the treatment of the patient to the confirmation of the epidemic situation. Since the early period of the epidemic is critical for effective prevention and control, this delay could have been dangerous. Fortunately, H7N9 did not have person to person transmission, so a greater spread of the epidemic did not occur.
Some information not based on science was released by governments and this also affected the public’s trust. Some provincial health departments had said that *Radix Isatidis* could prevent H7N9 bird flu, but its true effectiveness had not been confirmed at the time (B. Xie, 2013). There was also resistance from some sectors to the release of information. Some local and even the national poultry industry associations and enterprises, sent open letters and appeal letters to all levels of governments requesting that “reports of every H7N9 case should be stopped”. They believed that no hypernormal measures had been taken for viral hepatitis and tuberculosis whose infectivity and death probability ranked higher than H7N9 influenza virus, and they argued this was not fair to the employees involved and the industry.

### 7.4 Summary of emergency responses, epidemiological characteristics and impacts on SARS and H7N9 in China

SARS-CoV and A(H7N9) virus share some similarities. Neither virus had been reported in human beings previously. Both viruses can lead to severe disease, characterized by high fever, severe respiratory symptoms, and deaths, and there are still no specific antiviral drugs or vaccines for them. Additionally, the sources of human infections for both viruses remain to be definitively determined. SARS coronavirus is thought to be an animal virus from an as-yet-uncertain animal reservoir (perhaps bats) that spread to other animals (civet cats) and then to the first infected human beings in southern China in 2002. As for the H7N9 virus, the animal reservoir is poultry. Although most features of SARS and H7N9 are similar, the mortality from H7N9 was higher than SARS. The health, social and economic impacts of the SARS was more than H7N9.

During the different stages of emergency response to SARS and H7N9 in China, a change of work philosophy can be observed. Poor internal communication and external information blockades seriously affected the credibility of the government in the SARS outbreak, but in the
H7N9 outbreak, the Chinese Government’s response to H7N9 was much swifter and more transparent with regards to information disclosure. Table 11 provides a comparison of the two disease emergency responses, epidemiological characteristics and impacts.

Table 11  A summary of emergency responses, epidemiological characteristics and impacts on SARS and H7N9 in China

<table>
<thead>
<tr>
<th>Categories</th>
<th>SARS</th>
<th>H7N9</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emergency responses of the stage and strategies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>The initial stage of the breakout</strong></td>
<td>November 16, 2002 - February 2003</td>
<td>The end of March 2013</td>
</tr>
<tr>
<td></td>
<td>- Allowed no media reports, blocked network discussion about the epidemic situation.</td>
<td>- China CDC quickly completed virus gene sequencing, confirmed the new virus, and published within 2 days.</td>
</tr>
<tr>
<td></td>
<td>- Ignored the prevention and control of the infected individual citizens, including treatment.</td>
<td>- China NHFPC accurately reported the disease and the death toll around the districts in time.</td>
</tr>
<tr>
<td></td>
<td>- Notified the WHO of the situation, but the data provided was not accurate, including underreporting the number of deaths and disease.</td>
<td>- A delay of 39 days from the treatment of the patient to the confirmation of the epidemic situation</td>
</tr>
<tr>
<td><strong>The spread stage</strong></td>
<td>March - early April 2003</td>
<td>Early April 2013</td>
</tr>
<tr>
<td></td>
<td>- Held a press conference, declaring outbreak under control.</td>
<td>- A public health clinical center and pediatric hospital in Shanghai was designated a H7N9 diagnostic fixed-point hospital, and explicitly required that medical institutions must not delay patients due to cost.</td>
</tr>
<tr>
<td></td>
<td>- A lack of guidance for emergency management.</td>
<td>- Suspended the live poultry market transactions in Shanghai and other districts, culled poultry and cut off the source of infection.</td>
</tr>
<tr>
<td></td>
<td><strong>In late April 2003</strong></td>
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<tr>
<td></td>
<td>- The state council premier chaired a state council executive meeting, studied the prevention and control work.</td>
<td>- “Animal H7N9 bird flu emergency monitoring plan and the animal H7N9 avian flu emergency disposal guide” issued by the MOA, highlighted the key areas and carried out the disease screening and monitoring of the virus.</td>
</tr>
<tr>
<td></td>
<td>- Stricter management of the prevention and control measures, including international cooperation, official accountability, media supervision, expert guidance of response.</td>
<td>- The government informed the WHO, Hong Kong, Macao and Taiwan regions, and the relevant countries in</td>
</tr>
</tbody>
</table>
### The later stage

**May 2003**
- Effective control of Beijing epidemic situation, government regained the initiative. - Beijing was removed from the list of areas with recent local transmission on 24 June.

**May 2013**
- Emergency response was terminated, relevant prevention and control work went into normalized management, but the practice of daily monitoring continued.

### Epidemiological characteristics

<table>
<thead>
<tr>
<th>Virus type</th>
<th>Severe Acute Respiratory Syndrome coronavirus (SARS-CoV)</th>
<th>Avian influenza A(H7N9) virus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical signs and symptoms</td>
<td>Fever, myalgia, dry cough, headache and dizziness pneumonia, respiratory failure</td>
<td>Nasal congestion, sore throat, nausea and systemic muscle aches, fever, cough, respiratory failure</td>
</tr>
<tr>
<td>Virus tracing</td>
<td>From an as-yet-uncertain animal reservoir (perhaps bats) that spread to other animals (civet cats)</td>
<td>From exposure to infected poultry or contaminated environments</td>
</tr>
<tr>
<td>Transmission</td>
<td>Close contact or through inhalation of respiratory droplets</td>
<td>Limited person-to-person spread under specific circumstances</td>
</tr>
<tr>
<td>Treatment</td>
<td>Supportive care and appropriate infection control measures, no specific antiviral drugs and vaccines</td>
<td>Supporting therapies with antiviral drugs, no vaccines</td>
</tr>
</tbody>
</table>

### Impacts on health, society and economy

**Health effects**
- In 2003 in China: 5327/349, 6.6%
- By 11 July 2003, the virus had spread to 29 countries and regions, with a cumulative number of confirmed cases of 8096 people, 774 people deaths and an average death rate of 9.6%.

- In 2013 in China: 135/45, 33.6%
- By December 3, 2013, a total of 148 cases of H7N9 avian influenza were confirmed on the Chinese mainland, Taiwan and Hong Kong area, among whom 48 died, with a case fatality rate of 32.43%.

**Social impacts**
- Rumors, criticized
  - Food, salt and Banlangeng (Radix Isatidis) were sold out
  - Flights were cancelled
  - Schools were closed

- Social stability, praised
  - No social chaos
  - The management of the problem satisfied both the Chinese and international community.

**Economic impacts**
- The global macroeconomic impact of SARS was estimated at USD 30–100 billion or around USD 3–10 million per case
- Caused losses of USD 12.3–28.4 billion and an estimated decrease of 1% in GDP in China

- China's poultry industry suffered a loss of more than 40 billion RMB
- There were no more international notable impact on the economy.
7.5 Conclusion

Both outbreaks of SARS and H7N9 represented serious public health emergency crisis events in China, and both had a very large impact on health, society and the economy. SARS coronavirus and H7N9 virus share some similarities with epidemiological characteristics of clinical signs, symptoms and treatment, but the animal reservoirs and transmission are different. Neither virus had been reported in human beings previously. H7N9 had a much higher fatality rate. Worldwide, people of all ages had little protective immunity, though the elderly were both most vulnerable to dying, and both viruses presented a global pandemic threat.

China’s emergency management of the two epidemics varied. Despite the similarities of SARS and H7N9, and that mortality of H7N9 was much higher than SARS, control efforts for SARS were slow to be mobilized and were heavily criticized and generally considered to be suboptimal, as the poor handling of SARS exposed serious information communication problems in the then emergency management system processes. In contrast, the Chinese Government’s response to H7N9 was much swifter and more transparent than it was in the SARS outbreak. The social and economic impacts of H7N9 weren’t so serious as in the case of SARS. Progress had been made in information disclosure and epidemic surveillance. Despite these improvements as outlined in 7.3.5, there remain some problems and deficiencies in the epidemic prevention and control system.

Risk communication has enhanced the response to, and management of, public health emergencies. The next chapter will focus on more results from the case study of this research, by specially examining the principles of risk communication identified from the literature in Chapter Five, to analyze and discuss cooperation and information issues in the SARS and H7N9 outbreaks, and examine the utility of risk communication in improving emergency management of pandemics in China.
Chapter Eight  Application of risk communication for emergency management during the outbreaks of SARS and H7N9 in China: A comparative analysis

8.1 Introduction

Risk communication is an important means to enable cooperation, sharing resources, to enhance policy making and develop efficient strategies to deal with a public health crisis. Based on the analysis of important guideline documents and best practice studies, from the 21 principles of risk communication, which come from the guidelines of WHO, FAO and other international organizations eight were identified and described in Chapter Five: Risk Communication.

On the basis of focus group discussions and in-depth interviews that represent a range of stakeholders, this chapter first provides the results of a comparative analysis of risk communication used in the responses to SARS and H7N9 using eight key relevant principles selected as a useful framework of risk communication to guide disease outbreak management in China. These principles are: developing trust; being transparent; making announcements early; listening well; planning well; being honest and open; being empathetic and caring; accepting and involving the public as a partner.

It will analyze the cooperation relating to risk communication for decision making during the SARS and H7N9 epidemics. Such analyses will provide an evidence base to inform the further development of risk communication strategies in order to improve emergency management of pandemics and disease outbreaks in China.

8.2 A comparative analysis of risk communication in the responses to SARS and H7N9 using a framework of selected principles useful for China drawn from international good
risk communication practice

Following is an analysis of the responses to the SARS and H7N9 outbreaks in China, using a framework of principles drawn from international good risk communication practice. These principles are: developing trust; being transparent; making announcements early; listening well; planning well; being honest and open; being empathetic and caring; accepting and involving the public as a partner.

8.2.1 Developing trust

Trust is the basis for communication. Trust in the information provided is very important for stakeholders to build confidence for their response to a crisis. As stakeholders such as government officers, experts and the public have different professional and cultural backgrounds and different perceptions of risk and behavior, it is necessary to strengthen mutual trust for effective management of risks. If stakeholders trust the information they get, they are more likely to make the right decisions to avoid risks (Mishra, 1996).

In the SARS outbreak in 2003, just after the Spring Festival in Guangzhou, there were rumors about the disease and citizens panicked and hoarded white vinegar and Radix Isatidis. At this time, officials hadn't released any authoritative information, and even though some Guangzhou media were aware of cases in the community, they were required by the publication administration department of Guangdong province not to report the information. The delays of more than two months in reporting the first cases of SARS caused significant distrust both within China and internationally and this arguably contributed to an ineffective response.

The outbreak escalated after March, and although the MOH released epidemic information in early April, subsequent investigation found that the information released was not accurate. Some army medical institutions in Beijing had not reported information to the local health
administration department, which meant that the MOH not did have the complete epidemic picture. The epidemic information released was significantly different from the truth, and this incorrect communication increased the trust crisis in government.

In contrast, 10 years later in response to H7H9, after the first three cases were identified on 29 March, the NHFPC made an announcement of the H7N9 epidemic, and published “Questions and Answers” about the epidemic situation on the official website on March 31. Also, basic information on all the cases in China and measures taken were reported in a timely manner to the WHO. As mentioned by two international officers:

“During H7N9, because the information was more promptly disclosed, there was more transparency. We trusted the information” (I2).

“I think the information of H7N9 was more open, more transparent than SARS. It was reliable” (I1).

Despite this, there was still inaccurate information that may have affected the trust between public and governments. Some provincial health departments advised that Radix Isatidis could prevent H7N9 flu, but the effectiveness of this drug had not been confirmed (B. Xie, 2013). However, the interviewees who reported that they “did not worry at all” indicated it was their trust in the government’s competence that made them worry-free about H7N9. As mentioned by a community resident:

“As we could know the information of H7N9 by TV, newspaper, internet, it was clearer for us to know the dangers of H7N9 than SARS. We trusted the information [of H7N9]” (FG6).

Trust is related to the information provider and the information distributor. Almost all the
interviewees trusted the information released by the government agency and authoritative official traditional media or websites. As mentioned by one journalist:

“The [H7N9] epidemic information released from the authoritative official traditional media was more trusted” (J4).

The information channels most trusted by most of the focus group participants included China Central Television, major web portals, national and local newspapers, local TV channels, community information boards and health education materials disseminated by health authorities. As reported by a community resident of one focus group:

“I did not fear [SARS] after the information was transmitted by the China Central Television” (FG5).

Most focus group participants distrusted information from social media such as network blogs, QQ and WeChat. Similarly one media journalist said:

“I think a lot of things from social media were untrue, unreliable, the impact was not good” (J5).

Trust is very important for stakeholders to build confidence for response to a public health event. There was confusion and distrust of authority in the early stage of SARS, then trust built up in the later stage. For H7N9, as the information disclosure was timely and transparent, there was more trust by the public and the international community at the beginning and throughout the outbreak.

8.2.2 Being transparent

Transparency of information serves to maintain a sense of honesty and trust. In the early period
of the SARS outbreak in Guangzhou, there was no public information release. As mentioned by an international officer:

“I think the information was not open during SARS outbreak, and there were lots of rumors everywhere” (I2).

Under pressure, around February 11 almost three months later after the first case, the local government and health authorities held press conferences in Guangzhou, Foshan, Zhuhai providing simple reports about the epidemic situation. However the theme of these conferences was that the epidemic had been brought under control, “you don't need to panic”. Key information, such as infectivity, transmission, infectivity, clinical characteristics and treatment was not provided. The Department of Health still claimed that “China is safe” at a news conference in April 2. This lack of information disclosure meant that in other parts of the country targeted measures were not taken when they were needed to contain the spread. As mentioned by a hospital doctor:

“I felt that the dangers and treatments of SARS were not made clear at that time” (B3).

