

The 2011 Flood Crisis in Bangkok and the Central Region of Thailand: Challenges to a Resilient Health System

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Abstract

Background and Rationale: The flood disaster which affected Bangkok and the central region of Thailand in 2011 presented a critical challenge to the resilience of Thailand's health system in the face of sudden crisis.

Objective: To explore the extent to which the Thai health system was capable of responding to a public health shock, through the lens of health system resilience, with a particular focus on the issues of 'awareness' and 'adaptability'.

Methodology: A cross sectional study design was applied. Data were obtained from the representative household survey in 2011. Descriptive statistics and inferential statistics using t-test, Chi-square test and rank-sum test were applied.

Results: Overall, the Thai health system is quite 'resilient' especially in terms of 'awareness', as demonstrated by the good level of satisfaction that people had with the flood warning messages that they received. However, concerning 'adaptability', and using public health relief as an indicator, the Thai health system did not appear to perform well. Households in Bangkok had a better level of awareness than those in the central region. Households in the central region reported greater satisfaction in obtaining external public health assistance than the Bangkokian households.

Conclusion: The Thai health system is somewhat resilient in coping with public health shocks, but there remains room for further improvement. An expansion of public health collaboration to all relevant sectors including local communities, non-governmental organizations, as well as media and social networks is needed. Furthermore, re-orientating the health registration system to have clearer catchment areas is recommended.

Keywords: flood, disaster, resilient health system, awareness, adaptability, household

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อุทกภัยในกรุงเทพมหานครและภาคกลางของประเทศไทยในปี พ.ศ. 2554: ความท้าทายต่อความยืดหยุ่นของระบบสุขภาพ

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บทคัดย่อ

อุทกภัยในปี พ.ศ. 2554 ส่งผลกระทบต่ออย่างรุนแรงต่อพื้นที่กรุงเทพมหานครและภาคกลางของประเทศไทย นับเป็นความท้าทายที่สำคัญต่อความยืดหยุ่นของระบบสุขภาพไทยในการรับมือกับภาวะวิกฤติในครั้งนั้น การศึกษานี้จัดทำขึ้นเพื่อศึกษาว่าระบบสาธารณสุขไทยสามารถตอบสนองต่อภาวะวิกฤติได้เพียงใด ผ่านมุมมองเรื่องความยืดหยุ่นของระบบสุขภาพ โดยในที่นี้เน้นเฉพาะเรื่อง “การตระหนักรู้” และ “การปรับตัว” ข้อมูลที่ใช้ในการศึกษาได้จากการสำรวจครัวเรือน ซึ่งจัดทำโดยสำนักงานสถิติแห่งชาติ ในปี พ.ศ. 2554 วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนาและสถิติเชิงอนุมาน

ในภาพรวมระบบสาธารณสุขไทยค่อนข้างยืดหยุ่นในการรับมือกับภาวะวิกฤติ โดยเฉพาะในเรื่อง “การตระหนักรู้” ซึ่งสะท้อนผ่านการที่ประชาชนมีความพึงพอใจในระดับดีเกี่ยวกับการเตือนภัยน้ำท่วม อย่างไรก็ตามในเรื่องของ “การปรับตัว” ซึ่งใช้การบรรเทาสาธารณภัยเป็นตัวชี้วัดนั้น ไม่ได้อยู่ในระดับที่ดีนัก นอกจากนี้ ยังพบว่า ครัวเรือนในกรุงเทพมหานครมีการตระหนักรู้ในระดับที่ดีกว่าครัวเรือนในภาคกลาง ทั้งนี้ อาจเนื่องมาจากครัวเรือนในกรุงเทพมหานครได้รับข้อความเตือนจากหลายช่องทาง ในทางกลับกัน ครัวเรือนยากจนในกรุงเทพมหานคร เป็นกลุ่มที่สูญเสียรายได้จากเหตุการณ์น้ำท่วมมากที่สุด ส่วนครัวเรือนในภาคกลาง มีความพึงพอใจในการได้รับความช่วยเหลือจากหน่วยงานภายนอกมากกว่าครัวเรือนในกรุงเทพมหานคร ด้วยเหตุที่ครัวเรือนในภาคกลางที่ประสบอุทกภัยส่วนใหญ่มีประสบการณ์ในการรับมือน้ำท่วมมากกว่า และโครงสร้างระบบบริการสุขภาพนอกกรุงเทพมหานครมีการกระจายการปฏิบัติงานมากกว่า และมีขอบเขตรับผิดชอบที่ชัดเจน

