



**Building Bottom-up Health Emergency and  
Disaster Management (Health-EDRM) Programs  
in Disaster Prone and Resource Deficit Context**

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## About the Series

This Working Paper Series is a new publication of Integrated Research on Disaster Risk (IRDR), following the decision of the IRDR Scientific Committee in April 2019 to act to 'Expand IRDR Network and Scientific Output' (No. 5 of the IRDR Action Plan 2018-2020).

IRDR is an international scientific programme under co-sponsorship of the International Science Council (ISC) and United Nations Office for Disaster Risk Reduction (UNISDR) and with support from China Association for Science and Technology (CAST) and Chinese Academy of Sciences (CAS). Started in 2010, the Programme has been pioneering in the promoting international and interdisciplinary studies on DRR and has made its contributions through scientific publication and policy papers as well as dialogue toward shaping international agenda in the understanding disaster risks, bridging science and policy gaps and promoting knowledge for actions, all required in the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) and its top priorities. Over time, the scientific agenda of IRDR has attracted many international renowned expertise and institutions. IRDR community is now, institutionally speaking, characterized by its strong Scientific Committee and six thematic working groups, thirteen IRDR national committees (IRDR NCs) and one regional committee (IRDR RC), sixteen international centres of excellence (IRDR ICoEs), a group of some one hundred fifty Young Scientists (IRDR YS) and a broad partnership with national, regional and international institutions working for SFDRR.

This Working Paper Series is thus specially made to facilitate the dissemination of the work of IRDR NCs, ICoEs, YS and institutions and individual experts that IRDR considers relevant to its mission and research agenda, and of important values for much broader range of audience working in DRR domains. As one will notice, all working papers in this series has anchored their relevance and contributions of their work toward SFDRR, IRDR, SDGs and Paris Agreement on climate change. It is the hope of the authors of the working papers and IRDR that this working paper series will not only bring new knowledge, experience and information toward disaster risk reduction, but also helped build better coherence of DRR with the mainstream agenda of UN today toward inclusive, resilient and sustainable human societies.

Team of IRDR-IPO



# Building Bottom-up Health Emergency and Disaster Management (Health-EDRM) Programs in Disaster Prone and Resource Deficit Context

## Lessons Learnt in the Ethnic Minority Health Program for Dai Minority at Ma'an Qiao Village, Sichuan Province China

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# Abstract of this Working Paper

Adopting and implementing field-based bottom-up approaches in Health Emergency and Disaster Risk Management (Health-EDRM) programs may reduce disaster risks, maximize resilience and minimize adverse health impacts in resource deficit, disaster prone remote and rural communities. Ma'an Qiao Village, an ethnic Dai and Yi minority-based community in Sichuan province, the People's Republic of China, has sustained major infrastructure devastation in the 2008 Panzhihua Earthquake. A multidisciplinary-based Health-EDRM intervention program was implemented by a collaborative effort among academic, governmental, non-governmental agencies and local community between 2009-2018. The working paper summarizes the key results and lessons learnt in disaster risk reduction in health of this 9 years Health-EDRM program. Among many of its reported impact, knowledge increase and behaviour changes were found to be statistically significant in immediate post-intervention in terms of proper hand-washing technique, anti-indoor smoking, non-communicable diseases, waste management, Oral Rehydration Solution (ORS) preparation and disaster bag preparedness. Nine years after the initial intervention, temporal stability was also reported in knowledge retention of most areas of disaster risks awareness, health beliefs and practices, especially in household hygiene and waste management. The report also discusses various challenges to tackle to achieve program effectiveness for implementing disaster health promotion and disaster risk education in rural transitional developing context.

## Keywords

Health Emergency and Disaster and Risk Management (Health-EDRM), Disaster risk reduction, Bottom-up resilience, Resource deficit, Disaster prone, Earthquake, Ethnic minority, Dai and Yi minority, Health promotion, Program effectiveness, Collaborations, Partnership, Evaluation, China



# Indications of contributions to IRDR

## Science Plan and UN Agendas

<u><i>IRDR Sub-objectives</i></u>	1
<u><i>SFDRR targets</i></u>	SFDRR Target A and D
<u><i>SDGs and/or Climate Goals</i></u>	SDG Target 3.D; 6.B; 11.C
<u><i>S/T Roadmap actions</i></u>	4.1

### 1. How does this study contribute to IRDR research objectives?

The primary goal for our Ethnic Minority Health Project is to identify evidence-based solutions to support bottom-up resilience building in health and disaster preparedness in remote and rural communities. This study identifies some gaps in empowering vulnerable communities in rural and remote settings prepare and mitigate the adverse impact of disasters, and in developing rural and remote community capacity.