In contrast, during the H7N9 outbreak, China reported on the epidemic every day and the media discussion was also quite open and frank. Two days after confirming the first cases on the afternoon of March 29, 2013, the NHPFC published detailed information about the number of cases, and about measures to limit transmission, and continued to report this on a daily basis throughout the peak of the epidemic. This transparency was thought to reduce the panic of the public. As mentioned by an Agriculture officer:

“During H7N9, the impact on people's lives was very limited. In fact, the panic is derived from what people don't know. There wasn’t any panic, as we knew something
with H7N9” (A2).

At the same time, the basic information of all the cases in China and measures taken was reported in a timely way to the WHO. Further medical information about cases and the nucleotide sequence of the H7N9 virus was shared in a timely way with the international community.

“There were less rumors during H7N9, because the information was more promptly disclosed. There was more transparency (I2)”.

In stark contrast to the SARS early stages, the result was that H7N9 was brought under control quickly and the potentially significant negative large scale impacts of H7N9 were limited. This transparency helped to subdue rumours and maintain social stability and helped maintain trust in the government by both Chinese and international communities, hence ensuring more cooperation to reduce the spread of the disease.

8.2.3 Announcing information early

During a public health emergency, health departments and emergency professionals need to respond quickly and provide timely release of information so that the public, government agencies and relevant businesses can understand the actual situation of the event as soon as possible and take the necessary actions, and this encourages public confidence. If early action is not taken, secondary emergencies can evolve as other impacts emerge. As mentioned by a media journalist:

“Speed is really very important. It will be much better for the control of a disease outbreak, if the information can be provided comprehensively the first time” (J4).

In 2003, governments at all levels in China kept information regarding SARS incidence a
secret, and this practice resulted in misjudgement of the situation and erroneous decision making. As the epidemic information was not transparent, and local government did not report cases, the health sector couldn't truly grasp the dynamics of the epidemic situation, and could not do its job effectively and respond adequately to the outbreak.

The first incidence of SARS (initially called atypical pneumonia) was reported in Guangdong province in mid-November 2002, but Chinese provincial officials withheld important information about the disease from the general public and other sectors in China for another 3 months. This enabled the disease to be rapidly transmitted to more than 30 countries on five continents in early 2003, and there were rumors circulating about the disease. Citizens were panicking and hoarding white vinegar and Radix Isatidis. This caused distrust and inappropriate responses between government and the public. Further, the WHO did not get the epidemic report from China until 4 months after the first case appeared in Guangdong. This severely reduced the global response to the disease that had become a global outbreak – a true pandemic.

In contrast, during the H7N9 outbreak, the information was released quickly and updated frequently. As mentioned by a Health Department officer:

“Updating the information was certainly not timely in SARS, but the information was provided every day in H7N9” (H1)

The first patient was hospitalized on 20 February 2013 with an unknown type of influenza. On the afternoon of 29 March, diagnoses of 3 patients were confirmed human infection with H7N9 avian influenza by experts in the NHFPC. Two days later, on 31 March, the NHFPC made an announcement about the 3 cases. The Health Department and the WHO worked together to develop appropriate risk communication and prevention, and control measures were made
public quickly. Despite a 39 day delay between the first case and announcement of those cases, the result was more trust and more appropriate and effective cooperation between the public and the Chinese government, and China and the international community, and hence a more effective prevention and control response.

The long time delay of the announcement of SARS epidemic had caused distrust and ineffective response to the outbreak. In contrast, in the H7N9 outbreak, although there was still a delay in the announcement of cases, the result was more trust and more appropriate responses.

8.2.4 Listening well

As the perceptions of health risk of an issue can be different amongst organizations and different parts of the community, it is necessary for all stakeholders to listen to each other and exchange information, attitudes, values, beliefs and perceptions. This interaction should ideally be ongoing before a crisis so that during a crisis there is a greater understanding of risk across key stakeholders, including the community. This understanding of stakeholder perspectives may lead to a better understanding of risk perception differences and hence shape risk communication (Covello, 1995). It may also lead to more widely understood and accepted risk management decisions. For example, an expert from the CDC said:

“I need to listen to different people’s opinion and attitude to the disease outbreak, and I need to know what they need. What made them panic? What can make them feel safe? What are they pleased about?” (C1)

In response to a public health event, some government officers in China still try to restrict access to information, but generally officials endeavor to give the public information that they think they need. However, with no shared understanding of needs, there was mistrust, conflict
and contradictions between different sectors, which affected the preparedness and response to disease outbreaks such as SARS and H7N9. As mentioned by a CDC expert:

“If we listen and promptly respond to the concerns of the people and other sectors, then we can increase the degree of trust among the public during the whole prevention and control of disease outbreak” (C4).

As the SARS epidemic went largely unnoticed at first, there wasn’t good listening to other sectors or the public among government departments or other organizations. At the beginning of the outbreak, some local governments did not communicate with the public or other sectors, leading to the failure of government information, public panic and loss of government credibility. Further, many clinicians were unaware of the epidemic threat posed by the “atypical pneumonia”. As mentioned by a hospital doctor:

“At that time, I was a new doctor. I only knew the SARS was very severe from the old doctor, but we didn’t know the pathogen of SARS and the good treatment method for SARS (B4).

In response to H7N9, there was also a lack of listening between the Health and the Agricultural Department. As indicated by officers of the Health and Agriculture Departments:

“If we listened to more viewpoints of the Agriculture Department, then that would have been better for the control and prevention for the H7N9” (H3).

“The problem for H7N9 control was lack of effective communication between the Health and Agriculture” (N2).

In order to protect their industry, some local Poultry Industry Associations and even the national associations and some companies lobbied local government via letters, asking them to
stop reporting H7N9 epidemic information every day, arguing that it was unfair for the practitioners and industry. After listening to other sectors’ opinions, although there was no legal basis to stop reporting H7N9 new cases every day, the Guangdong Health Department stopped sending daily information about H7N9 cases to the media. This may have helped economic stability, but it had potential to harm the provincial government’s credibility and trust.

At the start of the SARS outbreak, in order to maintain local social stability and to guarantee local economic development, the Guangdong government took its traditional approach of management of a crisis event: to keep the truth about the epidemic information confidential, despite the Health Department management already taking actions internally. How to balance the protection of people’s health and reduction of economic impacts is a challenge for decision making for different government departments. However, as described in 8.2.2, lack of trust can also be damaging.

The mistrust, conflict and contradiction between different sectors can affect the prevention and control of a disease outbreak. There wasn’t good listening to other sectors and the public in SARS, but there was more listening in H7N9, even though there were problem.

8.2.5 Planning well

Prior to crises, public health professionals should have a health emergency risk communication plan. There should be different communication for the government, the public and medical personnel in one or different plans (Qiu et al., 2016). With a well-developed plan and good preparation, the responsibilities of different departments can be made clear, and the public health emergency risk communication can be well informed and conducted in an orderly manner. Testing the plans for different circumstances is also important to develop different
messages and strategies for different types of emergencies (A. Lin & Wu, 2010).

Since SARS, China has gradually started to attach importance to the practice of risk communication in emergency management. However in 2003 there was no formal risk communication plan that could be used for the SARS outbreak. In order to improve risk communication, in collaboration with China CDC and the US CDC, the Health Emergency Response Office, China MOH developed the *Guidebook on Risk Communication of Public Health Emergency* in 2007 (Cope et al., 2014). The principles in the *Guidebook*, which rely heavily on Western emergency risk communication principles, were tested to determine whether public health officials in China considered those principles relevant.

Most of the in-depth interviewee’s comments specifically indicated the need for a risk communication plan, specifying the responsibilities of the different departments and the critical importance of working collaboratively. As indicated by officers of the Agriculture and Health Departments:

“*In fact, I think the risk communication plan is very important, but overall they are still lacking, especially lacking in a theoretical framework*” (A5).

“*Before a new crisis event happens, we should have a plan of [risk communication]. There should also be prepared some exercises for risk communication*” (H5).

Several interviewees said that the concept of risk communication is new to them. Other studies have indicated the need for ongoing training as a broader part of developing risk communication plans (Tang et al., 2016).

However the *Guidebook* is an internal document only for some departments of the Ministry of Health and for CDCs. It is not accessible to all public health emergency professionals. Most of
the interviewees reported that they did not know the name or the contents of the *Guidebook*, or if they did it wasn't actively implemented. As mentioned by a Health Department officer:

*“There wasn’t a risk communication plan in hospital, and [some public health emergency plans] are impractical, operability is not very strong. It is common” (H1).*

However they all believed a guideline and a plan for risk communication is very useful for responding to a public health emergency event. All the interviewees indicated that some of the main principles of risk communication have been included in their emergency management planning, although there wasn’t a special guidebook on risk communication for H7N9 in their organization. As mentioned by an Agriculture officer:

*“There was no risk communication plan [of H7N9] in our hospital” (D3).*

And some emergency management planning was not effective, as it lacked operability for relevant stakeholders in practice. As mentioned by a CDC expert:

*“The operation of the emergency management planning and guidelines were not comprehensive, and there was no target audience” (C1).*

There was little guidance or planning for risk communication for emergency management prior to or during the SARS outbreak, but a changing culture saw communication more embedded in the emergency management planning in H7N9. Clearly, however, there is still much room for improvement.

### 8.2.6 Being honest and open

Being honest and open is critical for building trust. Chinese governments have had a history of keeping information regarding incidents and disasters secret, and such practices throughout the
SARS epidemic resulted in misjudgement of the situation and erroneous decision making. A television reporter said:

“The Propaganda Department controlled and did not allow us to have an interview. We had no way to find any information about the disease outbreak except hearsay” [in SARS] (J3).

During SARS, the Chinese Ministry of Health reportedly sent a team to Guangdong to investigate in late January, but the results were classified ‘top secret’ and no nation-wide health advisory was issued until 3 April. Despite the rapid development of the SARS epidemic, formal authoritative information release was limited, leading to gossip circulating. As mentioned by a media journalist:

Whatever I asked, they (government sector offices and hospital doctors) always ignored me and didn’t want to tell (me any information) (J3).

A community resident said:

“In the early stage of SARS, there were many people in hospital with the disease, and there wasn’t good communication with the public, which caused lots of people to panic and fear. Many people left Beijing, which was detrimental to infectious disease management. If the government had strengthened the overall risk reminders and announced some of the [solid] information, it would have facilitated the prevention and control of the entire work” (BF1).

Under pressure, on 11 February 2003, the Guangdong government finally made a statement about the disease, the same day that the official Communist Party national newspaper, People’s Daily, announced on its website that the province had succeeded in controlling the outbreak.
This news report was not correct, and meant that other parts of the country did not take targeted measures. As a result SARS spread out of Guangdong.

In contrast, disclosure of information was a priority in the H7N9 outbreak management. The newly established NHFPC reported to the WHO and the public about the epidemic on March 31, 2013, shortly after the China CDC completed full gene sequencing (on March 29) and the cases were diagnosed (on March 30, after discussion with clinicians and epidemiologists). Information about new confirmed cases was released on a daily basis until the later stage of the epidemic (Y. Wang, 2013).

Being honest and open is critical for building trust to respond to an epidemic. In the early stages of the SARS outbreak, honesty and openness was poorly practiced, but this improved and was more honest and open in the later stage. However, honesty and openness were a feature throughout the H7N9 outbreak.

8.2.7 Being empathetic and caring

Empathy concerns a person's resonant emotional response to another's distress (Thompson, 1998). Caring concerns a person's efforts to help another person, or a sector’s efforts to help the population. Empathy and caring are important during disease outbreaks, because the nature of this type of public health event means there is a lot of anxiety around illness and contagions. In these circumstances, people may feel empathy for another's distress but may not be capable or competent enough to respond in a helpful, caring manner. Knowing how to assist a case, for example, is a challenging task for a doctor, public health professional or government officer. Further, knowing how to formally communicate with a worried community in a way that demonstrates empathy is also important.

Humanistic care measures reflect the warmth of the community management and to a certain
extent, they can enhance the public’s confidence and trust in the government to fight outbreaks. As mentioned by a CDC expert:

“The community people should come to see them [patients] and to be concerned about what they want, including physiological and psychological needs (C2)”.

And by an Agriculture officer:

“It was necessary to give care, sympathy, and help [to SARS or H7N9 patients]” (N2).

During the SARS period, the state appropriated funds to establish a disease prevention fund, and introduced a series of regulations about relief of medical expenses and related industry taxes, which reflected humanistic care to some extent. However in the course of SARS treatment, some hospitals only paid attention to the physical treatment of patients and ignored psychological aspects. As mentioned by a hospital doctor:

“Human care was very bad during SARS. The family was not allowed to visit a SARS patient in hospital. Pagers and mobile phones were collected on one side and the patients were not allowed to use them as they had been infected. Then a SARS patient could not contact with their family. Some patients could not see anyone before they died in hospital. There was no video system at that time” (D1).

Quarantine has been used for centuries in an effort to prevent the introduction, transmission, and spread of communicable diseases. However psychological stress is a risk for those confined because of a quarantine order. The psychological impact of quarantine can be derived from two sources: (1) the fear and ambiguity of the disease and (2) incarceration (Barbisch, Koenig, & Shih, 2015). Patients with SARS reported fear, loneliness, boredom, and anger, and they worried about the effects of quarantine and contagion on family members and friends. As
reported by a community resident:

“During SARS, I also had a high fever, but I didn’t dare go to hospital, as I feared the hospital would keep me and not allow me to go home” (FG1).