โดยสรุป ระบบสุขภาพไทยมีความยืดหยุ่นในการรับมือกับปัญหาภาวะวิกฤติทางสาธารณสุข แต่ก็ยังมีความท้าทายที่พึงปรับปรุงในอนาคต ตัวอย่างเช่น ควรมีการเสริมสร้างความร่วมมือด้านสาธารณสุขระหว่างหน่วยงานที่เกี่ยวข้อง รวมถึงชุมชนท้องถิ่น หน่วยงานนอกภาครัฐ องค์กรสื่อและเครือข่ายทางสังคม ด้วยกลไกดังกล่าวจะช่วยขยายความช่วยเหลือไปยังประชากรกลุ่มเปราะบางได้มากขึ้น และเพิ่มการตระหนักรู้ต่อภาวะวิกฤติในครัวเรือนกลุ่มเสี่ยง ยิ่งไปกว่านั้น พึงมีการปรับระบบการขึ้นทะเบียนการให้บริการแก่ประชาชนทุกคน โดยเฉพาะในเขตกรุงเทพมหานคร เพื่อให้มีพื้นที่ที่รับผิดชอบชัดเจนยิ่งขึ้น

คำสำคัญ: น้ำท่วม, ภัยพิบัติ, ความยืดหยุ่นของระบบสุขภาพ, ความตระหนัก, การปรับตัว, ครัวเรือน

Background and Rationale

Thailand has extensive experience in health system development over the past four decades. Quality assurance of the care delivery system, human resources for health investment, and health financing reform are some of many

key policies that have contributed to a significant development of the Thai health system. This development has led to a number of successes in improving the health of the Thai population. Exemplary evidence for this account was the decline of the infant mortality rate from 47.3 per

1,000 live births in 1980 to 10.8 per 1,000 live births in 2015, and the gradual increase in life expectancy at birth from 64 years in 1980 to 75 years in 2015.⁽¹⁾ In addition, the improvement in financial risk protection, following the implementation of the Universal Coverage Scheme (UCS), was remarkable. Prevalence of households with catastrophic spending after receiving inpatient services at private facilities decreased from 32.1% in 2002 to 27.8% in 2004, and after this a declining trend was observed.⁽²⁾

Recent years have seen increasing concern and discussion, between academics and policy-makers, of the need for good health systems to function effectively in unexpected circumstances, like natural disasters or health shocks, as well as in normal circumstances. A health system that is capable of preparing for, and coping with, such unexpected circumstances is considered ‘resilient’.⁽³⁾ The term ‘resilient’ in this regard comprises five key elements: ‘awareness’, prompt perception of health disturbances; ‘diversity’, the ability to tackle a wide range of challenges, not limiting itself to a particular health problem; ‘self-regulation’, the potential of the system to prevent emerging health threats while maintaining routine health services; ‘integration’, the incorporation of diverse ideas and actors to initiate solutions for tackling specific health threats; and ‘adaptability’, the ability of the system to keep and improve its function in the event of adverse conditions.⁽³⁾

At present, natural disasters are critical challenges for a ‘resilient’ health system. In recent years, Thailand has experienced many disasters,

which have caused tremendous losses in health and the economy. Flooding has been considered one of the most disastrous events for Thailand.⁽⁴⁾ In 2011, the country faced the worst flooding crisis in seven decades due to a series of tropical cyclones combined with inadequate flood prevention and control. Almost all regions in the country faced the crisis, starting from the northern region, following by the central region and finally reaching the Bangkok Metropolitan area.⁽⁵⁾ According to the National Statistical Office (NSO) survey, 30 percent of the affected households were flooded for more than 30 days.⁽⁶⁾ The flooding caused more than 800 deaths and 9.5 million victims.⁽⁷⁾ Although, Thailand had national framework for disaster management, there was little evidence that guaranteed the system readiness when public health crisis arose.⁽⁵⁾ Flood management was one of the major problems which were on political spotlight but at times lacked clear responsible agencies.⁽⁸⁾

The present study sought to examine whether, and to what extent, the Thai health system was resilient enough to address public health shocks. For this study, the authors used the flood crisis in 2011 as a proxy for public health shocks. Note that the focus of this study was confined to the central region and Bangkok—the sites most affected by the flood. In terms of resilience, this study only paid attention to some components of resilience, which were most relevant to the situation; those were ‘awareness’ and ‘adaptability’. Flood perception was used as an indicator of ‘awareness’ and ‘public health assistance’ was used as



an indicator for ‘adaptability’.