### 2. How does this study contribute to SFDRR targets?

By focusing on the health risks of the vulnerable population, our study demonstrated ways to reduce disaster mortality at the rural communities by averting the major threats to life post disaster. Together with the work of our partner organisation in the village, we strengthened the rebuilding of the critical infrastructures including the community centre along with the clinic facility, thus reducing the disaster damage in the future.

### 3. How does this study contribute to SDGs and the Climate Goal?

Ensuring good health for all is the key outcome for the ethnic minority health project. By improving the health literacy and through identified key areas for intervention, education targeting healthy behaviours, lifestyle modifications and self-management of illnesses was delivered to the community members through various channels. Water and sanitation was a key area identified for health intervention and featured prominently in the structural rebuilding of the housing prototypes and the community centre.

### 4. How does this study contribute to Science & Technology Roadmap Actions?

The empathises on providing a prototype of health intervention and successful knowledge transfer and behavioural change was present throughout this paper. The evidence-based solutions identified and the focus on community preparedness and awareness are valuable lessons for the national disaster risk reduction plans. The project

delivery with a focus on inclusiveness and the vulnerable population contribute to the knowledge on the roadmap actions.

# Main Text

## 1. Background

Although occurrences of disasters might be unpredictable, human impact after disasters is often the result of complex interaction between natural hazards, the exposure, risks, community vulnerability and people's capacity to cope and respond. Asia-Pacific is the world's most disaster prone region (UNESCAP, n.d.; Chan, 2018). In addition to the geophysical hazards (earthquakes and volcanos), the increasing frequencies of climate-related natural hazards such as floods and typhoon have posed greater disaster risks and vulnerability to developing context of a number of high density, large populated based countries in the region.

Health-EDRM is an academic paradigm describes specific actions to reduce emergency and disaster risks with a focus on health. Such actions include reducing vulnerabilities and hazards through prevention, preparedness, response, and recovery measures (Lo et al., 2017; Chan & Murray, 2017). One of the main themes of Health-EDRM, is to increase awareness through emergency and disaster risk management education interventions (World Health Organization, 2013). Yet, there are limited published literature and lessons learnt at the field level to inform best practice and policy development.

Published literature indicated certain population subgroups, such as the poor and marginalized, people with disabilities, women and children, and the elderly tend to bear the greatest vulnerability and preventable burden of disaster risks (Davis et al., 2013; Chan & Shi, 2017). Among the vulnerable communities, ethnic minorities frequently experience more devastation from disasters and significant challenge in coping with disasters (Chan et al., 2014; Du et al., 2016; Chan et al., 2017; Chan, 2018; Chan et al., 2018a; Chan, Man, & Lam, 2019).

In China, the country with the highest repeated frequency and accumulated health impact of disasters (CRED, 2015), limited evidence is available to understand and evaluate how Health-EDRM interventions are performed. Among its population, non-Han ethnic minority-based communities often reside in rural Western or Northern regions which are often characterised by highlands and mountain ranges. These geographic locations are often characterized by their disaster proneness, extreme poverty, limited access to healthcare, education and suboptimal socio-economic development (Wang, 2002; Chan, 2018). The context often renders its population more susceptible to the adverse impact of earthquakes, landslides and climate-related disasters. Cultural differences and lack of published data and reports also further curtails understanding of how to bridge and improve effectiveness of program and policy attempts to reduce disaster risks, increase the resilience and coping capacity of many rural ethnic minorities.



The Ethnic Minority Health Project (EMHP) was developed in 2009 by CCOUC to examine and evaluate intervention approaches which reduced disaster and health risks of remote communities which are disaster prone and with limited resources (Chan, 2017). This working paper reviews and explains the first EMHP was developed and how Health-Emergency Disaster risk management program might be implemented and evaluated. It discusses lessons learnt in program effectiveness and examines temporal stability of the health-related aspects of a 9-year multi-disciplinary collaborative project in disaster risk reduction in Ma'an Qiao Village, a remote non-Han ethnic based minority based, disaster prone community in China.

