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## School safety and children health in a post-disaster community: Implications to collaborative care and service learning in school health

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### ABSTRACT

**Objectives:** To explore the impact of the Lushan earthquake on the schoolchildren's health and learning environment after 2 months of the earthquake and to collect children health information and identify school environmental health risks.

**Methods:** This was an explorative single-case study. The case was defined as the two primary schools affected by the earthquake on 20th April, 2013 and relocated in a rebuilt temporary classroom. This study collaborated with Department of Social Work, Sichuan Agricultural University located in Ya'an. With the support from the above social work station, 448 school-age children from the affected Majun and Gonghe primary schools were invited to participate in this study from July 1 to 2, 2013. Finally, 187 children participated. Data were collected through structured questionnaire, field observation and the social work station's report and analyzed by using descriptive analysis and qualitative content analysis.

**Results:** One hundred and eighty-seven school-age children participated in this study. Participants' demographic characteristics showed that around half of the subjects (89; 47.6%) were male. Majority were aged 10 or above (114; 61%) and in grades 4–6 (108; 57.7%), whereas only 7% (13) were preschool children. Near three quarters (134.0; 71.7%) children were not living with their parents. School environmental health risks were identified including public health and school building risks.

**Conclusions:** One hundred and eighty-seven school-age children in two primary schools were involved in this study. Baseline data for children's health status were obtained and the school health risks were identified. The findings suggested that it would be vital to develop collaborative care and service learning model to enhance children health and school safety in a disaster-prone community.

## 1. Introduction

On May 12, 2008, a massive earthquake hit Wenchuan and killed 87476 people<sup>[1]</sup>. At least 5335 schoolchildren and adolescents were killed and 546 students suffered injuries that resulted in various degrees of disability<sup>[2]</sup>. Compared to adult survivors and rescue/recovery workers, children are particularly vulnerable because of their physical and psychosocial vulnerabilities in natural disasters<sup>[3–6]</sup>. In addition, disasters like earthquakes do not only damage educational

infrastructures and buildings, but also disturb children's regular educational activities, especially for those living in rural areas<sup>[7]</sup>. Disaster risk reduction measures can create safer school buildings and safer learning environments that will help to prevent mortality and morbidity; these measures can also promote optimal health for schoolchildren<sup>[8]</sup>. However, in the wake of the devastation caused by the earthquake that struck Lushan County on April 20, 2013, little is known about the disaster's full impact on children's health and the school environment in Sichuan Province of China.

The aim of this study was to explore the impact of the Lushan earthquake on the schoolchildren's health and learning environment after two months of the disaster struck, and to collect children's health information and identify school-related environmental health risks.

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## 2. Materials and methods

This was an exploratory case study focused on the two primary schools that were affected by the 2013 Lushan earthquake and relocated in temporary classrooms. This study collaborated with the Department of Social Work from Sichuan Agricultural University located in Ya'an. With the support from the above social work station, a total of 448 schoolchildren from the affected two primary schools were invited to participate in this study from July 1 to 2, 2013. A total of 187 children (89 male, 98 female) finally participated in the study. Structured questionnaires, field observations and the social work station's report were used to collect the data in this study.

Descriptive analysis and qualitative content analysis were used to analyze the data. Approval for this research study was obtained from the Human Ethics Committee of the Hong Kong Polytechnic University. Written or verbal consent was obtained from the schoolchildren's parent(s) or grandparent(s) before delivery of the questionnaire.

## 3. Results

A total of 187 children (89 male, 98 female) participated in this program. The participants' demographic characteristics were presented in Table 1. The majority of participants were primary school students aged 10 or above (114; 61.0%) and in grades 4–6 (108; 57.7%), whereas 7% (13) were preschool children. Nearly three-quarter (134; 71.7%) children were not living with their parents.

**Table 1**

Participants' characteristics and health status.