Methodology

Materials and methods

A cross-sectional design was applied. This study used secondary data from the representative flood survey conducted between July and December 2011 by the NSO in collaboration with the International Health Policy Program (IHPP) of the Ministry of Public Health (MoPH) and relevant partners such as the Health Systems Research Institute (HSRI) and the World Health Organization (WHO). The survey adapted stratified two-stage sampling design where primary and secondary sampling units were enumeration areas (EAs) and individual households respectively. A total of 8,602 flooded households in the central region and Greater Bangkok from 36,727 household samples were recruited for the survey.

Questionnaire design

The questionnaire was composed of 2 sections. The first section explored the severity of the flood and the characteristics of the affected households. The second section examined health system resilience through the perceptions of the participants. In this section, the questionnaire was divided into 2 subparts: (i) awareness, using warning messages about the flood, and hygiene recommendations as proxies—arranged in the Likert scale from 1 (totally unaware) to 5 (fully aware), and (ii) adaptability, using satisfaction with public health assistance as a proxy—arranged in

a three-level ordinal scale (not received, received but inadequate, and adequate).

Data analysis

Descriptive statistics were employed in the first section. The results were presented in terms of mean and percentage. The authors also used the flood severity index as described by Ninno et al (2001) to assess the severity of the flood in the first section. The index categorized flood severity into four levels (index = 11-16 - very severe, 6-10 - severe, 1-5 - moderate and 0 - not exposed).⁽⁹⁾ Inferential statistics were used in the second section to assess the difference between interested parameters between the central region and Bangkok. Then differences of the level of health system resilience between household economic levels (using household income prior to flooding period as proxy of household economy) in each region were analyzed. Only households where income data were not available were excluded from the analysis. The household economic level was divided into quintiles. Student’s t-test and Wilcoxon rank sum test were used in this section. The study results were reported in the way that conformed to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist where applicable.

Ethical committee approval

As the dataset used by this study was one of the national household surveys conducted by the government agency, namely the NSO, there was no need to obtain ethics approval from the MoPH.

However, as mandated by the Statistics Act B.E. 2550 (2007), Article 15 ensures confidentiality of data collected by NSO field work and also other users of the dataset, the researchers had strictly followed the confidential requirement in Article 15 of the Act. All individual information was strictly kept confidential and not reported in the paper.

Results

General characteristics

A total of 7,843 households in the central region of Thailand (91.2 %) and 759 households in Bangkok (8.8%) participated in the survey. The characteristics of the flooding were quite similar between the central region and Bangkok. Around 69% of the affected households faced flooding inside their houses while 31% experienced flooding of their homestead.

The degree of flood severity in the central region saw 64.0% of the households faced moderate-level flooding, followed by 34.2% experiencing severe flooding and just 1.8% very severe flooding. The percentage of households in Bangkok facing severe and very-severe levels of flooding was marginally larger than in the central region. In addition, the period of flooding in Bangkok was comparatively longer than in the central region. The majority of households in the central region had previously experienced flooding at least once, this contrasts with Bangkok where over four-fifths of the households had never faced flooding in their lifetime, see Table 1.

The flood also led to substantial losses of

assets and income. Overall, the economic loss of the poor in Bangkok was twice (45,471.2 baht per household) the average loss in the central region (19,394.6 baht per household). There was no remarkable difference of asset and income loss between the rich and the poor households in the central region, but Bangkok revealed a contrast finding. The poorest quintile suffered from asset and income loss almost the same level as the rich quintiles (48,056.5 baht and 40,819.1 baht per household for the fourth and the fifth quintiles

Table 1 Flood patterns in the central region of Thailand and Bangkok

	Central (%) (n=7,843)	Bangkok (%) (n=759)
Flood characteristic		
Homestead	31.1	30.7
Home	68.9	69.3
Total	100.0	100.0
Flood severity		
Moderate	64.0	55.3
Severe	34.2	35.7
Very severe	1.8	9.0
Total	100.0	100.0
Duration of the flood		
0 days	31.2	30.7
1-7 days	22.2	2.9
8-14 days	2.5	3.7
15-30 days	14.2	20.3
31-60 days	24.0	24.2
61-99 days	5.9	18.2
Total	100.0	100.0
Previous experience of flooding		
Yes	55.9	18.1
No	44.1	81.9
Total	100.0	100.0