## 1.1 Context

In China, Han majority accounts for 92% of its population, yet there are 55 ethnic minority groups officially recognized across China (8.41% of the total in the 2000 census to 8.49% in 2010 (National Bureau of Statistics of China, 2011a)). In Sichuan province, the ethnic minority population accounted for 6.10% in 2010 (National Bureau of Statistics of China, 2011b). Although poverty rates are dropping among minorities, ethnic minorities as a group remain disadvantaged in economic terms and were 1.5 to 2 times more likely to experience poverty than their Han counterparts (World Bank, 2010).

In 2008, the Wenchuan earthquake killed more than 69,000 people and received domestic donations of 4.185 billion Chinese Yuan (about 600 million USD) within the first week after the quake. Many government agencies and NGOs earmarked financial and material aid specifically for the Wenchuan earthquake. A 6.1 Richter-scale Panzhihua earthquake struck the border between Sichuan and Yunnan on August 30, 2008. It caused 41 deaths and destroyed more than 10,000 houses. Because it hit an area of relatively low population, the loss of life was not devastating, but damage to infrastructure was vast. Ma'an Qiao Village was one of the villages that were most seriously hit by the earthquake. Despite the vast damage, the Panzhihua earthquake was largely overshadowed by the Wenchuan Earthquake on May 12, 2008, which caught most of the domestic and international attention. The Panzhihua case illustrated forgotten disasters are fairly common and, as in the case of the Panzhihua earthquake, are usually those that impact remote areas with minority groups and rural populations.



Fig. 1 Project site location

Ma'an Qiao Village is located in the Jinsha River area of Xin'an Township, Huili County, Liangshan Yi Autonomous Prefecture, Sichuan Province (Fig. 2). Huili County has a population of about 440,000 and covers an area of about 4,527 square kilometres. Jinsha River holds its westernmost section on the major headwater streams of the Yangtze River and flows through the village. There are seven sub-villages in Ma'an Qiao Village, all within a perimeter of a few kilometres. Dai is the main ethnicity in the village, followed by Yi (Chan et al., 2017).

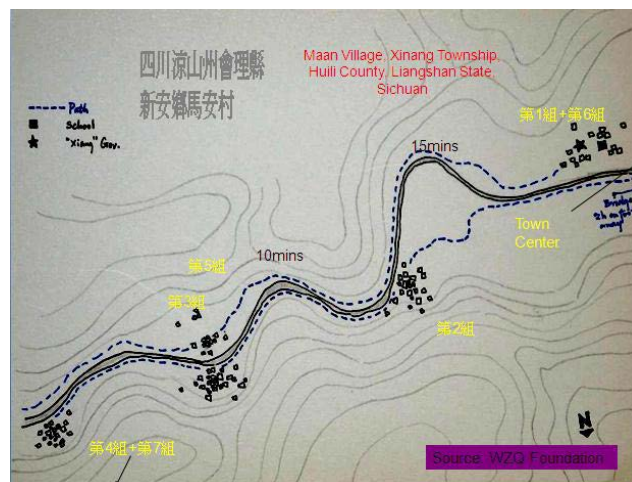
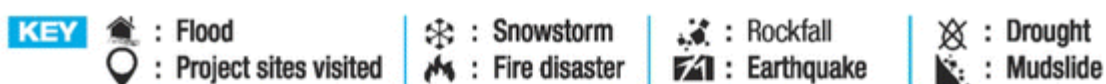


Fig. 2 Site map of Healthy Village: Ma'an Qiao Village project

In 2009, the Collaborating Centre for Oxford University and CUHK for Disaster and Medical Humanitarian Response (CCOUC) established the Ethnic Minority Health Project (EMHP) to work with remote, disaster prone ethnic-minority villages that live in poverty (Fig. 3). The main project objective was to develop and evaluate the effectiveness of bottom-up health and emergency and disaster risk management (Health- EDRM) for vulnerable populations in remote areas in Asia (Chan, 2018). In many of its project attempts, it includes infrastructural and socio-development dimensions to compliment and maximize the health promotion and disaster preparedness at the community level. For disaster preparedness, EMHP attempts to decrease disaster risks and adverse impact through low-cost health education to enhance disaster and health risk literacy, reduce disaster vulnerability and self-efficacy and self-help capacity at the individual and household level.