A CDC expert added:

“The SARS or H7N9 patient suffered from the disease as well as the panic. We should give them more sympathy and care for them including psychological help and physical help” (C1).

Similar problems also were identified in the treatment of H7N9 cases. However, during the H7N9 outbreak, in addition to focusing on infected patients, the media was concerned about health care workers and the health of vulnerable groups of the public.

While most of the interviewees indicated that empathy and caring is very important in the emergency management for SARS and H7N9 outbreak, they indicated that there is still room for improvement in the way individual cases are treated and in communications with the public so as to demonstrate empathy and care.

8.2.8 Accepting and involving the public as a partner

In response to public health emergencies, the measures adopted by government and health administration should be communicated to the public through the media, on the internet and through advertisements; and at the same time, the needs and attitudes of the public should be sought and passed to the health administration and relevant government departments. This two way process will facilitate more support and cooperation between government departments and the public when it’s really needed, thus helping stakeholders to work together to cope with emergencies under highly stressful circumstances (Fairbanks, Plowman, & Rawlins,
Thus risk communication is the interactive process of exchanging risk information and views among stakeholders, including individuals, groups and institutions. It emphasizes citizen participation. Government departments need to choose the appropriate channels to convey the actual situation of risk events in a way that can be understood, and provide timely disclosure of the necessary relevant measures that need to be or have been carried out. As mentioned by a Health Department officer and an international officer:

“We only [need to] know what the public wants or what they lack, then [we can know] what we can give to them” (H4).

“It is more important to pass on information, which helps the public to understand and accept it” (N2).

During the early stages of SARS, there was no listening to the public’s voice as officials withheld information. In the later stage, the national government used the Chinese media to gain public support for the SARS response, including posters and publications with the slogans “Declare War on SARS” and “Activate the whole Party, mobilize the entire populace, win the war of annihilation against SARS” (Wishnick, 2010). Thus although the government’s communication strategy improved, it was still a one-way communication system.

During the H7N9, there were daily reports of the epidemic in China, and there was open discussion about H7N9 in the Chinese media. The Chinese government also paid special attention to interacting with the public, by creating public accounts on WeChat, timely updating of epidemic information, timely providing of necessary responses and anti-rumours on social media, such as Weibo. These represented an attempt at two-way communication.

Overall the quality of the response to H7N9 indicated that the different agencies received regular feedback from the public and that the agencies were responsive to the public’s needs.
As mentioned by a Health Department officer:

“It is necessary to listen to the needs of the public, or what are they want to know and to pay attention to the public. For example, some relatively new information needs to be updated promptly to them [in H7N9]” (H1)

However, health officials also recognized the importance, as well as the difficulty, of verifying information received from the public. Several interviewees indicated that they did not believe useful information had been received or could be received from the public, as they thought the public lacked professional knowledge of public health. So these interviewees still did not appear to understand the importance of listening to the public with regards to the H7N9 emergency response process.

Almost all interviewees indicated that a mechanism now exists to ensure that the views and perceptions of the public are taken into account during an emergency and at the planning stage. As mentioned by a CDC expert:

“For a response department, it is certainly important to collect epidemic information and the public’s concerns, then to analyse the reasons and how to guide the public correctly” (C3).

The most frequent feedback mechanism during H7N9 was via telephone hotlines, websites responses, and electronic mailbox accounts, as well as media monitoring of public opinion by the Chinese government.

Listening to the public is important in the emergency response process. There wasn’t sufficient consideration of the public voice in the early stages of SARS. There was a more regular exchange between the public and interaction between government and community during
H7N9, but there was still room for improvement in listening to the public.

**In summary**, it is clear that the H7N9 response was far better than that to SARS across almost all these principles of risk communication. However on the basis of the comments about the H7N9 events, room for improvement was identified for categories of planning, accepting and involving the public as a participant, and listening. Table 12 provides a summary of the key risk communication principles and how they were applied in SARS and H7N9.

Table 12  Key risk communication principles and how they were applied in SARS and H7N9

<table>
<thead>
<tr>
<th>Principles</th>
<th>SARS</th>
<th>H7N9</th>
</tr>
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<tbody>
<tr>
<td>Developing trust</td>
<td>The early stage: from confusion to distrust of authority</td>
<td>More trust by the public and the international community at the beginning and throughout</td>
</tr>
<tr>
<td></td>
<td>The later stage: trust built up</td>
<td></td>
</tr>
<tr>
<td>Being transparent</td>
<td>The early stage: no transparency</td>
<td>Transparency throughout</td>
</tr>
<tr>
<td></td>
<td>The later stage: more transparent</td>
<td></td>
</tr>
<tr>
<td>Announcing early</td>
<td>Announced very slowly, delayed about 3 months from November 16 2002 to February 11 2003</td>
<td>Announced quickly, still delayed by 39 days from February 20 to March 31 2013</td>
</tr>
<tr>
<td>Listening well</td>
<td>Not good listening to other sectors or the public</td>
<td>More listening to the public, but still lack of listening between Health and Agriculture Department</td>
</tr>
<tr>
<td>Planning well</td>
<td>No planning for risk communication with emergency management</td>
<td>Risk communication was included in the emergency management planning, but not by all and not easily used</td>
</tr>
<tr>
<td>Being honest and open</td>
<td>The early stage: historical habit of keeping information regarding incidents and disasters secret</td>
<td>Honest and open throughout</td>
</tr>
<tr>
<td></td>
<td>The later stage: more honest and open</td>
<td></td>
</tr>
<tr>
<td>Being empathetic and</td>
<td>Lack of humanistic care</td>
<td>Lack of humanistic care, but the media was concerned about</td>
</tr>
<tr>
<td>Accepting and involving the public as a partner</td>
<td>The early stage: no consideration of about public voice</td>
<td>The later stage: all people involved</td>
</tr>
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</table>

8.3 Risk communication for multi-sector cooperation in SARS and H7N9

Risk communication is an important means to enable cooperation, sharing resources, facilitating more effective policy making and developing efficient strategies to deal with a public health crisis. Risk communication is not only a process of transferring of and feedback about risk information, but also a process of risk recognition, risk positioning, risk spreading, risk involvement, trust formation, communication forming and consensus reaching (Pang & Zhang, 2013). The process of risk communication is also a form of public health crisis response in the risk decision making process (D. C. Glik, 2007). In the process of public health crisis management, government should not consider risk communication as an instrument of eliminating criticism or quelling public anger, but they should regard it as part of the crisis management in decision-making process (Yan, 2012). As mentioned by Health and Agriculture officers:

“Department cooperation is very important. Because a health department may provide professional guidance and advice [to other departments], we have to rely on other departments, such as the department of education, the transport sector. The specific implementation will have to rely on them, it is very necessary for multi-sector coordination to prevent and control the infectious disease. This cannot be carried out by one department” (H1).
“Departmental cooperation now is one of the very important parts of our entire public health emergency management process, because public health is involved in all social activities, it is difficult to rely on a single department” (A3).

Public decision-making can be divided into daily decision-making and crisis decision-making. Daily decisions generally relate to conventional decision-making; crisis decision-making generally requires the organization to complete the specific measures to tackle the crisis in highly adverse circumstances, that is, once the crisis appears, some routine procedures and methods may need to be modified in order to take unconventional emergency decisions as soon as possible (Peng, Zhong, & Yu, 2005). Crisis decision-making embodies more intense time pressure and information needs from stakeholders when compared with common decision-making; otherwise it is easy to increase the uncertainty of consequences (Tong, 2013).

Even for the same emergency, different government risk communication strategies, culture background of different places and system differences can lead to different outcomes (Yan, 2012).

In China, communication and collaboration about health emergencies between the Health Department and related governmental departments is generally inadequate because the assignment of responsibility and response procedures have not been specified in detail in most current plans. As mentioned by one CDC expert:

*The main obstacle to sectoral cooperation is information communication. This information sharing problem remain on the sector’s papers [i.e. is not implemented] (C10).*

Furthermore cross-regional communication and collaboration are more difficult than that within the same region. As mentioned by a Health Department officer:
“The same information between different departments has different interpretations, suggesting that the department's communication and coordination is very important, especially for early cross-sectoral coordination” (H5)

This section analyses how coordination and cooperation for risk communication affected decision making through the SARS and H7N9 events.

8.3.1 Cooperation for SARS was inadequate

Lack of information sharing

During the SARS outbreak, it became clear that coordination and collaboration at every level of government, including the CDC, hospitals and institutes nationwide and globally were inadequate in attempting to control this disease (Feng et al., 2009). In the early prevention and control period, there was a lack of public health emergency plans, and the health system worked in isolation. There was no information sharing even within the health system, including hospitals and the CDCs. Because of the lack of a uniform national public health information platform, and the lack of a mechanism for effective communication between government departments, medical and health information, and disease control strategies were not effectively shared between departments, making it difficult to form a unified and efficient coping mechanism.

In addition to the problems of sharing information in the health sector, cooperation problems among the health, traffic, tourism agencies and other departments also hindered the effectiveness of the epidemic prevention work. Most interviewees mentioned the lack of good coordination among different sectors.

Lack of a coordination mechanism
In Guangdong province, the disease emerged before the Spring Festival. At this time, most people travel to their hometown to see their families. However the Transport Department did not take any measures to deal with travel, which led to the disease spreading to areas within and outside Guangdong province (Tong, 2013). At this time as well, a doctor from Guangzhou who had flu symptoms travelled to Hong Kong, thus spreading SARS to the outside world. The lack of coordination hastened the spread of SARS. Moreover the spring holiday required significant decisions by other sectors beyond the scope of the health management responsibilities, even beyond the local region, but due to the lack of coordination and integration of departmental decision-making in the horizontal direction, further measures were not carried out.

Due to the lack of a coordination mechanism for other departments, the epidemic became the sole responsibility of the Health Department. However, contradictory information was being released by other departments. For example, in the beginning of April, although this serious epidemic was still spreading, the National Tourism Administration announced “China’s tourism is safe”. This was despite the knowledge that the transportation, tourism and personnel flow had been identified as being the main ways that SARS was spread.

During the SARS outbreak, formal mechanisms for communication, collaboration, and coordination among adjacent regions, related departments, and agencies were absent. As mentioned by one Agriculture officer:

“During SARS, there also was friction between our Agricultural Department and the Health Department in response to the disease outbreak. The friction is about information communication which was very important. At first, the information sharing was not good between the two departments” (A4).

The early phase of China's SARS crisis response lacked effective decision making, and
coordination and cooperation management. In Beijing, there are two separate health systems - the local government and the military. The SARS patients who had been in Beijing, had come from more than 70 hospitals earlier, including city hospitals, hospitals of various ministries, industry and military hospitals (H. Lin et al., 2012). As the information of the two systems couldn’t be shared, a complete picture of the epidemic was missing (H. Zhu, 2003). This was the key reason why the statistical data for the epidemic was not accurate and therefore why the response was inconsistent across departments and slow.

The Chinese government did not quickly organize effective collaboration to facilitate identification of the offending pathogen, or to cooperate with WHO until April 2003. WHO organized an international collaborative endeavor in which 11 research groups embarked on a hunt for the virus, and one month later the SARS-Cov was identified by scientists in America, Hong Kong and Canada. China’s failure to first identify the coronavirus and sequence its genome was due to the organizational obstacles that hindered collaboration and the malfunction of coordination among different institutions from the scientific leadership (Cao, 2004).

After April 20, the government utilized its administrative control of local cadres, improved its gathering of information from localities and the disclosure of that information, improved its control measures, and actively coordinated bureaucracies and local administration in SARS management. A mechanism was established for coordinating epidemic prevention work between Beijing the local government administrative system and military system: different departments of China's administrative system were finally trying to work together. Communication pathways between the government and the public were established, and information collection was unobstructed outside the system, which led to improved control.

The lesson from SARS was that an effective response requires collaboration between scientists
and medical doctors, the mobilization and best use of resources, and the cooperation of different government sectors horizontally and vertically. This was generally lacking in the first 6 months of the SARS outbreak. SARS emphasized the importance of communication and collaboration with domestic and international policy makers, financial markets, the travel industry and other key sectors.

8.3.2 Cooperation for H7N9 had greatly improved

During the H7N9 outbreak, there was more collaboration within the health sector, across the sectors, with the public and the international community at the beginning and throughout.

A joint multi-sectoral prevention and control mechanism (JPCM) was established at national and local levels to lead and coordinate the emergency response to the H7N9 virus. The national JPCM, led by the NHFPC, consists of 13 governmental ministries and commissions, including the MOA, the State Forestry Administration, and the Ministry of Science and Technology. An inter-regional JPCM was also established to support sharing of information and coordinated response among the affected provinces and municipalities, including Anhui, Jiangsu, Shanghai, and Zhejiang. Significant efforts were made to ensure that the emergency response to the newly detected H7N9 virus was consistent with laws and regulations, and followed the principles of transparency, prioritization and international collaboration (WHO, 2013a). As mentioned by one Health Department officer and one CDC expert:

“We had public health joint meetings by city council, as we need the cooperation and communication with other sectors for prevention and control of H7N9’ (H2).

“During H7N9, we certainly had cooperation with the agricultural sector, business sector, and forestry sector” (C3).
The Chinese Influenza Centre equipped each network laboratory with detection reagents for the H7N9 virus quickly, and required the hospitals treating influenza to increase specimen collection, enhance monitoring of the cases with pneumonia in hospital and to sample suspicious cases. These all played a key role in the early discovery and early treatment of the disease. Guangdong and other places, combined this intensive monitoring, and established a monitoring system of pneumonia in hospitals with medical institutions. These practices showed that the enhancement of the cooperation between medical and disease control agencies helped with early pathogen detection during hospitalization, achieving the goal of early diagnosis. This is a fundamental principle of outbreak management.