Table 2 Asset and income losses by household economic level during the 2011 flood

Household economic level	Asset and income loss (Baht)			
	Central (n=7,843)		Bangkok (n=759)	
	Mean	S.D.	Mean	S.D.
quintile 1	19,394.6	63,505.1	45,471.2	117,477.4
quintile 2	19,835.3	51,110.4	28,815.6	63,106.5
quintile 3	19,993.2	53,760.0	24,211.8	27,625.8
quintile 4	22,300.1	84,241.2	48,056.5	93,788.5
quintile 5	23,821.4	57,446.4	40,819.1	103,655.8

respectively), see Table 2.

Health system resilience

Awareness

Regarding flood warnings, respondents in Bangkok reported a better awareness of warning messages and hygiene recommendations than those in the central region. Though this difference was quite minimal, a statistical significance was observed for all the questions. For instance, the mean level of awareness of poisonous animals in Bangkok was 2.9, compared to 2.7 in the central region with a *p*-value of 0.004 for Student's *t*-test and 0.001 for rank sum test. The most distinct difference was found in electrical and power protection (mean awareness level = 3.0 in Bangkok versus 2.7 in the central region), see Table 3.

The richest household in Bangkok appeared to have better awareness in almost all awareness questions (especially for question about emergency services recommendations) than that the central region (mean awareness level

for all questions = 3.0 for the richest household in Bangkok and 2.6 for the richest household in central region). Nonetheless no statistical significance was observed in the poorest quintile when comparing between households in the central region and those in Bangkok, see figure 1.

Adaptability

With regards to external assistance, aside from relief packages, there were gaps between the respondents' needs and the relief provided. In both study sites, most households did not receive adequate external support in terms of clothes, transport services, and emergency care for emergency conditions. Note that there were some subtle differences between regions and household economic levels. The percentage of households reporting 'not received' was slightly lower in the central region relative to Bangkok for both the richest and the poorest quintiles. Though the difference was quite small, a statistical significance was observed for all items excepting garbage management and security guard service.

Table 3 Awareness level before and during the flood in the central region and Bangkok (min=1, max=5)

Awareness questions	Region	Mean	S.D.	Median	Interquartile range (IQR)	p-value for t-test	p-value for rank sum test
<i>Before the flood</i>							
Flood warning/information for surveillance	Central	3.0	1.7	3	4	0.034	0.026
	Bangkok	3.2	1.5	3	2		
Warning/information on evacuation	Central	2.9	1.7	3	3	<0.001	<0.001
	Bangkok	3.1	1.5	3	2		
<i>During the flood</i>							
Electrical/power protection recommendations	Central	2.7	1.7	3	3	<0.001	<0.001
	Bangkok	3.0	1.5	3	3		
Protection against poisonous animals recommendations	Central	2.7	1.7	3	3	0.004	<0.001
	Bangkok	2.9	1.5	3	3		
Hygienic/water sources recommendations	Central	2.8	1.7	3	3	0.004	0.001
	Bangkok	3.0	1.5	3	3		
Life and assets protection (including robbery) recommendations	Central	2.7	1.7	3	3	<0.001	<0.001
	Bangkok	2.9	1.5	3	3		
Emergency services recommendations	Central	2.7	1.7	3	3	<0.001	<0.001
	Bangkok	2.9	1.5	3	3		