- |  |  |
|--|--|
| ① Gamai Village - Ethnicity: Tibetan     | ⑧ Bapa Village - Ethnicity: Dong    |
| ② Heihe Village - Ethnicity: Jingpo, Lisu           | ⑨ Nanjiang Village - Ethnicity: Dong     |
| ③ Manbangtang Village - Ethnicity: Kunge, Bulang    | ⑩ Gaoyou Village and Nongtuan Village - Ethnicity: Dong   |
| ④ Guai Village - Ethnicity: Zhuang     | ⑪ Macha Village - Ethnicity: Han    |
| ⑤ Hongyan Village - Ethnicity: Yi    | ⑫ Datan Village - Ethnicity: Hui    |
| ⑥ Ma'anqiao Village - Ethnicity: Dai, Yi     | ⑬ Dangzheng Village - Ethnicity: Han     |
| ⑦ Xingguang Village - Ethnicity: Miao    | ⑭ Dacao Village - Ethnicity: Manchu   |

Fig. 3 Project sites of the CCOUC Ethnic Minority Health Project in China as of April 2017 (Source: Chan et al. 2017)

The Ma'an Qiao Village project was the first EMHP and was established in collaboration with the local government and its NGO partner, Wu Zhi Qiao (Bridge to China) Charitable Foundation (WZQ), after the 2009 Panzhihua Earthquake. This multi-disciplinary based project aimed to rebuild the Ma'an Qiao Village as a model of sustainable, health and disaster resilience village. In addition to awarded with the 2011 UNESCO Asia Pacific Heritage Award for Jury Commendation for Innovation (UNESCO, 2011), it was also recognized in a number of education and knowledge transfers awards which highlighted the importance of collaboration between academic and communities.

## 2. Overall Design

The program content framework of EMHP was based on the modification of the WHO Healthy Villages model. It adapts a multidisciplinary based, holistic approach intended to address the critical Health-EDRM and environmental health problems in rural areas (Howard et al., 2002; Chan 2018). Based on the MAP-IT program development model (USDHHS, 2001), a typical EMHP project lasts for 18-24 months and is structured into four program management phases, namely needs assessment, health intervention, immediate impact and long-term program evaluation (Chan, 2018). **Table 1** showed the project timeline of EMHP at Ma'an Qiao Village.

**Table 1: Timeline of EMHP - Ma'an Qiao Village**

Phase	Phase 1 (March 20-26, 2009)	Phase 2 (January 20-24, 2010)	Phase 3 (March 15-21, 2011)	Phase 4 (January 18-21, 2018)
Main theme	<i>Needs Assessment</i>	<i>Health Intervention &amp; Further Needs Assessment</i>	<i>Impact Evaluation &amp; Health Intervention</i>	<i>Long Term Impact Evaluation</i>
Interventions and activities	Focus groups	Hand-washing	Non-communicable diseases	Impact evaluation survey
	Key stakeholder interviews	Anti-smoking	Nutrition	
	Household surveys	Disaster preparedness	Waste Management	
		Pre- and post- evaluation survey	Disaster Preparedness	
		Pre- and post- evaluation survey		