Characteristics		n	%
		(total = 187)	
Demographic factors	Gender	Male	89 47.6
		Female	98 52.4
	Age	< 10	73 39.0
		≥ 10	114 61.0
	Education level	Pre-school	13 7.0
		Primary 1–3	66 35.5
Primary 4–6		108 57.7	
Living status	Living with parents	53 28.3	
	Not living with parents	134 71.7	
Healthcare service utilization	Doctor	Yes	153 81.8
		No	34 18.2
	Dentist	Yes	29 15.5
		No	158 84.5
Ophthalmologist	Yes	9 4.8	
	No	178 95.2	
BMI level (kg/m <sup>2</sup> )	Underweight < 18.5	48 23.1	
	Normal 18.50–24.99	124 66.3	
	Overweight > 25	9 4.8	
	Obese > 30	5 2.7	
	Missing < 18.5	1 0.5	
BP level	Normal (SBP) < 90th percentile	176 94.1	
	High (SBP) ≥ 90th percentile	11 5.9	
	Normal (DBP) < 90th percentile	185 98.9	
	High (DBP) ≥ 90th percentile	2 1.1	
Mental health status*	Normal	179 95.7	
	Perceived mild and severe distress	8 4.3	

\*: Mental health status was measured by general health questionnaire. BMI: Body mass index; BP: Blood pressure; SBP: Systolic blood pressure; DBP: Diastolic blood pressure.

The majority of children (153; 81.8%) visited a doctor before the study. The dental service was performed in twenty-nine children (15.5%) while the optometry service was performed in nine children (4.8%). In terms of BMI levels, the majority of children were measured in normal ranges (124; 66.3%) and approximately a quarter (23.1%) of them were underweight. Almost all of them (185; 98.9%) had normal DBP and 94.1% had normal SBP. Nearly all (179; 95.7%) of the children's mental health status was within the normal range. Eight students were suspected with mild and severe stress levels (8; 4.3%) measured by general health questionnaire.

### 3.1. Participants' eating habits

Table 2 shows that nearly a quarter of the children (42; 22.6%) only ate breakfast 2 times or fewer per week. The main reported reason was low/no appetite (33; 75.0%) followed by insufficient time (13; 30.2%).

**Table 2**

Participants' eating habits.

Eating habits	n	%
How often do you eat breakfast (n = 186)	Never	16 8.6
	1–2 times a week	26 14.0
	3–4 times a week	47 25.3
	5 times or more a week	97 52.2
Reasons for not having breakfast (n = 43)	Insufficient time (n = 43)	13 <sup>a</sup> 30.2
	Get up late (n = 41)	9 <sup>a</sup> 22.0
	No time to prepare it (n = 41)	6 <sup>a</sup> 14.6
	Nobody prepares it at home (n = 39)	0 <sup>a</sup> 0.0
	Not hungry/No appetite (n = 44)	33 <sup>a</sup> 75.0

Numbers in the brackets represent the number of subjects replied the question.

<sup>a</sup>: The number of subjects who replied "Yes" among the total subjects for each reason for not having breakfast.

### 3.2. Identification of school environmental health risks

According to the information obtained from the investigator's observation as well as the documentation and a brief report made by local social workers, the nature of the Lushan earthquake and its impact on two primary school buildings and infrastructures was described as: the earthquake registering 7.0 on the Richter scale occurred at 08:02 Beijing time on April 20, 2013 in Lushan County, Sichuan Province. The casualties included 196 dead, 21 reported missing, and 14000 injured, and more than 1200 households and 4500 people affected. Seven major villages in Shangli Town, Rain City District were affected by this earthquake. They included Gonghe, Temple Xia, Qijia, Zhi-an and Sijia, Wujia, and Liujia. Majun and Gonghe Primary School served for this local community. Both schools included seven grades (from pre-school to Grade 6). Because the earthquake occurred outside of school hours, no children were injured or killed during the earthquake. However, 14 adult residents in the villages were injured, and of those, 4 were severely injured and sent to the hospital during the incident. There were 208 students in Majun Primary School, and 240 in Gonghe Primary School. The actual risks were presented in Figures 1–10.



**Figure 1.** Gonghe Primary School built in September, 2000 and damaged on April 20, 2013.



**Figure 4.** The uneven ground tended to result in fall-related injuries.



**Figure 2.** Majun Primary School built in 2008 after the Wenchuan earthquake and the facility was damaged on April.



**Figure 5.** Children are playing around the old damaged school building and traffic roads.



**Figure 3.** Spaces limited between temporary classrooms and learning environments worsened during sunny and rainy weather.



**Figure 6.** Garbage scattered around the classroom.



**Figure 7.** Head lice due to the lack of shampoo and the inability to adequately wash hair.



**Figure 8.** Unclean skin and related skin lesion problems.



**Figure 9.** Muddy water from pipes due to the lack of clean water facility.



**Figure 10.** Children are directly drinking untreated (non-boiled) water.

#### 4. Discussion

This study was an exploratory study of multiple information sources that combined quantitative and qualitative data. In total, 187 children took part in this study and most were between 10 and 14 years old. Among them, the majority did not live with their parents, and might not have eaten breakfast because they had no sufficient time to prepare it and had little or no appetite. Healthy eating habits are vital for good health, especially for children and adolescents<sup>[9]</sup>.