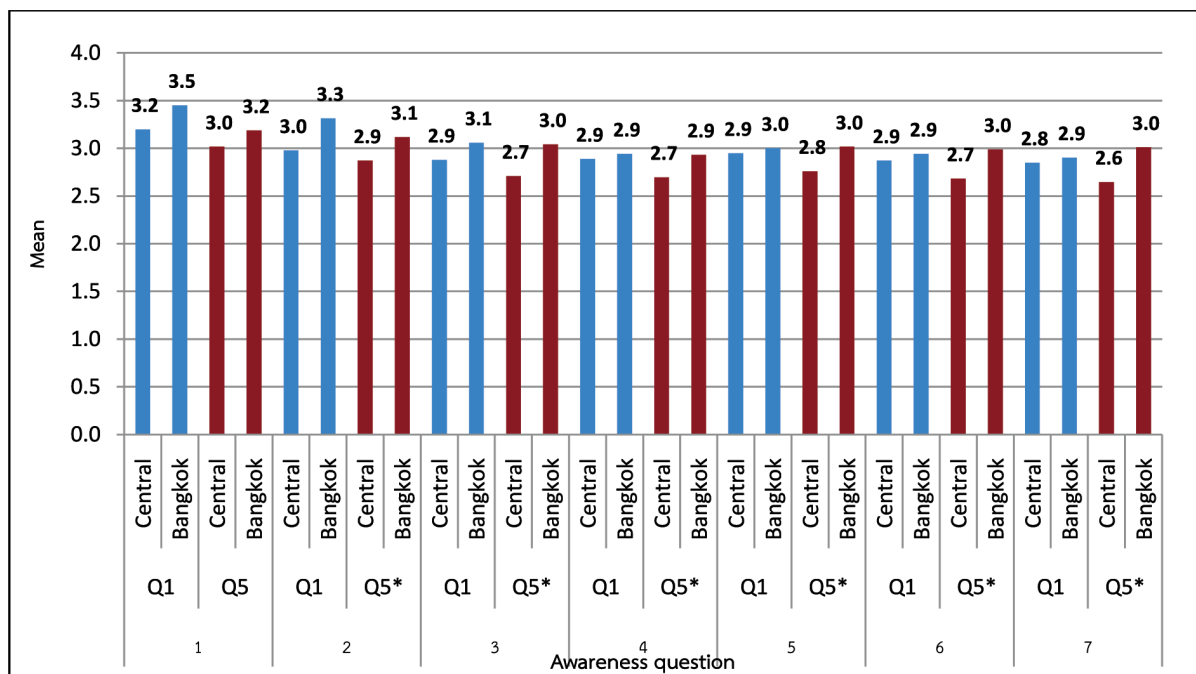


Figure 1 Awareness level in the central region and Bangkok by household economic quintiles

Note * p-value < 0.05 when compared Central with Bangkok awareness question: 1 = Warning/information for surveillance, 2 = Warning/information for migration, 3 = Electrical/power protection recommendations, 4 = Prevention of poisonous animals/dangerous animals, 5 = Hygienic/water-based recommendations, 6 = Taking care for life and assets (included theft) recommendations, 7 = Emergency services recommendations

Table 4 External assistance to households in the central region and Bangkok

External assistance	Central				Bangkok				p-value by Chi-square test
	Not received	Inadequate	Adequate	Total	Not received	Inadequate	Adequate	Total	
Relief package	23.3	42.3	34.4	100.0	43.2	37.3	19.5	100.0	<0.001
Clothes	77.2	18.8	4.0	100.0	93.3	5.3	1.4	100.0	<0.001
Mobile toilet	71.0	24.3	4.7	100.0	84.8	11.1	4.1	100.0	<0.001
Garbage management	67.0	26.0	7.0	100.0	61.8	32.5	5.7	100.0	<0.001
Security guard service	70.3	23.5	6.2	100.0	70.6	21.1	8.3	100.0	0.040
Free transport	72.0	24.6	3.4	100.0	46.6	42.0	11.4	100.0	<0.001
Mobile health care service	67.8	22.7	9.5	100.0	84.3	11.7	4.0	100.0	<0.001
Emergency service	78.6	19.3	2.1	100.0	88.3	8.4	3.3	100.0	<0.001