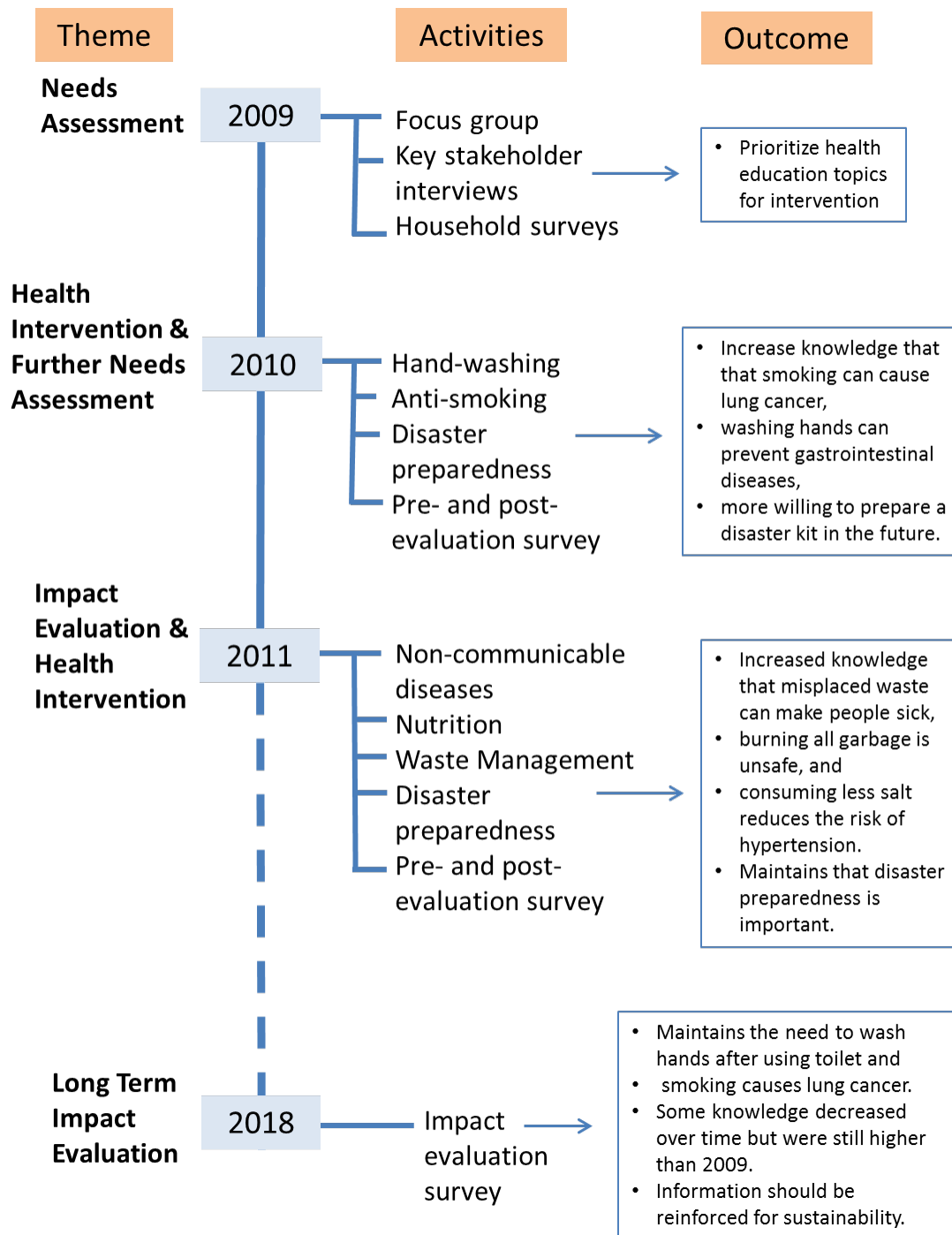


Fig. 4 Logic flow model of the timeline, activities and outcomes

## 2.1 Needs Assessment

Program planning is an integral part of program implementation and of evidence-based practice. The planning consists of multi-level field data collection about the target population to guide evidence-based and community participatory informed health promotion program. Given the active socio-economic development during the study program period (2009-2018) and very limited information were available for the general population and health status of people living in the Jinsha River area. Thus, for this 9-year project, continuous field-based health needs assessments were being conducted in



different time points throughout the project time period to maintain an updated understanding of needs in the village.

Three project based need assessments were conducted throughout the project. The first needs assessment, a face-to-face household survey based on the WHO Healthy Villages model collected household-level data on environment, health awareness, personal hygiene, access to health care and disease patterns, was conducted in March 2009 by four members from the CCOUC team. The second needs assessment, the household survey examined the knowledge, attitude and practice (KAP) among the villagers with regard to non-communicable diseases (NCDs) and nutrition was conducted in January 2010 explored NCDs and nutrition. The final assessment conducted during the final trip conducted in March 2011 aimed at assessing the impact of disasters on attitudes, and future disaster preparedness. The following section provides a brief key summary of each of these need assessments.

Community health and disaster needs were also supplementary with qualitative key stakeholder interviews, focus groups discussions and quantitative survey assessment through systematic sampling. The last birthday method (Chan et al., 2008) at the household level was also used to ensure the respondent are not bias for language and gender preferences in communication during the need assessment process. Cultural, language and gender appropriate translators were included in all the interviews to minimize potential biases. To protect the local community and to ensure international guidelines of research of human subjects of participants were respected and observed, relevant research ethics approval process were sought and granted at both the village/community level and at the Survey and Behavioral Research Ethics Committee of the Chinese University of Hong Kong.