At the same time, China maintained an open, cooperative and responsible attitude to further strengthen the cooperation with the WHO. Basic information on all the cases in China and measures taken were reported in a timely manner to the WHO. In this epidemic situation, Chinese scientists identified the virus subtype, source and sequence features in a timely manner, investigated and analyzed the epidemiological characteristics of the disease, its clinical features and its influencing factors and released the information of the epidemic situation and virus to the world. This engaged the biologists and medical scientists globally with this epidemic situation, encouraging a lot of research on the development trends of the disease and laying a good foundation for the global defense against influenza pandemics in the future. In the months after the outbreak, WHO carried out an assessment of the epidemic situation in China and guided the treatment of cases. This cooperation helped further improve the ability of China to deal with the epidemic situation of the new influenza and reduce its impacts.

Avian influenza prevention and control involves multiple departments, in particular, the timely communication between veterinary and human medicine and the open sharing of animal epidemic monitoring information and human epidemic monitoring information. The migration
of birds is a worldwide activity, and only by strengthening international exchange, cooperation and coordination, and actively participating in the construction of the global early warning mechanism for avian influenza, can the occurrence of avian influenza be effectively prevented and controlled (Cai, Gao, He, Zhu, & Huang, 2015). In addition, control of this virus involves the management of live poultry markets (K. Xu & Bao, 2015). As mentioned by a Health officer:

“With the cooperation of the public, and understanding and communication with the agricultural sector, we could understand different interests and needs of different stakeholders” (H3).

In the epidemic area, the poultry market was identified quickly by infectious disease epidemiologists and the main source of infection was closed. Poultry monitoring was enhanced with cooperation from agriculture departments and the technical guide for control and prevention of human infections with H7N9 avian influenza was updated and distributed. However, there are still some challenges for cross-agency engagement between health and agriculture regarding concerns for poultry industry. As a CDC experts said:

“In the early stage of H7N9 outbreak, if we had paid attention to the poultry industry, it would have been better for us to control and prevent the epidemic of H7N9” (C3).

The Chinese Government’s response to H7N9 was much swifter and more transparent than it was in the SARS outbreak. This response has earned praise from the international community. “We are very satisfied and pleased with the level of information shared and we believe we have been kept fully updated on the situation”, said Michael O’Leary, WHO’s representative in China. The WHO director-general Margaret Chan said that China's epidemic prevention and control work of H7N9 was quick, transparent in information, embodying the Chinese
government’s responsible attitude to the disease, and the results are obvious. The WHO highly praised the Chinese government's work and was willing to further initiate close cooperation with China, thus jointly evaluating epidemic risk and carrying out risk communication (Zhu & Yang, 2011). This suggests an improved level of trust and bodes well for effective prevention and control of future outbreaks.

8.4 Conclusion

This chapter presents the results of analysis of SARS and H7N9 prevention and control in China using a set of risk communication principles drawn from international good risk communication practice. This analysis clearly identifies that the H7N9 response was better than that for SARS for almost all these principles of risk communication, including trust, transparency, honesty, frankness and openness, empathy and caring. However analysis of risk communication throughout the H7N9 event suggests that there is still room for improvement in the planning, accepting and involving the public as a partner, and listening.

Cooperation plays an important role in the decision-making process in public health crisis management. Successful decision making and implementation and effectiveness of the emergency management of SARS and H7N9 rely greatly on cooperation, coordination and information communication. During SARS, there were cooperation failures across numerous levels: within the health sector, within government, between local, provincial and national and with other countries and the international community. These appear to have been largely overcome in the H7N9 case, though the relationships between agencies was challenged in attempting to balance human health protection with economic and livelihood priorities.

This chapter has focused on results from the case study of this research. A number of important findings from the fieldwork have been identified and analyzed in this chapter. The next chapter
draws together the findings from Chapter Seven, Chapter Eight and the literature review in Chapters Two to Five. It analyzes the findings in the context of the literature, describes the implications of the findings, the study limitations and makes recommendations for policy, practice, and further research on the basis of these findings.
Chapter Nine    Main findings, discussion and recommendations

9.1 Introduction

The previous two chapters presented the key findings regarding emergency management and risk communication for prevention and control of SARS and H7N9 in China. This chapter develops a discussion of these key findings based on the literature reviews and case study analysis, and identifies the learnings of risk communication practice in disease outbreak prevention and control in China. Then it provides recommendations for risk communication in the improvement of the emergency management process for pandemics in China.

9.2 The main findings about risk communication and pandemic prevention and control in China: challenges and key learnings

9.2.1 The main findings

In just the last 16 years, the world has experienced SRAS, H1N1, H7N9, MERS, Ebola and Zika public health crises events. Chapter Two described such crises over time pointing out the significant damage to population health and the economy. Chapter Two identified the impacts of SARS which killed more than 700 people and reduced China’s GDP by 1%. China’s response to the SARS outbreak crisis has been to improve its emergency management system. Ten years later, a new influenza strain H7N9 emerged in poultry and this spread to human with devastating consequences the health and the poultry industry. The response this time showed China’s progress in managing public health emergencies.

Effective public health emergency management can reduce avoidable mortality and morbidity and reduce economic and social impacts of such disease outbreaks and pandemics. Chapter Three indicated that the effective and efficient coordination and collaboration, information
sharing are still challenges for public health emergency management worldwide. Although China’s emergency management has greatly improved, the information communication and cooperation among the departments associated with all types of emergencies are problematic, which was discussed in Chapter Four.

Risk communication is an important means to enable cooperation, sharing resources, quality policy making and developing efficient and important strategies to deal with a public health crisis. An extensive review of international literature and risk communication guidelines revealed over 20 principles and themes about risk communication good practices. For the comparative analysis of risk communication relevant to and useful for China, eight key principles were selected to form a frame of reference for the assessment: developing trust; being transparent; making announcements early; listening well; planning well; being honest and open; being empathetic and caring; and accepting and involving the public as a partner. On the basis of focus group interviews and in-depth interviews, Chapters Seven and Eight presented a range of stakeholder views and the analysis of the application of these key principles of risk communication in the SARS and H7N9 outbreak in China.

SARS coronavirus and H7N9 virus share some epidemiological similarities in characteristics of clinical signs, symptoms and treatment. Both viruses can lead to severe disease, but the case fatality rate for H7N9 was higher than for SARS. There still are no specific antiviral drugs and vaccines for them. They have both caused serious public health emergency crisis events in China, and both have had a very large impact on health, society and economic life. Worldwide, people of all ages had little protective immunity, and both diseases presented the threat of a global pandemic.

The SARS outbreak fully exposed China's lack of experience in public health risk communication. Poor internal communication and external information blockades seriously
affected the credibility of the government internally and externally. In contrast, by the time of the H7N9 outbreak, the Chinese government’s risk communication strategies had improved significantly by increasing its public trust by providing open, transparent and timely dissemination of information, planning, engagement with the public, and collaboration between sectors. These were associated with a smoother process, a more responsive community, less social disruptions, and rapid control of this serious disease.

Previous literature seldom mentioned the role of risk communication in facilitating decision-making and cooperation, but this study revealed the importance of risk communication towards decision-making and cooperation in dealing with uncertainties involved with pandemics. From SARS to H7N9, risk communication practices in China have greatly improved, which in turn has facilitated the decision-making process in public health crisis management. Timely decision-making, smooth implementation, and effectiveness of pandemic emergency management relied greatly on collaboration between different stakeholders, which was enhanced by risk communication.

The keys to effective multi-sectoral collaboration are information sharing and the development of a coordination mechanism. More importantly, early engagement of key stakeholders and involving them in the decision-making process is vital for the success of cooperation for prompt responses to crisis. Risk communication strategy should incorporate such measures.

9.2.2 Challenges and key learnings

From SARS to H7N9 bird flu, it took 10 years for China to build its infectious disease outbreak management system, from the disorder of the early stage of SARS to self-confidence, calm and order. It not only reflects China's achievements of the construction of the emergency management system, but also suggests that China's concept of risk management has changed
from “passive” to “active”. Risk communication has begun to play an important role in decision-making process in public health crisis management. Analysis of the case studies has revealed some key issues for risk communication for emergency management of pandemic that require discussion. They include: awareness of risk communication and risk perception, developing and maintaining trust, information disclosure and communication mechanism, considering the public as a partner, relevant laws, and regulations and planning, and multisectoral cooperation.

9.2.2.1 Lack of awareness of risk communication and risk perception

One of the purposes of risk communication is to reshape the stable social relations between decision-makers and executors, government and public through exchanges in order to achieve the purpose of maintaining mutual trust. In China, because the management culture for response to a crisis is still not well established, some government officials only pay attention to economic development. They lack psychological preparation for the advent of risk in society and lack a rational understanding of risk management (Fang & Qi, 2009). Therefore, the response to risk is still inadequate in the whole culture. Once the risk transforms into a crisis event, the government is often caught in a passive state and it is difficult to calmly take the initiative to respond in an effective way. Some local governments lack risk awareness and have inadequate preparation for dealing with risks. (A. Lin & Wu, 2010) Therefore, in the advent of risk, they miss the best opportunity to deal with risk with the result that risk extends and spreads, which not only affects the credibility of government, but also affects social stability.

One of the theoretical models of risk communication discussed in Chapter Five, the risk perception model, holds that there are a myriad of factors affecting how individuals perceive risk. Perceptions of risk present significant challenges for risk communication efforts and understanding these perceptions can assist in designing an appropriate risk communication
approach. It is perceptions of risk, not actual risk, that determine how people respond to hazards.

Though timely and accurate information release can solve various problems of risk communication, the cognition of risk messages needs to be understood thoroughly, otherwise the effectiveness of the communication may be limited. The government needs to not only provide timely and correct information, but it should also make sure that such information is received and understood by relevant stakeholders. Some of the current information published by the government is too “specialized”, so that the related departments and many ordinary people have difficulty in understanding it. Because of this, social panic tended to grow in several outbreaks (S. Wang, 2014). Risk communication must also consider whether stakeholders and the public need all this information and how can they receive it.

As the SARS epidemic went largely unnoticed at first, there wasn’t good listening to other sectors or the public among government departments or other organizations. At the beginning of the outbreak, some local governments did not communicate with the public or other sectors, leading to the failure of government information, public panic and loss of government credibility. Further, many clinicians were unaware of the epidemic threat posed by the “atypical pneumonia”.

Just posting truthful and accurate information for the public cannot ensure effective communication. For example in H7N9, there was a statement that people had been infected with H7N9, a new subtype of influenza virus which is only found among birds. The human-to-human transmission of avian influenza virus was not mentioned. And these professional announcements made ordinary people confused (L. Sun & Ma, 2012). Actually in the prevention and control of the epidemic, relevant departments only needed to tell the public in plain language how H7N9 spreads, and how to prevent it. Academic discussion can be
carried on in other places or moderated by government to confirm the key messages for readers.

9.2.2.2 Developing and maintaining trust is the key

Trust is the basis for communication. Trust in the information provided is very important for stakeholders in building confidence for response to a crisis when there are differences in risk perception between different parties. In a crisis, trust can assist parties to maintain a positive and cooperative attitude in the face of uncertain risks, with the belief that the event will move in a better direction. However, the trust model of communication in Chapter Five maintains that when people are upset they commonly do not trust authority. Trust, therefore, must be established well in advance of an actual crisis event. Compared with things which can build trust, the negative events that destroy trust attract far more public attention, and the effects of negative events are far bigger than positive events. Hence what determines trust between the parties is very important. In risk communication, if there is no trust, it is impossible to truly overcome the barriers. Therefore, trust is critical.

In a crisis, the public’s discernment and resistance to information are weak and inevitably, they may be confused, lost, and many even panic. If rumors are not clarified, this can cause public panic and social disruption (J. Liu, 2014). Comprehensive and objective reports will help the public deal with risks in an informed way. During the H7N9 outbreak, the media reported authoritative, timely, scientific information which ended the rumors, effectively stabilizing society and building public trust in the media and government.

In the SARS outbreak in 2003, just after the Spring Festival in Guangzhou, there were rumors about the disease and citizens had panicked and hoarded white vinegar and Radix Isatidis. At this time, officials hadn't released any authoritative information, and even though some media
were aware of the disease they strictly abided by the disciplines of news and considered that they mustn't take the liberty to report SARS. The delays of more than two months in reporting the first cases of SARS caused distrust both in China and in the international community and an inadequate response. However, in response to H7N9, after the first three cases were identified on 29 March, 2013, the NHFPC notified the public of the H7N9 epidemic, and published “Questions and Answers” about the epidemic on the official website on March 31. Basic information on all the cases in China and measures taken were reported in a timely manner to the WHO. As the information was more promptly disclosed and there was more transparency, there was more trust by the public and the international community.

9.2.2.3 Inadequate information disclosure and communication mechanism

Chapter Three has suggested that information communication is essential in emergency management, and the public speculation and panic caused by poor information communication may be more terrible than the crisis itself (Fang & Qi, 2009). Public health emergency management must use a two-way flow of information to build trust between the government and the public, so as to jointly deal with the risks. Only practicing a two-way and symmetrical communication model can enhance the role of risk communication. In the past in China, after the occurrence of sudden public health events, because of the practice of top-down one way communication, there was a delay in information collection, transmission, publishing and public information feedback (Guo, 2012). These lags seriously affected the government’s effective management of sudden public health events.