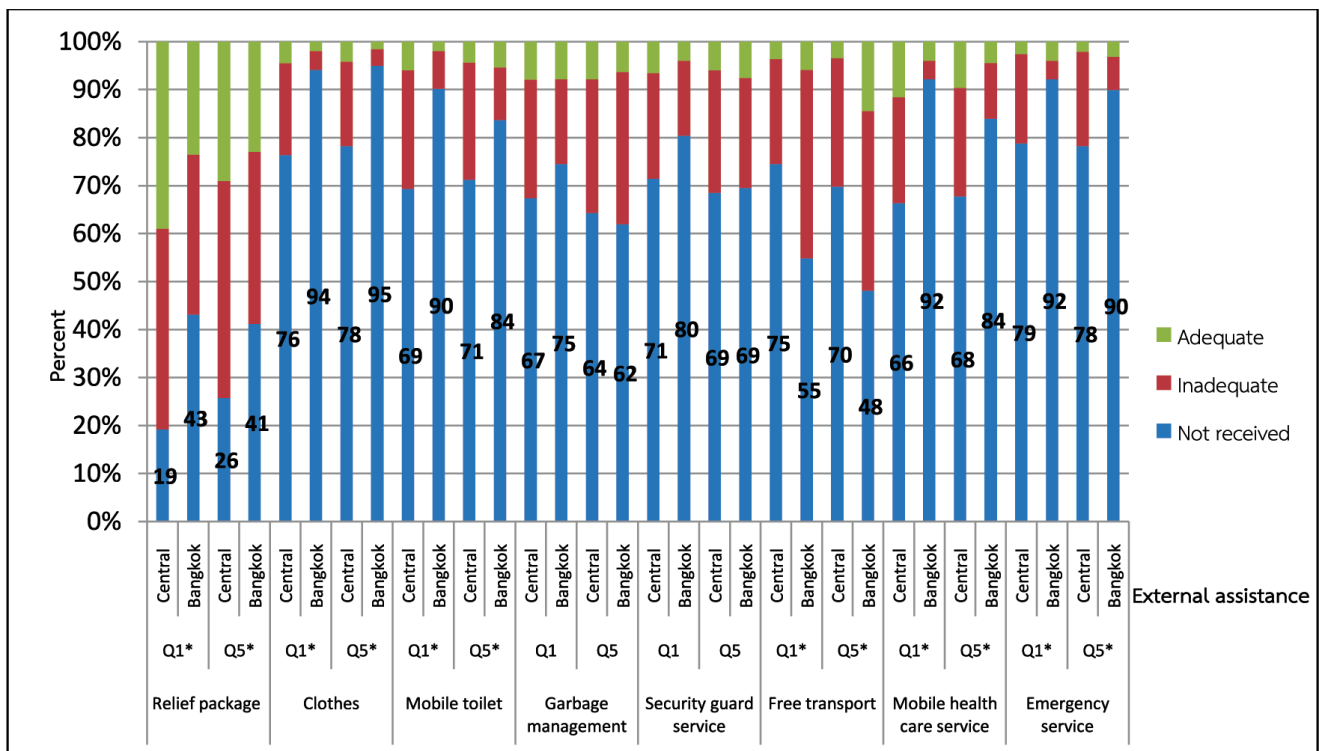


Figure 2 External assistance received by households in the central region and Bangkok, divided by household economic quintiles

Note: * p-value < 0.05 when compared Central with Bangkok

For those obtaining assistance, there was no clear pattern regarding the difference between those answering ‘adequate’ and ‘inadequate’ in both regions, see Table 4 and Figure 2.

Discussion

The major flood in 2011 was a critical challenge for the Thai health system. Note that ‘health’ in this sense goes beyond physical health as it also includes public health aspects, such as disaster preparedness, warnings, and relief. According to the findings above, it was clear that the Thai health system was somewhat resilient to the health shock, especially in the aspect of ‘awareness’. However, on the issue of ‘adaptability’, the system appeared to have underperformed. This was demonstrated by the above results which showed a large number of households reporting a lack of external assistance.

It is noteworthy to discuss some subtle differences between the two study sites. The relief and assistance for households in Bangkok appeared to be lacking compared to the central region. Besides, the poorest households in Bangkok seemed to suffer from a large extent income loss almost at the same level of the rich households despite the fact that Bangkokian respondents reported better awareness. This point also reflected a larger inequity problem between the rich and the poor in Bangkok compared to similar problem in the central region.

A possible explanation for this phenomenon is that during that period, Bangkok was the final province to be affected by the flood; this provided

more time to send warning messages to its residents. This situation was also coupled with the fact that mass media paid more attention to the flood in Bangkok as it was the center of business and administration of the country. Another possible reason for authorities in the central region being able to provide more adequate public health assistance was that most provinces in the central region were quite familiar with seasonal flooding. Their experiences with seasonal flooding might have made them better prepared.⁽¹⁰⁾ In contrast, a system to cope with flood crisis in Bangkok seemed to be inefficient, possibly due to a lack of major flood experience which made the authorities less well-prepared.⁽⁸⁾

More importantly, the decentralized administrative structure of the health service system in upcountry areas might facilitate the provision of assistance to the residents in each catchment area. Local government bodies and registered district hospitals always knew the population within their catchment area.⁽¹¹⁾ This phenomenon was rarely found in Bangkok because there were no district hospitals in the city. When compared to residents of other provinces, Bangkokians had a lower degree of awareness of their registered primary care facilities. This reflected the comparative complexity of the health system in the urban environment. However, the interpretation of aforementioned findings should be made with caution. This was because the statistically significant differences of health system resilience between Bangkok and the central region did not always lead to policy implication significance.