Very few children used the available dental and optometry services. Chan addressed the need to develop a primary healthcare service to meet individual physical and mental health care demands in post-disaster situations<sup>[10]</sup>.

Eight students reported mild and severe distress and most of them were left-behind children. Kiliç *et al.* stated that as their

parents needed to work outside the home for better job opportunities, some children may have an increased risk of mental health problems if they are separated from their parents or if they have a lack of family support<sup>[4]</sup>.

A school teacher noted that students have more frequent instances of emotional instability and conflict after the earthquake compared to before. This might be associated with the high proportion of children in this rural area who were left without emotional support from their parents or other family members following the earthquake.

Public health risks for children included inadequate clean water and sanitation facilities as well as a lack of awareness in hygienic practices, such as washing their hands before eating or drinking. These factors carry the risk of communicable diseases and vector borne illness such as diarrhea. International Federation of Red Cross and Red Crescent Societies suggested that behavior modification (hand-washing, practicing road safety and preventing water-borne diseases) can eradicate such problems<sup>[11]</sup>.

Temporary classrooms were set up 11 days later on May 2, 2013, and the schools were reconvened for half-day sessions. The temporary facility was located in the farmland near a highway. When students walked between classrooms and crossed traffic roads, it became very unsafe. No safety warning signs were placed on the campus. Children faced safety hazards whether they played indoors or outdoors. After class, students played indoors with narrow aisles which easily lead to injury. Outdoors, the uneven ground was unsafe to traverse and students were also susceptible to fall-related injuries. Other students preferred to play in the old (damaged) school buildings because of their familiarity. The compromised structure, however, might cause unintentional injuries, too.

In summary, this study addressed several issues. The health risks following the earthquake included the actual and potential problems of communicable diseases and vector borne illness. It also showed that normal educational activities were disrupted due to damaged buildings and facilities, which made it difficult for schoolchildren to continue their normal studies. The temporary learning environments may have been more conducive for proper schooling or growth development. United Nations Office for Disaster Risk Reduction Asia and the Pacific noted how disasters impact school facilities and safety<sup>[7]</sup>. Additionally, they addressed the importance that children should return to school-related activities, as, in post-disaster recovery, they help promote psychosocial wellbeing through community and social activities. World Health Organization stated that children are more vulnerable to the effect of disasters; there is a need to develop an innovative disaster risk reduction measure for health and help reduce the negative effects of a disaster on the health of children<sup>[12]</sup>.

The pilot study is important to obtain a better understanding of children's health and school-related environmental health risks following a natural disaster. These findings have several significant implications. First, they provide baseline data for children's health status. Based on this information, the research team had completed a general health assessment report for each child's parents or guardians through the social work station. In this report, attention was paid to those with inappropriate eating behaviors (*i.e.*, breakfast), psychological distress and less than optimal BMI and blood pressure levels. Second, a report identified school-related environmental risks based on field observations and interactions with children and their families. This information was subsequently shared with the schools' principal and teachers.

All these activities are significant in developing collaborative care and services in order to promote children's health and school safety. Through developing and delivering collaborative care and service learning programs in disaster-prone areas, university students from different disciplines and professions such as the faculty of health and social sciences, the faculty of engineering and the faculty of construction and environment, can learn how to collaborate with community stakeholders (*i.e.*, local government officials, primary healthcare workers, public health workers and local residents) in the event of such disasters. As a result, these students would be capable of identifying and assessing health risks and implementing effective post-disaster risk reduction activities while promoting children's health and school safety.

This was an explorative single-case study; a one-time data collection was conducted and a long-term follow-up study is needed, as the impact of disasters is complex and can last over long periods of time. This study was a pilot study that involved only on-site nursing faculty who worked with seven social worker students in the two noted primary schools. Further studies are recommended, especially a collaborative care and service learning model that would involve more students from different faculties and disciplines. This would allow university students to cooperate with the local community stakeholders and then to achieve the goal of improving school safety and children's health in post-disaster communities.