In an environment of open, comprehensive, transparent risk information, one can have a more comprehensive understanding of risk and accurate risk assessments. One can ease emotions of fear and anxiety, and can increase rationality (J. Liu, 2014). The public can fully understand the real epidemic, and can deal with rumors scientifically and rationally. Maintaining an open and
honest attitude, at the same time focusing on risk information needs will build trust in risk communication and realization of public trust in the media, the government, and the society. While facing risk events, open, honest reports can address the concerns of the public. Truth-seeking through the media and an accurate grasp of public opinion can curb rumors and ease the public panic, and prevent social unrest (J. Liu, 2014).

Because the system of public health information is not perfect, this can affect the timeliness of reporting and hence the efficiency of dealing with emergency events. In order not to affect the evaluation results, some adverse information is sometimes deliberately obscured by the government, by delaying, understating or concealing sudden public health events. The government may be concerned that the public disclosure of real information will cause social panic, and it may deliberately hide the true epidemic information. Such opacity and untimely disclosure of information not only increases the cost of public health incidents, but also increases the formation of social unrest factors and aggravates social panic, and mistrust in authority (Qiu et al., 2016).

In the past, as reflected in the case of SARS, the Chinese government often failed to fully provide comprehensive crisis information to the public in a timely manner so that the public were not aware of the full extent of the crisis. Limited to the traditional propaganda strategy of “loose outside and tight inside”, the government was often accustomed to controlling the normal dissemination of information and thus appeared to have covered up the truth. Thus, it was often not effective or easy for the government to become proactive (A. Lin & Wu, 2010). This actually caused public panic and aggravated the difficulty of handling the events and the degree of control. In the early stage of the SARS outbreak, officials didn't release any authoritative information, and even the media were afraid to report what they actually knew. The government departments and health authorities didn’t establish their credibility by
releasing information to the public promptly, leading most people to choose to believe the rumors. The delays of more than two months in reporting the first cases of SARS caused distrust and led to an inadequate response.

While dealing with H7N9, the Chinese Government had a stronger epidemic information management system, and it adopted a more open, timely and accurate reporting process. Generally, there was no mass panic and the social situation was relatively stable. Starting from public health and the risk prevention, through risk response knowledge provided by the media, they met various needs to a better degree and established public trust in the government, and achieved better risk communication.

If we compare the effect of information dissemination in China and in developed countries, during the H7N9 outbreak, China’s dissemination was still not entirely adequate. The developed countries mostly adopted specific prevention and treatment means in accordance with the advice of WHO, such as the use of vaccines or the treatment with the drug “Tamiflu”. In China, a lot of non-scientific treatments were suggested by some local health departments. They included *Radix Isatidis* and white vinegar (S. Wang, 2014). At the same time, some information announced by government was expressed in professional “jargon”, which made it difficult for many ordinary people to understand the information and increased social concern and anxiety.

Under normal circumstances, any public health emergency can lead to the public speculating and doubting. Therefore, if the health emergency decision makers want to obtain public trust, they must treat the public with a sincere and honest attitude, and reveal relevant information in an open, timely manner. But during the SARS outbreak and to a lesser extent during the H7N9 outbreak, the government didn't make its information public enough. In some places, it often fell into a passive response to media disclosure and suppressing information.
Although the provisions of step by step reporting in China regulate the information release procedures and avoid major mistakes, it often leads to a lag time for the publication of information and results in many loopholes in the risk communication of sudden events. With the development of the high tech information society, the channels for government communication in China are also being improved. While the main carriers of government information are newspapers, TV, government websites, radio stations and other mainstream media and announcements, bulletins and other official publications, these are no longer enough to reach the diverse target audience.

In order to further protect the public’s right to know and to update the concept of communication technology of China’s government information disclosure, the government should actively collect information on domestic and foreign information disclosure, and expand the channels of information disclosure.

9.2.2.4 Considering the public as a partner

Covello suggests that risk communication is an interactive process of exchange of information and opinion among individuals, groups and institutions for risk management (see Chapter Three). The consequences of sudden events not only depend on the incident itself, but also depend on the public perception, interpretation and response to these sudden events (Yan, 2012). The cooperation of the public can make up for a shortage of emergency management ability in sudden public health events. The traditional risk communication of sudden public health events was based on government standards, and it was believed that the events could only be controlled by the government, and that the public's awareness of the situation was not important (Guo, 2012). This attitude seems to persist. Government unilateral action neglecting public participation is still a major problem in emergency risk communication at present in China.
The aim of risk communication is not only to reduce public concerns and increase the efficiency of actions, but also to foster an informed, involved, interested, rational, thoughtful, committed cooperative group (J. Liu, 2014). This partnership, once it is established and maintained, will affect the risk communication effectiveness to a certain extent. Open communication makes a decisive impact on the effectiveness of risk communication (X. Xie & Zhen, 2003). Effective emergency risk communication should be two-way interactive communication with the public. It needs to fully mobilize the initiative and enthusiasm of the public (Guo, 2012).

But the reality is, in many of the risk events, the status of the parties is not completely equal. The general community is always in the vulnerable position of receiving and asking for information. The government and related institutions are in the advantaged position of providing such information. In China, the government controls the majority of the society's information resources. The status and nature of media also determine their priority in receiving information, particularly in risk communication (A. Lin & Wu, 2010). In the emergency risk communication of sudden public health events, health administrative departments and health care institution tend to communicate top down. The information is released to the public by the health administrative departments, but there is no mechanism collecting for public feedback.

During the early stages of SARS, there was no listening to the public as the officials withheld information. In the later stage, the national government used the Chinese media to gain public support for the SARS response, including posters and publications with the slogans “Declare War on SARS” and “Activate the whole Party, mobilize the entire populace, win the war of annihilation against SARS”. But there was still little opportunity for the public to give feedback.

In contrast, during the H7N9, China had daily reports of the epidemic, and there was heated
discussion about H7N9 in the Chinese media. Chinese government also paid special attention to interacting with the public, by creating public accounts on WeChat, timely updating of epidemic information, giving timely responses and countering rumours on social media, such as microblogs. Overall the responses to H7N9 indicated that the different agencies received regular feedback from the public and that the agencies were responsive to the public’s needs. However, they recognized the importance, as well as the difficulty, of verifying information received from the public.

With the development of new media, despite increased opportunities for the public, and the apparent interest of leaders in the public, the public is still a disadvantaged group as the public is separated from the authorities. Moreover, this group are direct victims of the risk. Their vulnerable status limits their voices (X. Fan, 2014). The government needs to understand that the risk of epidemic disease outbreaks relates to people, and emphasize the dialogue between stakeholders (Guo, 2012). It should be committed to reconciling the cognitive differences and contradictions about the disease risk between the government, professional organizations and the public, which will become the important content of the emergency management mechanism of sudden public health events in the future.

9.2.2.5 Enhancing relevant laws, regulations and planning

As Chapter Four described, in order to more effectively respond to public health emergencies and prevent bioterrorism, China has revised and promulgated a series of laws, regulations and measures in recent years. At present, they include “The People’s Republic of China Government Information Disclosure Regulations”, “Public Health Emergency Regulations” and the introduction of “Earthquake Disaster Reduction Law” before 2003 and “People’s Republic of China National Defense Law”. Throughout the laws and regulations promulgated in the past 20 years, one thing remains the same. That is, the government should promptly
release the latest information on the emergency to the public (Guo, 2012). However, the laws and regulations related to public health emergency risk communication mechanism are not perfect. Although China has the “Emergency Response Law”, “Open Government Information Ordinance”, “Public Health Emergency Regulations” and other public health requirements to publish provisions for emergency public health information, it emphasizes the unilateral release of information and ignores two-way emergency risk communication.

The emergency plan is the blueprint of emergency management. If the effective plan of risk communication cannot be developed, it will be difficult for the risk management strategy and policy planning to be completed (A. Lin & Wu, 2010). With a well-developed plan and good preparation, the responsibility of different departments is clear, and public health emergency risk communication can be well informed and conducted in an orderly manner.

Chinese public health risk communication includes few special plans either at national or local government levels. After the SARS outbreak in 2003, in order to improve risk communication, the MOH developed the Guidebook on Risk Communication of Public Health Emergency in 2007. The principles in the Guidebook relies heavily on Western emergency risk communication principles. However the Guidebook is an internal document for some health departments and CDCs, and is not accessible to all public health emergency professionals. Thus advance planning for public health emergencies is still inadequate.

In the prevention and control of influenza H1N1 in China, the MOH developed a special “Risk Communication Guide for H1N1”. Except for in the strong explanation of principles of communication, the main content of the guideline was education about prevention of H1N1, and it asked health departments, hospitals and CDCs to respond to media themselves. The Guidebook also lacks substantive operational content. Thus, during H7N9 outbreak, although some of the main principles of risk communication were included in the emergency
management planning, there was no a special guide on risk communication for H7N9. There was a lack of operability and a lack of clarity about the target audience in some emergency management planning, which limited the effectiveness of the response.

9.2.2.6 Multisector cooperation is critical to effective risk communication

Dealing with public health emergencies cannot be accomplished by a single department or a person. The challenge of cooperation and coordination has been discussed in Chapter Five. Risk communication also involves links between the health administrative department and the public, the administrative department of public health and the media, and within the health administrative department itself. Good coordination and cooperation between related government departments will be conducive to co-ordinate strength, and help to complete the information collection and feedback, and can facilitate timely provision of comprehensive information for emergency decisions.

Emergency preparedness and response to pandemics requires multi-sectoral cooperation and coordination. To ensure a multifaceted response to an infectious disease outbreak, and to reduce the impact of the outbreak on many sectors of society, a well-defined command and control structure with strong leadership is required to coordinate the response, allocate resources appropriately, and ensure the dissemination of consistent information in a timely matter. For public health emergencies, because the large number of stakeholders involved, decision making is not a simple process. It needs interagency information communication and various support and cooperation.

At present, the Chinese government’s risk management is affected by traditional public management mechanisms, and it lacks a specialized risk management system. When an incident occurs, the government practice is to immediately establish an interim command
structure, set up a temporary command team and introduce a set of interim measures. Due to this lack of an emergency management center of unified command, therefore, the government is often unable to integrate different departments and agencies in an orderly way, and it is unable to effectively coordinate the various functions of joint response (Fang & Qi, 2009).

SARS emphasized the importance of communication and collaboration with domestic and international policy makers, financial markets, the travel industry and other key sectors. During the SARS outbreak, formal mechanisms for communication, collaboration, and coordination among adjacent regions, related departments, and agencies were absent. In the early outbreak of SARS, there were two separate health systems for the local government and military in Beijing. As the information of the two systems couldn’t be shared, unified management was difficult. Although some epidemic prevention policy was carried out, the lack of collaboration finally brought the difficulties in execution of the policies, and a failure in epidemic prevention work. It was the lack of coordination between government departments, especially the health and agricultural sectors, which led to the greatly increased costs of crisis management, and even lead to the instability of society and social disorder.

Medical institutions are often the first contact with infectious diseases in patients, but also the main bodies for collecting and reporting epidemic information. However, the poor historical collaboration between medical institutions and the CDCs means there has been a lack of effective integration of the limited health resources. Thus strengthening the public health system and medical system linkage mechanism is particularly important (Shao & Tian, 2013). The failure to identify the SARS virus in 2003 and the infection of so many doctors and nurses was mainly because the Chinese government did not organize quickly effective collaborations to facilitate identification of the offending pathogen and to share the prevention measures.

During the H7N9 outbreak, a JPCM was established at national and local levels to lead and
coordinate the emergency response to H7N9 virus. The national JPCM, led by the NHFPC, consisted of 13 governmental ministries and commissions, including the MOA, the State Forestry Administration, and the Ministry of Science and Technology. An inter-regional JPCM was also established to support the sharing of information and coordinated responses among the affected provinces and municipalities. Significant efforts were made to ensure that the emergency response to the newly detected H7N9 virus was based on laws and regulations, the principle of transparency, prioritization and international collaboration. At this time, China CDC rapidly established and always maintained very close technical cooperation relations with the WHO, in discussions of technical problems. It also maintained close communication and technical discussion with the representative office of WHO, West Pacific headquarters, and the WHO Collaborating Centre for Reference and Research on Influenza.

### 9.3 Recommendations for risk communication for emergency management in pandemics in China

Identification of these key influences of risk communication and China’s experience to date suggests a number of areas for improvement.

### 9.3.1 Increase the awareness of risk communication and bring risk communication thinking into daily management of disease prevention and control

In the public health emergency management process, the relevant departments are worried about the impact of their own image and economic losses, so they have concealed epidemic outbreaks and dealt with the epidemic secretly. These ideas restrict the management of emergencies in China. Although the information blockade and concealing the facts could stop negative influences from spreading in an environment of bad transportation and communication, in the age of globalization and information technology, this approach no
longer works. Once the public get to know the truth, they will not trust the government anymore. Further revelations of the facts will extend the negative impacts. Therefore, the government must change its concept of emergency management, and establish an awareness of the need for risk communication.

Daily risk reports and early warnings are the key to the communication of public health emergencies. Trust is not established after the event, but establishing a culture of open, transparency and honest in everyday communication does establish trust. Only by bringing the awareness of risk communication into the daily routine can government offices gain the trust of the public. Risk communication in government emergency management is based on the collection of information, and the planning of risk communication needs to be tested by representatives of target audiences. Only correctly understanding the normality of emergency management can make effective evidence-based management possible. These require that the government needs to identify the daily risk communication sectors and strengthen risk communication information and communication mechanisms between public, government and media in their daily work.

9.3.2 **Provide timely and comprehensive scientific information, to enhance public trust**

Experience warns us that in public health incidents, if information is not published in a timely manner and the information does not match public demand, it is possible for the public to use all of the informal public methods and channels to compensate for the lack of information. But information obtained by such methods is often from unreliable sources, and even may be wrong, malicious or one-sided information, so that the public cannot accurately or objectively assess its risk perceptions.