Besides, the response to public health emergency was not just a sole responsibility of any single sector, either the public or the private. In practice, previous studies revealed that local communities, media and private providers always played pivotal role in assisting the public sector for flood relief.⁽¹²⁻¹⁵⁾ Thus, better flood management necessitates a seamless collaboration among all sectors. To assess this issue in more details, further studies that involve policy makers and all relevant stakeholders are recommended.

Despite a large number of samples, this research still faced some limitations. Some instances of the limitations were as follows: Firstly, awareness and adaptation, which are vital components of a resilient health system, are definitely composed of other aspects apart from the receipt of warning messages and public health relief. For example, the inadequacy of crisis relief did not merely stem from the failure of the health system alone but was also ascribed to other factors such as insufficient collaboration between various sectors responsible for crisis management.^(16,17) Secondly, the questionnaire applied a self-reporting design, which was subject to individual perception. Moreover, this survey was not designed for estimating resilience health system from the first instance. Further studies comprising both objective and subjective assessments on other key elements of health system resilience (aside from awareness and adaptability) are recommended. Thirdly, only two regions were recruited for this research. Thus, the generalizability power is quite limited. Finally, this

study focused on micro-level resilience only, a macro-perspective approach was lacking. A comprehensive assessment of health system resilience necessitates an examination from both micro- and macro-perspectives. This point should be deliberately considered in future research.

Notwithstanding the limitations above, there are some policy implications that can be derived from this research. To make the Thai health system more ‘resilient’ to public health emergencies, the collaboration between all sectors involved in disaster preparedness and response should be strengthened. The term ‘sectors’ in this sense includes the public health facilities, communities, business enterprises, civil society groups, and non-government organizations. Such a collaboration would enable the public sector to expand its assistance coverage, especially to the hard-to-reach groups such as people in slums or temporary sheltered areas; these populations are difficult to identify by a formal approach and non-governmental institutions, including charitable institutes, might play a pivotal role in this process.⁽¹⁸⁾ In addition, the health system in very urbanized areas like Bangkok should be re-orientated. The design of the health system in upcountry areas has a worth-learning lesson in the point that a clear catchment area for each facility should be established. All people should be aware of their registered primary contact for care. Such an approach will help all beneficiaries know where to turn when public health relief is needed. Besides, this is not just a matter of health facilities as public health assistance encompasses

not only medical services but also basic life and hygiene support such as garbage management and sanitation. Therefore, the primary care contact from each sector (health sector, administrative authorities and the municipality to name a few) should be integrated when a natural disaster takes place. Note that these are just some broad recommendations, in practice, there are many more details to consider when implementing such policies. Also, regular rehearsal of crisis management is essential.

Conclusions

In conclusion, the Thai health system is somewhat resilient in coping with public health crises; however, there is room for further improvement. An expansion of public health collaboration to all relevant sectors, including local communities and non-government organizations might be beneficial for better flood management; and this point requires further studies. The government might consider collaborating with civil society groups, the media and social networks to increase awareness of households of public health crises and natural disasters as this approach will help extend the assistance coverage to the whole population, especially the vulnerable ones. Moreover, other dimensions of health system should not be overlooked. Re-orientating the health service system in complex urbanized areas like Bangkok is recommended. People in urbanized areas should know which primary care facility they are registered with; this will ensure that they know where they can seek assistance when it is needed.

Acknowledgement

We would like to thank the National Statistical Office of Thailand, the International Health Policy Program (IHPP) of the Ministry of Public Health (MoPH) for their collaboration, and relevant partners such as the Health Systems Research Institute (HSRI) and the World Health Organization (WHO) for their support. The advice received from senior staff of IHPP is greatly appreciated. Financial support of this study was received from IHPP's core resource.

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