A total of 187 schoolchildren from two primary schools participated in this study. The children's baseline health status data were obtained and the temporary school health risks were identified. The findings suggested that university students can be benefited from creating an innovative service learning project to serve the community to reduce disaster health risks and enhance the health of children and school safety.

### Conflict of interest statement

The authors report no conflict of interest.

### Declaration

The authors would like to report that insignificant part of the manuscript and Figure 10 were published in form of an abstract in the Proceeding of the Second University Social Responsibility Summit cum Inaugural International Service-Learning Conference.

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### References

- [1] Centre for Research on the Epidemiology of Disasters. Country profile (China P Rep) for the period 1984 to 2013. Belgium: Centre for Research on the Epidemiology of Disasters; 2015. [Online] Available from: [http://www.emdat.be/country\\_profile/index.html](http://www.emdat.be/country_profile/index.html) [Access on 11th September, 2015].
- [2] Xu B. China releases number of dead, missing students from Sichuan quakes. Beijing: Xinhua News Agency; 2009. [Online] Available from: [http://news.xinhuanet.com/english/2009-05/07/content\\_11330782.htm](http://news.xinhuanet.com/english/2009-05/07/content_11330782.htm) [Accessed on 17th June, 2015]
- [3] Norris FH, Kaniasty K. Received and perceived social support in times of stress: a test of the social support deterioration deterrence model. *J Pers Soc Psychol* 1996; **71**(3): 498-511.
- [4] Kiliç EZ, Özgüven HD, Sayil I. The psychological effects of parental mental health on children experiencing disaster: the experience of Bolu earthquake in Turkey. *Fam Process* 2003; **42**(4): 485-95.
- [5] Freedy JR, Simpson WM Jr. Disaster-related physical and mental health: a role for the family physician. *Am Fam Physician* 2007; **75**(6): 841-6.
- [6] World Health Organization. Disaster risk management for health: overview. Geneva: World Health Organization; 2011. [Online] Available from: [www.who.int/hac/events/drm\\_fact\\_sheet\\_overview.pdf?ua=1](http://www.who.int/hac/events/drm_fact_sheet_overview.pdf?ua=1) [Accessed on 17th June, 2015]
- [7] United Nations Office for Disaster Risk Reduction Asia and the Pacific. Guidance notes: assessment and mitigation planning for risk reduction. Bangkok: United Nations Office for Disaster Risk Reduction Asia and the Pacific; 2010. [Online] Available from: [www.unisdr-apps.net/confluence/download/attachments/4554883/1MSSH\\_GuideNotes\\_Assess-Mit-Planning\\_070110.pdf](http://www.unisdr-apps.net/confluence/download/attachments/4554883/1MSSH_GuideNotes_Assess-Mit-Planning_070110.pdf) [Accessed on 17th June, 2015]
- [8] Save the Children. Comprehensive school safety: working towards a global framework for climate-smart disaster risk reduction, bridging development and humanitarian action in the education sector. Fairfield: Save the Children; 2012. [Online] Available from: [resourcecentre.savethechildren.se/sites/default/files/documents/7119.pdf](http://resourcecentre.savethechildren.se/sites/default/files/documents/7119.pdf) [Accessed on 17th June, 2015]
- [9] World Health Organization. Adolescents: health risks and solutions. Geneva: World Health Organization; 2014. [Online] Available from: [www.who.int/mediacentre/factsheets/fs345/en/](http://www.who.int/mediacentre/factsheets/fs345/en/) [Accessed on 17th June, 2015]
- [10] Chan EY. The untold stories of the Sichuan earthquake. *Lancet* 2008; **372**(9636): 359-62.
- [11] International Federation of Red Cross and Red Crescent Societies. Public awareness and public education for disaster risk reduction: a guide. Geneva: International Federation of Red Cross and Red Crescent Societies; 2011. [Online] Available from: [www.ifrc.org/Global/Publications/disasters/reducing\\_risks/302200-Public-awareness-DDR-guide-EN.pdf](http://www.ifrc.org/Global/Publications/disasters/reducing_risks/302200-Public-awareness-DDR-guide-EN.pdf) [Accessed on 17th June, 2015]
- [12] World Health Organization. Disaster risk management for health: child health. Geneva: World Health Organization; 2011. [Online] Available from: [www.who.int/hac/events/drm\\_fact\\_sheet\\_child\\_health.pdf](http://www.who.int/hac/events/drm_fact_sheet_child_health.pdf) [Accessed on 17th June, 2015]