Comprehensive and open information is the prerequisite and foundation of realistic “risk
perception”. Risk information is the core of uncertainty, uncertainty is the essence of a state of incomplete information. If the accuracy of information increases, uncertainties will diminish, risk levels will be reduced accordingly. In the era of highly developed networks, people can get messages through various channels, so any false information will not have a positive impact on epidemic prevention and control, but will lead to rumors and exacerbate social panic.

Only the open publication of adequate information can help stabilize the public opinion and to appease public sentiment. For the Chinese government, as the largest owner and coordinator of public information resources in the country, effective management of information in a crisis is the key to handling public crisis events. Effective and timely crisis communications can avoid a crisis of public opinion and cause further troubles. Therefore, when the risk occurs, the government needs to publicize information through various media channels including social media, such as press conferences, notification, WeChat, Blog and other forms, and carry out related work promptly.

9.3.3 Protect the public's right to know, recognizing the diverse public’s needs and value the public as a resource and protect its right of expression

In emergency management, government must respond to crises and share information with the public. Risk communication is the process of the public participating in community decision-making processes (A. Lin & Wu, 2010)s. Protecting the public's right is a prerequisite for risk communication. The government must view the public interest as a starting point, follow its own law, and promptly publicize the information and the measures to be taken.

In fact, the government's active and timely disclosure of information, and respecting the public's right to know are not only conducive to objective understanding and rational judgement of the risk, but also conducive to enhancing public confidence to the government, so
as to enhance the authority of the government in the processing of risk.

Accordingly, the public feedback in risk communication has caught the attention of Chinese society, seeking ways to solve the problem, creating an agenda-setting conversation between the government and media and the public. It also ensures the full exercise of people’s right of expression. At the same time, if the public get the information and give their feedback, that will promote the smooth movement of information between the government and the public, which makes it possible to combine efforts of the government and public (W. Sun, 2013).

Through the media, opinion and suggestions can be equally communicated to each party which realizes two-way communication and interaction between the government and the public. In this process of interaction and communication, in addition to completing the two-way flow of information and ideas, the public can accumulate experience in the interactions, to some extent, and can improve their “public participation” (J. Liu, 2014).

While dealing with public health, the government can take advantage of convenient channels and media to collect people's attitudes, opinions and recommendations. In addition to traditional phone calls, text messages and other ways, the media can tap into people's voices by WeChat, Weibo, BBS and so on.

9.3.4 Strengthen information communication, to establish mutual trust and good partnership

Establishing and perfecting a set of operational and practical emergency risk communication mechanisms will play a very important role for the government, the administration of the Department of Public Health and the news media in the future. This will involve risk communication in the management of public health emergencies including health administration and the public, health administrative departments and the public media, and
between the administrative departments themselves.

Establishing and improving a multi-party emergency risk communication mechanism will facilitate the coordination of all forces. The establishment of communication mechanisms will contribute to the coherence, completeness of information exchange and interaction, and assist the administrative departments to collect reactions. It will also help the public and the media to quickly report events to the administrative departments of public health; it will help to monitor the results and developments of the events, and will help the administrative departments to make the right decisions (Guo, 2012). This kind of information gathering, feedback, emergency communication system is a complete emergency risk communication mechanism.

To jointly deal with the risks, public health emergency management must use a two-way flow of information to build trust between the government and the public. Only practicing a two-way and symmetrical communication model can enhance the role of risk communication. During the H7N9 outbreak, risk communication achieved more realistic perceptions of risk through the dissemination of information, and established mutual trust and good partnerships. These results were based on the “two-way and symmetrical communication” mode.

Public health departments need to strengthen the public health emergency awareness of risk perceptions, learning from foreign experience, doing in-depth research, strengthening theories, and establishing a complete emergency risk communication mechanism. In order to break with the patterns of the past, they need thorough consideration to further improve risk communication method, making a sustained, bi-directional communication between the government and the public.

9.3.5 Respect and engage key stakeholders as early as possible, to establish trust in each other
Trust is the core of risk communication and also a key factor in risk communication to achieve the desired outcomes. Public health and people's lives and health are closely connected, and always attract public attention. Everything health practitioners do is for people's healthy growth. Public health itself is a humanitarian cause, and public health workers should put people’s concerns at the center position, in order to maximize its own value. So in the process of communication of the need for public health measures, in addition to the presentation of timely, accurate, scientific reporting of an event, special attention is required to consider humane care in communication, as an expression of social and public responsibility. Any lack of humane care in public health work will cause people to lose confidences, and damage public trust in the very people there to protect them. Establishing an effective risk communication system to fully protect the public's right to know and the right to express, so that the public can fully and openly express a desire to obtain information and requirements will go a long way towards mutual trust.

To build trust, especially from the audience's point of view, communications should reflect the events and concerns experienced by the people. This is clearly reflected in the H7N9 outbreak. In addition to focusing on infected patients, the media was concerned about health care workers and vulnerable groups of the public. Through different reports on events and real people, they vividly showed people’s strong hearts, as well as traits of confidence and determination. Such news used emotional appeals of the risk, but at the same time, also allowed the media to get more public attention and trust, which contributed to building credibility of the authorities. This provides the necessary conditions for the work of a successful risk communication and it is the guarantee of good results of risk communication.

9.3.6 Take advantage of new media and other non-government information channels, to improve open, transparent and timely dissemination of information and timely
dissemination of information

Traditional mass media such as television, newspapers, radio, as the most basic link between the government and the public, play a big role in a public crisis. With the rapid development of information technology, however, the internet has become a platform for the public to express their feelings and views. New media have become a new authoritative source of information and very important actors and performers in international affairs, and government is paying more and more attention to that. Due to the borderless communication characteristics of the media, as well as the characteristics of the popularization of the new media, a country’s crisis will always be the concern of domestic and foreign media. As the public crisis continues, new media as the main force of the mass media, become the main voice of public opinion. In all kinds of unexpected public health incidents, non-mainstream media and social spread of gossip are the main factors causing social instability (Guo, 2012). Nevertheless, several respondents indicated that they did not believe useful information had been received or could be received from the public, as they thought they had a lack of professional knowledge. Thus it is imperative that governments understand both the positive and the negative power of these new media.

During the H7N9, Chinese government also paid special attention to interacting with the public, by creating public accounts on WeChat, promptly updating epidemic information, promptly giving responses and countering rumours on social media such as Weibo. This illustrates an understanding of the positive power of these media.

In terms of the different characteristics of various communication channels, the government and the media should select the appropriate communication channels according to its mastery of the critical incident information and ability to withstand the risk. There are many communication channels, so government needs to make use of new media and other
non-government information channels (A. Lin & Wu, 2010). Especially in recent years with the development of science and technology, management of new information and communication technologies has brought new power for the government's public handling of the crisis. It should be combined with the new information and communication technologies, to take a suitable approach to information dissemination.

In this new situation, for public health crisis information dissemination, we should make full use of multimedia power to update the inherited information channels, and we should deal with public crisis incidents in an open and interactive way, in order to eliminate public panic and coordinate of crisis management. In the meantime, we should also monitor the media development, keep pace with the times and let the people make full positive use of the media they like.

9.3.7 Establish and implement comprehensive laws, regulations and plans related to emergency risk communication

For upgrade its outdated emergency management capacity, China needs to constantly update related laws and regulations, and to develop a national medium- and long-term project to develop planning for emergency risk communication. China needs to revise current plans and solve the linkage problem between sector plans and special plans, and clarify the duties of every division of government. In order to ensure the operability of the plan, China also needs to strengthen the comprehensive emergency practice runs. In relevant plans, it needs to consider the different needs of government personnel, medical workers, the public, and the departments which are directly related, and use different communication strategies to perform targeted risk communication.

Meanwhile, relevant government authorities actively organize the related research works,
focusing on people’s specific information requirements, information access, acceptability of information, communication evaluation, to provide facts for promoting risk communication.

To effectively address global emerging infectious threats, the government of China should gradually standardize the legal position international multilateral joint control mechanisms. At the time of revision of the International Health Regulations, we should identify mechanism for transnational multilateral prevention and control of infectious diseases, specify responsibilities, powers and interests and international location. China should establish open and transparent decision-making mechanism with wide participation of countries, experts and members, open academic meetings and conferences and increase transparency and scientificity in decision-making (Z. Huo, 2016).

9.3.8 Strengthen multisector cooperation and communication mechanism, to enhance decision-making and capacity for emergency management

Any risk management process is constituted of a series of decisions, which determine the success or failure of the action. Risk management involves a great deal of expertise in decision-making and implementation, and different types of risk events require different professional support. This requires government departments to fully consult experts in decision-making, and to have access to experts’ close cooperation in the implementation. In addition the authorities need to make adjustments in decision-making and implementation, in order to evaluate the uncertain consequences of an influenza pandemic, and to achieve maximum benefits with minimum cost from the decision-making processes.

The authorities need to strengthen risk management, establish unified command center, perfect a mechanism for joint control by multiple related government entities, and coordinate integrated joint efforts of different sectors and institutions, providing timely and
comprehensive information for emergency decisions. Mainly, the government needs to strengthen the internal communication of the health administrative sectors, to streamline the urban and rural network reporting system, to collect public health event information early and ensure good communication between the higher and lower levels of government, making sure the information is sent to health departments promptly, which can create conditions for timely decision-making.

The government also needs to focus on notification and sharing of information between the health administrative sector and the quarantine testing sector, the education sector, the environmental protection sector, and the food and drug monitoring management sector, to achieve sector collaboration and create conditions for cooperation of the various sectors to deal with emergencies.

The mechanisms for international or multilateral disease control involves different states. Since languages and cultures are different, the early information sharing and exchange are difficult, so we need to establish and perfect a mechanism for international exchange and cooperation. We need to develop an international outlook, abandon national differences, and strengthen cooperation and information through interconnected exchanges of staff. We need to unify standards, channels and ways of reporting information and ensure sharing of related information to all relevant sectors.

9.4 A summary of key findings, discussion and recommendations

This research is designed as a degree study but also serves as a tool for Chinese decision makers to improve their emergency management of pandemics and disease outbreaks. The main findings, discussion and recommendations are summarized in Table 13.
Table 13  The main findings, discussion and recommendations

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<th>Theme</th>
<th>Main findings</th>
<th>Discussion</th>
<th>Recommendation</th>
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| Risk communication for emergency management in pandemic prevention and control in China | 1. For the comparative analysis of risk communication relevant to and useful for China, eight key principles were selected to form a frame of reference for the assessment:  
- Developing trust  
- Being transparent  
- Making announcements early  
- Listening well  
- Planning well  
- Being honest and open  
- Being empathetic and caring  
- Accepting and involving the public as a partner  
2. The SARS outbreak fully exposed China's lack of experience in public | 1. Lack of awareness of risk communication and risk perception  
2. Developing and maintain trust is the key  
3. Inadequate information disclosure and communication mechanism  
4. Considering the public as a partner  
5. Enhance relevant laws, regulations and planning | 1. Increase the awareness of risk communication and bring risk communication thinking into daily management of disease prevention and control  
2. Provide timely and comprehensive scientific information to enhance public trust  
3. Protecting the public's right to know, recognizing the diverse public’s needs and value the public as a resource and protect its right of expression  
4. Strengthen information communication, to establish mutual trust and good partnership  
5. Respect and engage key stakeholders as |
Poor internal communication and external information blockades seriously affected the credibility of the government internally and externally. In contrast, by the time of the H7N9 outbreak, the Chinese government’s risk communication strategies had improved significantly by increasing its public trust by providing open, transparent and timely dissemination of information, planning, engagement with the public, and collaboration between sectors. These were associated with a smoother process, a more responsive community, less social disruptions, and rapid control of this serious disease.

This study revealed the importance of risk communication towards decision-making and cooperation in dealing with uncertainties involved with

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<th>6. Multisectoral cooperation is critical to effective risk communication</th>
<th>early as possible, to establish trust in each other</th>
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<td>6. Take advantage of new media and other non-government information channels, to improve open, transparent and timely dissemination of information</td>
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<td>7. Establish and implement comprehensive laws, regulations and plans related to emergency risk communication</td>
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<td>8. Strengthen multisector cooperation and communication mechanism, to enhance decision-making and capacity for emergency management.</td>
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pandemics. From SARS to H7N9, risk communication practices in China have greatly improved, which in turn has facilitated the decision-making process in public health crisis management. Timely decision-making, smooth implementation, and effectiveness of pandemic emergency management relied greatly on collaboration between different stakeholders, which was enhanced by risk communication.

4. The keys to effective multi-sectoral collaboration are information sharing and the development of a coordination mechanism. More importantly, early engagement of key stakeholders and involving them in the decision-making process is vital for the success of cooperation for prompt responses to crisis.
9.5 Conclusion

By linking with the literature review in Part I of this thesis, this chapter has outlined the main findings from the previous chapter and then developed a discussion about the risk communication in China’s emergency management operation, and has concluded with recommendations regarding risk communication for emergency management for future pandemics in China. This discussion allows for the research conclusions to be accurately documented in the next chapter.
Chapter Ten    Conclusion

10.1. Introduction

This thesis demonstrates global knowledge of the role of risk communication in emergency management by providing a systematic analysis of two cases in China, and hence contributes to better understanding of the role of risk communication in this important field. By comparing the processes of prevention and control of the SARS and H7N9 in China with a focus on risk communication, the research identifies and analyzes risk communication issues in order to improve emergency management of pandemics in China.

The research reflects the progress that has been made in risk communication for emergency management of disease outbreaks in China. Risk communication plays a very important role in decision making in disease outbreaks. The recommendations for risk communication strategies provided in the previous chapter have significant implications for future public health emergency management in China.

This final chapter summarizes the overall findings of the research, emphasizes the findings of each chapter, and draws attention to the major contribution and significance of the research. Limitations of the research and suggestions about possible directions of further research on China’s risk communication for emergency management are also summarized.
10.2 Overall findings of the research

The overall purpose of this research was to compare China’s responses to SARS and H7N9 in a framework of principles drawn from international good risk communication practice in order to inform risk communication strategy development to improve emergency management of pandemics in China. The main findings and discussion of this research are summarized as follows:

- An extensive review of international literature and risk communication guidelines revealed over 20 principles and themes about risk communication good practices. For the comparative analysis of risk communication relevant to and useful for China, eight key principles were selected to form a frame of reference for the assessment: developing trust; being transparent; making announcements early; listening well; planning well; being honest and open; being empathetic and caring; and accepting and involving the public as a partner.

- The SARS outbreak fully exposed China's lack of experience in public health risk communication. Poor internal communication and external information blockades seriously affected the credibility of the government internally and externally. In contrast, by the time of the H7N9 outbreak, the Chinese government’s risk communication strategies had improved significantly by increasing its public trust by providing open, transparent and timely dissemination of information, planning, engagement with the public, and
collaboration between sectors. These were associated with a smoother process, a more responsive community, less social disruptions, and rapid control of this serious disease.

- Previous literature seldom mentioned the role of risk communication in facilitating decision-making and cooperation, but this study revealed the importance of risk communication towards decision-making and cooperation in dealing with uncertainties involved with pandemics. From SARS to H7N9, risk communication practices in China have greatly improved, which in turn has facilitated the decision-making process in public health crisis management. Timely decision-making, smooth implementation, and effectiveness of pandemic emergency management relied greatly on collaboration between different stakeholders, which was enhanced by risk communication.

- The keys to effective multi-sectoral collaboration are information sharing and the development of a coordination mechanism. More importantly, early engagement of key stakeholders and involving them in the decision-making process is vital for the success of cooperation for prompt responses to crisis. Risk communication strategy should incorporate such measures.

This research identified a gap between China’s government health emergency management and the good practice from other parts of the world, especially in the handling of the SARS crisis, which exposed a lot of problems in the Chinese government’s in health emergency management, especially health emergency risk
communication and decision-making mechanisms. There is still much to learn about risk communication from past disease outbreaks and pandemic prevention and control programs in China. They can be categorized under 6 major headings:

- Lack of awareness of risk communication and risk perception
- Developing and maintain trust is the key
- Inadequate information disclosure and communication mechanism
- Considering the public as a partner
- Enhancing relevant laws, regulations and planning
- Strengthening multi-sector cooperation

Based on these learnings, this research provides the following recommendations:

- Increase the awareness of risk communication and bring risk communication thinking into daily management of disease prevention and control
- Provide timely and comprehensive scientific information to enhance public trust
- Protect the public's right to know, recognizing the diverse public’s needs and value the public as a resource and protect its right of expression
- Strengthen information communication, to establish mutual trust and good partnership
- Respect and engage key stakeholders as early as possible, to establish trust in each other
- Take advantage of new media and other non-government information channels,
to improve open, transparent and timely dissemination of information

- Establish and implement comprehensive laws, regulations and plans related to emergency risk communication
- Strengthen multisector cooperation and communication mechanism, to enhance decision-making and capacity for emergency management.

10.3 Purpose and main findings from each chapter of the thesis

Focusing on the research topic, this thesis was developed in two parts: first, a literature review, then the methodology, findings, discussion and conclusion. Chapter One provided the fundamental background for this research. It focused on the research background and rationale, scope and aims, described the research methodology and provided the structure of this thesis.

Part I, the Literature Review, includes Chapters Two to Chapter Five. It presents a literature review for the four contextual fields: pandemic and disease outbreak, public health emergency management, public health emergency management in China and risk communication.

Chapter Two describes the history, feature and impact of pandemics. This chapter explores the concept and history of pandemics; summarizes the seven key features of a pandemic, including wide geographic extension, disease movement, novelty, severity, high attack rates and explosiveness, minimal population immunity, infectiousness and contagiousness. It also discusses the negative impacts of pandemics and disease
outbreaks on health, economy, social and global security.

Chapter Three analyzes effective public health emergency management to reduce avoidable mortality and morbidity, economic and social impacts of pandemics and disease outbreaks. This chapter explores the concepts of emergency management and public health emergency management, and discusses the principles of emergency preparedness and response, and related problems of collaboration, information sharing and risk communication for public health emergency management. To manage public emergencies in order to reduce their impacts, effective preparedness and response are very important. Emergency preparedness and response requires a multi-sectoral approach. Effective and efficient coordination and collaboration, and information sharing are still challenges for public health emergency preparedness and response.

Chapter Four addresses emergency management as one of the priorities of the Chinese government’s health crisis management. This chapter provides an overview of the public health emergency management system in China, focusing on the organizational structure, legal framework, management system, and identifying challenges for the system. The China public health emergency management system has developed very fast, and China’s emergency management has greatly improved, but the emergency network in China is still not efficient enough, the responses to major accidents and emergencies are not adequately unified, the joint response mechanisms are weak, and ongoing communication and cooperation among the departments associated with all types of emergencies are problematic.
Chapter Five examines risk communication theories, principles and practices in public health. This chapter identifies the concepts of risk and risk communication, explains the purpose and theories of risk communication, and examines its roles, principles, and practices and the problems of risk communication in public health. Risk communication plays a central role in the management of infectious disease, but there are many factors that cause problems in risk communication. They include lack of risk awareness, lack of transparency, lack of openness, weak planning, giving information late, not listening to other stakeholders, and lack of collaboration and coordination.

Based on an analysis of some important guideline documents and best practice studies, eight key principles are identified as essential for a comprehensive risk communication for outbreak management. They are: develop trust; be transparent; make announcements early; listen well; plan well; be honest and open; be empathetic and caring; accept and involve the public as a partner.

Part II, research methodology, key findings, discussion, recommendations and conclusion, has five chapters. Chapter Six, based on the literature reviewed in Part I, explains the research design, presents the research question, the conceptual framework and the methodological approach, and provides the details of the fieldwork processes for data collection and analysis. Research validity, reliability and ethical issues are also described in this chapter.

Chapter Seven examines the two cases of SARS and H7N9 prevention and control processes in China. This chapter analyzes the epidemiological characteristic, history,
impacts, emergency management, and the communication and collaboration problems of SARS in 2003 and H7N9 in 2013. Both outbreaks of SARS and H7N9 represented serious public health emergency crisis events in China, and both had a very large impact on health, society and the economy. The control efforts for SARS were slow to be mobilized and were heavily criticized and generally considered to be suboptimal, as the poor handling of SARS exposed serious information communication problems in the then emergency management system processes. However, the H7N9 response earned the praise of the international community, as the response was much swifter and more transparent than it was in the SARS outbreak.

Chapter Eight provides further results based on the document review, in-depth and focus group interviews from the case study. This chapter focuses on the results and major findings of the research. This chapter provides the results of a comparative analysis of risk communication used in the responses to SARS and H7N9 using eight key relevant principles selected as a useful framework of risk communication to guide disease outbreak management in China. It is clear that the H7N9 response was better than that for SARS for almost all these principles of risk communication including trust, transparency, honesty, frankness and openness, empathy and caring. However this is analysis there is still room for improvement in the planning, accepting and involving the public as a partner, listening in the H7N9 events. Cooperation plays an important role in public health crisis management in decision-making process. Successful decision making and implementation and effectiveness of the emergency management
of SARS and H7N9 relied greatly on cooperation, coordination and information communication.

Chapter Nine provides a discussion of the key findings based on the literature reviews and case study analysis, and identifies the challenges and key learnings from analysis of the role of risk communication in disease outbreak prevention and control in China. Then several recommendations for risk communication in emergency management of pandemic in China are provided.

Chapter Ten, this chapter, summarizes the overall findings of the research, concludes with the limitations of the research and the future research implications, and the significance of this research.

10.4 Limitations of the research

Some limitations come from the qualitative collection methods as well. The main qualitative data collection methods include face-to-face interviews and focus group discussion. The participants were chosen from identified key stakeholders based on their background, roles and experiences in the research fields. They were contacted via informal networks of colleagues, existing organizations and networks in 4 cities: Beijing, Shanghai, Guangzhou and Zhejiang. Thus the in-depth interviewees did not include any county or grass-roots level organizations. They may not provide an accurate representation of the overall population, so there are inherent limits to generalizability of the data.
10.5 Future research implications

This research does not include daily risk communication. Prior to the occurrence of public health emergencies, risk communication and health education should be regularly carried out, which will help to build the communication channels during an incident. Future research may focus on the study of work organization, communication content, the monitoring of public opinion and the evaluation of risk communication effect on daily risk communication.

In order to advance risk communication models and better understand relevant factors in dealing with public health emergencies, it is necessary to further develop the research framework on the basis of empirical research, and extract the relevant factors influencing public health decision-making, and build a model of the relevant factors. It will be useful to develop a set of comprehensive, accurate and systematic assessment indicators to evaluate the risks of any situation, and to develop a system of indicators to evaluate the capacity for effective risk communication.

10.6 Significance of the research

Drawing from a range of international literature, this research has formulated a frame of reference consisting of eight principles useful to guide risk communication practices for public health emergencies in China. By comparing the SARS and H7N9 prevention and control processes in China with a focus on risk communication, the research findings provide an evidence base to inform risk communication strategies
development in order to improve emergency management of pandemics in China, and contribute to a better understanding of the field of risk communication in this important field.

This research highlights the importance of good cooperation for risk communication and emergency decisions. The process of risk communication is a critical part of the response to a public health crisis, and it should not be used as an instrument to eliminate criticism or quell public anger. These should be regarded as part of the crisis management in the decision-making process.

By comparing the SARS and H7N9 responses in China, the research demonstrates the importance of risk communication for emergency management, and its role in facilitating multi-sectoral cooperation and decision-making. Moreover, the study also provide useful evidence and recommendations to policy-makers on future risk communication strategies development for pandemic response, not only useful for China, but the global communities dealing with infectious outbreaks.
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TITLE OF PROJECT

Risk Communication for Emergency Management of Pandemic Prevention and Control in China

中国疾病大流行防控应急管理中的风险沟通

INFORMATION SHEET FOR INTERVIEW AND FOCUS GROUP

知情同意书

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Why is the research being conducted? 为什么要开展本次研究？

Pandemic related crises have caused enormous negative impacts on health, economies, and even national security in the world. Effective and efficient emergency management can reduce avoidable morbidity and mortality, and the negative impacts on social economy and national security in pandemic crises. Risk communication is needed in the whole process of emergency management, and has been demonstrated in some countries and settings as an effective tool to facilitate communication among
stakeholders during such a process.

China has a history of varying responses to outbreaks – eg the control efforts for SARS were heavily criticized and generally considered to be suboptimal, but the H7N9 response has earned the praise of the international community. Little systematic analysis of the role of risk communication has been undertaken. This proposed research study will use a case study approach to compare the strengths and weaknesses of risk communication in the SARS and H7N9 prevention and control response in China in order to inform future risk communication strategies development in China.

This study will be conducted under the supervision of Griffith University and is for Wuqi Qiu’s PhD thesis.

(in Chinese)疾病大流行相关危机事件在全球已对健康、经济甚至国家安全带来巨大的负面影响。有效的应急管理可以减少大流行疾病发病率和死亡率、社会经济和国家安全的负面影响。风险沟通贯穿于应急管理全过程，并在国际上某些国家事件处置中已证明为促进涉及的不同利益相关者之间沟通过程中的有效工具。

中国的疾病流行暴发，经历过不同的应对，如2003年非典（SARS）的应对受到了国际社会的批评，防治措施被认为不好的，但是2013年H7N9型禽流感应对赢得了国际社会的赞扬。在这些不同的应对中，风险沟通发挥的作用缺乏系统的研究分析。本研究将使用案例研究的方法，比较分析SARS和H7N9防控中风险沟通运用的好的经验和不足，为中国未来疾病大流行应急管理风险沟通提供策略依据。

本次研究由澳大利亚格里菲斯大学（Griffith University）发起，作为邱五七（Wuqi Qiu）博士研究论文的研究内容。

**What you will be asked to do 将会涉及哪方面的问题？**

Participants will be asked about some questions relating to what the social impacts, experience, barriers, problems and suggestions about risk communication for emergency
management in the SARS and H7N9 prevention and control response in China. The interviews will be asked about 12 questions (6 questions for media journalists) and about 3-4 questions will be discussed in the focus groups meeting. Interview will last about 60 minutes and the focus groups meeting will last about 1.5 hours, and both of them will be recorded by a digital voice recorder.

(in Chinese) 本次研究将对被深度访谈人员询问 12 个方面问题 (媒体记者 6 个问题)，焦点访谈小组会议讨论 3-4 个方面问题，问题主要包括中国 SARS 和 H7N9 对社会造成的影响，应急管理风险沟通过程中好的经验、所遇到的障碍问题及建议。访谈时间大约均需要 60 分钟，个人深度访谈和小组会议讨论内容均被电子设备录音。

The basis by which participants will be selected or screened
访谈人员选择的原则和基础

According to the research methods, in-depth interviews include officers from WHO, National Health and Family Planning Commission, the experts initially from local health department, agriculture department, CDC, hospitals and media journalists in Beijing, Shanghai, Guangzhou and Hangzhou cities; Focus group will be used for the other residents who have experience of SARS and/or H7N9 in local cities.

(in Chinese)深度访谈人员主要包括 WHO 官员，国家卫生计生委官员，北京、上海、广州和杭州 4 个城市的卫生行政部门、农业部门、疾病预防控制中心和收治病人定点医院的专家及主流媒体记者；焦点小组访谈人员主要包括当地经历过 SARS 和/或 H7N9 的当地居民。

The expected benefits of the research

These research findings will advance global knowledge on the role of risk communication in emergency management by providing systematic analysis and examples from two
cases in China. Hence they will contribute to better understanding of the application of risk communication in this important field. They will also provide an evidence base to inform risk communication strategies development in order to improve the emergency management of pandemics in China.

(in Chinese) 本研究将结合中国的典型案例，通过系统分析全球疾病大流行应急管理中风险沟通的作用,有助于将来更好地理解风险沟通在这一重要领域的应用。同时，该研究可以为发展风险沟通策略提供依据，以提高中国疾病大流行应急管理能力。

**Risks to you 可能涉及的危害**

The possible risks in this study include being uncomfortable with the questions or the answer may offend someone else.

(in Chinese) 本次访谈可能给您带来的可能危害包括自由言论对周围的人产生不适而对受访者产生不利影响，消除该危害的办法是对受访者的访谈内容严格保密，仅仅对研究负责。

**Your confidentiality 私密性**

Only the interviewee agrees and signs the informed consent can the study be carried out. All the information gathered remains confidential and in an anonymous form. The research involves access to, collection or generation of identified personal information, and there is no plan to disclose identified information to third parties. The information collected is confidential and will not be disclose to third parties without interviewees’ consents.

(in Chinese)访谈的数据不论是否被采用，包括论文以及发表的研究成果，被访谈者的个人信息都将严格保密，发表的数据一律以匿名的形式呈现。访谈前与受访者签订访谈知情同意书，并且弄清受访者是否愿意将数据用于发表文章及论文。受访
Your participation is voluntary 参与的自愿性

The participation in this study is completely voluntary and interviewees may refuse or withdraw at any time during the research process.

(in Chinese)参与本次访谈是完全自愿的，受访者可以在任何时间自主决定是否参加访谈，以及自主决定在访谈进行的任何时候退出。

Questions / further information 其它问题

If has any question, an interviewee may contact anyone of our research team.

(in Chinese)受访者如有任何其它问题，可以与本研究小组的任何一个成员联系。

The ethical conduct of this research 本次研究的伦理问题监督

Griffith University conducts research in accordance with the National Statement on Ethical Conduct in Human Research. If have any concerns or complaints about the ethical conduct of the research project, the participants should contact the Manager, Research Ethics on 3735 5585 or research-ethics@griffith.edu.au.

(in Chinese)本次研究有格里菲斯大学（Griffith University）开展，由澳大利亚人类研究伦理审核委员会（National Statement on Ethical Conduct in Human Research）进行伦理问题的督导，如果在伦理方面有任何的问题，可以联系：

电话：+61 7 3735 5585

邮件：research-ethics@griffith.edu.au

Feedback to you 反馈
If participants would like to receive a summary of the research results, he or she may complete the mailing address detail or email address to ask for the feedback from research team.

(in Chinese)如果受访者愿意得到访谈结果，可以向研究小组成员索取。

Privacy Statement 隐私声明

The conduct of this research involves the collection, access and/or use of your identified personal information. The information collected is confidential and will not be disclosed to third parties without your consent, except to meet government, legal or other regulatory authority requirements. A de-identified copy of this data may be used for other research purposes. However, your anonymity will at all times be safeguarded. For further information consult the University’s Privacy Plan at http://www.griffith.edu.au/about-griffith/plans-publications/griffith-university-privacy-plan or telephone +617 373 54375

Only the interviewee agrees and signs the informed consent can the study be carried out. All the information gathered remains confidential and in an anonymous form.

(in Chinese)本次研究将对任何涉及的个人隐私材料严格保密，未得到受访者同意，个人隐私材料不会对任何第三方公开。如有疑问，可以参考格里菲斯大学网站说明：

或者打电话+617 373 54375.
Appendix 2  Consent Form

Risk Communication for Emergency Management of Pandemic Prevention and Control in China

中国疾病大流行防控应急管理中的风险沟通

CONSENT FORM FOR INTERVIEW AND FOCUS GROUP

知情同意书

**Research Team 研究组**

Name(s) Cordia Chu, Shannon Rutherford, Wuqi Qiu

School(s) / Centre(s) CEPH 环境与人口健康中心

Contact Phone 联系电话：+8613911892057

Contact Email 联系邮件：wuqi.qiu@griffithuni.edu.au

By signing below, I confirm that I have read and understood the information package and in particular have noted that:我确信已经阅读并了解了以上知情同意书内容，特别是以下内容:

- I have had any questions answered to my satisfaction 我已经得到任何有疑虑的问题的解答
- I understand the risks involved;我明白可能涉及的沟通危险
- I understand that there will be no direct benefit to me from my participation in this research 我明白我的参与没有任何直接的效益
- I understand that my participation in this research is voluntary;我明白我的参与完全是自愿的
• I understand that I will participate in an interview about 60 minutes. 我明白访谈大约持续 60 分钟左右

• I understand that if I have any additional questions I can contact the research team; 我明白如果我有任何问题都可以联系研究小组成员

• I understand that I am free to withdraw at any time, without comment or penalty; 我明白我可以在任何时间自由退出该研究

• I understand that I can contact the Manager, Research Ethics, at Griffith University Human Research Ethics Committee on +61 7 373 54375 (or research-ethics@griffith.edu.au) if I have any concerns about the ethical conduct of the project; and 我明白我可以联系该项研究的管理者，格里菲斯大学伦理研究委员会（电话+61 7 373 54375，邮件research-ethics@griffith.edu.au）

• I agree to participate in the project. 我同意参与该项目

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Appendix 3  Interview Outline for In-depth Interviews

1. Do you have some experiences of the SARS and/or H7N9 events in China? What were the impacts on you, your community and your city? Why?

1. 您经历过我国非典型肺炎（SARS）、H7N9禽流感暴发流行事件吗？这两个事件分别对您、您家社区及您生活的城市带来些什么主要影响？为什么？

2. Do you think the emergency management of SARS and/or H7N9 was suitable in China? If yes, why? If not, what aspects were not reasonable? How can we improve the work of emergency management?

2. 您认为我国政府对SARS、H7N9暴发流行应急管理整体效果如何？若不好，不好在哪里？为什么？若好，好在哪里？为什么？如何改善应急管理？

3. Which information was very important for you in the SARS and H7N9 events in China? What kind of information were you provided with? How did you obtain the information? Who provided it? Did you believe the information? If not, why not?
3. 您认为在 SARS、H7N9 暴发流行事件中，什么信息对您是最重要的？

您得到过什么信息？

您是怎么得到这些信息的？

谁提供给您的？

您相信这些提供的信息吗？

如果不相信，为什么？

4. What problems about communication for emergency management of SARS and H7N9 did you notice?

How could communication for emergency management have been improved? What strategies needed to be developed to improve emergency management of pandemics according to local conditions at that time?

4. 您是否知道 SARS、H7N9 应急管理沟通中存在什么问题？

这些沟通是如何被改善的？

根据当时情况，需要制定什么策略去提高该疾病暴发流行的应急管理？

5. What strategies of emergency management were taken in your institute?

Do you think these strategies were effective?

If not, why not?

If yes, why?

5. 您单位采取了哪些主要应急管理措施？

您认为这些措施是否有效？

如效果不好，为什么？

如效果好，为什么？
6. Are there any barriers to multi-sectoral cooperation in general and specifically for emergency response?
   If yes, what were they?

6. 在日常和疾病大流行应急管理中，多部门合作中是否存在障碍？
   如果存在，主要障碍是什么？

7. Did your institute conduct multi-sectoral cooperation relating to SARS and H7N9?
   If yes, which sectors were included?
   What were the advantages of multi-sectoral cooperation to your organization?

7. 在 SARS、H7N9 防控工作中，您们单位是否与其他多部门进行了合作？
   如果是，合作过的部门包括哪些？
   对您们单位来说，进行多部门合作有什么好处？

8. Were there any guidelines or handbooks of risk communication for emergency management of SARS and H7N9 in your organization?
   If there were, what were the main contents?
   Are they clear about the roles and responsibilities of the sectors involved?
   What were the main responsibilities of your institute?
   How did the guidelines work in practice? Why?
   Were there any difficulties in communication with other sectors in your work? What were they?

8. 您们单位有 SARS、H7N9 应急管理风险沟通预案或指南吗？
   如果有？预案主要包括哪些内容？
   预案中各部门职责是否清楚？
您们单位的主要职责是什么？
实际工作中可执行性如何？为什么？
在您们工作中，与其他部门沟通存在些困难吗？
困难是什么？为什么？

9. 在我国 SARS、H7N9 防控工作中，使用过什么风险沟通原则和策略？
您们单位在疾病暴发流行不同的阶段，流行前、流行中和流行后，分别使用什么风险沟通原则和策略？
效果分别如何？为什么？

10. 什么信息您需要从公众和当局在 SARS 和 H7N9 事件中？
所需信息应由政府向公众提供吗？
为什么？
是否准时提供？请解释为什么说“是”或“不是”。
您认为有必要倾听公众及反馈的信息并及时公布全部实时疫情信息给公众吗？请解释。
谁应负责提供信息？为什么？
媒体扮演了什么角色？为什么？
使用了什么媒体进行沟通？
What media did your organization use?
How effective were they? Why?

10. In SARS, H7N9 events, what information did you need from the public and government agencies?
   
   You believe what information should be provided by the government to the public? Why?
   
   Were these information transmissions timely? Please explain.
   
   Do you believe it is necessary to pay attention to the public and update them with current information? Why?
   
   Who should convey this information?
   
   What is the role of media?
   
   What is the role of social media?
   
   Which media were used to convey information?
   
   What media have you used in your organization?
   
   How effective were they? Why?

11. Did you think that a SARS case or H7N9 case and their families should have received more help and support from the organization, community, or government?
   
   What help and support should have been provided for the community?

11. Do you believe a SARS or H7N9 patient and their families should have received more help and support from the organization, community, or government?
   
   What help and support should have been provided to the community?

12. What do you think are the key differences in risk communication for emergency management between SARS and H7N9 in China?
   
   Is there anything else you would like to add to the comments you have already made?

12. What are the key differences in risk communication between SARS and H7N9 in China?
   
   Is there anything else you would like to add to the comments you have already made?
Appendix 4 Interview Outline for Focus Groups

1. Evaluation of the emergency management of SARS/H7N9 prevention and control in China

Do you know the control measures taken by the government in SARS outbreak?
How effective were the measures?
If effective, what aspects were reasonable? Why?
If not effective, what aspects were not reasonable? Why?
How can we improve the work of emergency management?

1. 政府 SARS/H7N9 防控工作整体感受及评价

您是否知道 SARS/H7N9 暴发流行情况及政府采取的主要防控措施？
防控措施效果如何？
如果好，好在哪里？为什么？
如果不好，不好在哪里？为什么？

2. Social impacts of SARS/H7N9 outbreak in China

Were there any inconvenience and impact on your daily life during SARS/H7N9 outbreak?
What were the inconvenience and impacts?
Were you afraid? What were your fears? Why?
Did you change your behavior during the outbreak? What did you change? Why?

2. SARS/H7N9 暴发流行对社会造成的影响

SARS/H7N9 暴发流行期间，是否对您的日常生活带来不便和影响？
哪些地方带来不便和影响？
您是否感到恐慌？恐慌什么？为什么要恐慌？

您的行为与日常有什么不一样？为什么？

3. **Public demand during SARS/H7N9 outbreak**

Which information was very important for you in the SARS/H7N9 events in China?

What kind of information were you provided with?

How did you obtain the information?

Who provided it?

Did you believe the information?

If not, why not?

Do you think that a SARS/H7N9 case and their families should have gotten more help and support from organization, community, or government?

What help and support should have been provided for communities?

3. **SARS/H7N9 暴发流行期间公众的需求**

您认为在 SARS/H7N9 暴发流行事件中，什么信息对您是最重要的？

您怎么得到这些信息的？

您相信这些信息吗？为什么？

您认为 SARS/H7N9 病人及其家庭是否应该从单位、社区或政府得到多的帮助和支持？

这些帮助和支持应该包括哪些？
GRiffith University Human Research Ethics Committee

12-Mar-2015

Dear Mr. Wuqi

I write further to the additional information provided in relation to the provisional approval granted to your application for ethical clearance for your project "NR: Risk Communication for Emergency Management of Pandemic Prevention and Control in China" (GU Ref No: ENV/63/14/HREC).

The additional information was considered by Office for Research.

This is to confirm that this response has addressed the comments and concerns of the HREC.

Consequently, you are authorised to immediately commence this research on this basis.

The standard conditions of approval attached to our previous correspondence about this protocol continue to apply.

Regards

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web:

Cc:
Researchers are reminded that the Griffith University Code for the Responsible Conduct of Research provides guidance to researchers in areas such as conflict of interest, authorship, storage of data, & the training of research students. You can find further information, resources and a link to the University’s Code by visiting http://policies.griffith.edu.au/pdf/Code%20for%20the%20Responsible%20Conduct%20of%20Research.pdf

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This email and any files transmitted with it are intended solely for the use of the addressee(s) and may contain information which is confidential or privileged. If you receive this email and you are not the addressee(s) [or responsible for delivery of the email to the addressee(s)], please disregard the contents of the email, delete the email and notify the author immediately.
Appendix 6  Publications

The following papers have been published or submitted based on work in this thesis:

Work published:


Submitted for publication