#### ***Key Findings of Phase 1 assessment: March 20-26, 2009 (CCOUC, 2009)***

Initial needs assessment results (CCOUC, 2009) indicated the population in Ma'an Qiao Villages had worse health outcomes when compared with its counterparts, other provincial rural statistics by the Statistical Bureau of Sichuan Province in 2003. Overall, this community had limited disaster risk awareness, overall health risks knowledge and disaster preparedness attempts despite of its proneness and experiences with major extreme events (e.g. The 2009 Panzhihua earthquake). For water and sanitation, although water was easily accessible in this community, personal hygiene and sanitation practice were found to be major regular health risks (regardless of disaster status). The assessment also indicated that there were no household-based toilets. Only 50% of people washed their hands after using toilets and only 34% of people reported normal daily hygienic activities such as tooth brushing. Perhaps, due to these hygiene predispositions, respiratory and gastrointestinal problems were persistent at a high prevalence of 47% and 53% respectively. Another public health issue identified during the assessment was the community's behavior practices related to management of livestock and personal health-related behavior. 61% of respondents reported to allow farm animals to freely roam around their living quarters and there was no waste management system in place for the

entire community. Smoking was prevalent with 65% of participants reporting being regular smokers, 29% of them reporting smoking indoors, and 34% believing there is no difference in effect between indoor and outdoor smoking. Only 58% and 42% believed that smoking would cause lung cancer and heart disease respectively.

### *Key findings of Phase 2 assessment: January 20-24, 2010 (CCOUC, 2010)*

A second needs assessment was conducted in January 2010 and general knowledge about common non-communicable diseases was also assessed. Majority of the villagers lacked the knowledge in basic principles and ways to deal with diseases such as hypertension, diabetes, cancer, and psychological problems. For hypertension (the most common non-communicable disease in China), 81% was unaware of what normal blood pressure (systolic pressure) might be. For diabetes mellitus, only 18% knew there might be effective management principles. 62% and 48% believe there might be a need to control diet and exercise respectively for diabetic patients. Enquiries of dietary habits showed that there was a poor understanding of food nutritional values of food and the balance consumption of various kinds of nutrients may contribute to good health. Only 7% of the villagers knew that lack of iron in diet might lead to anaemia. Only 5% would eat fruits on a daily basis and nearly 98% would eat fried food occasionally. A mere 30% knew the role of vitamins as major nutrients in maintaining human metabolism. Knowledge, attitudes, and practices related to NCDs were found to be a priority for follow up and to be incorporated into the health education component of the program.

### *Key findings in Phase 3 assessment: March 15-24, 2011 (CCOUC, 2011a)*

Assessments during the March 2011 mission trip aimed to further explore determinants of health for the Ma'an Qiao community as well as gaps that might impede future disaster preparedness. Due to the accessibility in recent memory and salience of the 2008 Panzhihua earthquake, participants' disaster preparedness seems to have improved. In fact, results showed that participants who reported having experienced a disaster, and those who evacuated their homes due to damage, now believe it is necessary to prepare a disaster emergency rescue package, and this was significantly higher than those who had no disaster experience (Odds Ratio=12.1,  $p=0.02$ ), and were not evacuated (Odds Ratio=4.7,  $p<0.01$ ).

## **Summary of overall need assessment findings**

Throughout the three-year implementation of the "Healthy Village: Ma'an Qiao Village" project, the CCOUC team has continuously assessed the evolving health needs post-2008 Panzhihua earthquake. Initially, immediately after the disaster, identified health-related needs included a safe living environment, access to health care, personal and environmental hygiene, health awareness, and infectious diseases risk due to undesirable health habits. During the second mission trip, 18 months post-disaster; the needs had shifted to long-term health issues such as NCD. **Table 2** highlights the summary of health needs and issues identified during the field health needs assessment in Ma'an Qiao Village according to the Howard/WHO Healthy Village Model.

Table 2 Summary of health need assessments findings\* of Ma'an Qiao Village in March 2009 according to Howard/WHO (2002) Healthy Village Model

	<i>Key components in Promoting health in "Healthy Village" Approach</i>	<i>Findings from Local Study</i>
1	<i>Environment</i>	<p><u>Physical Environment</u></p> <ul style="list-style-type: none"> <li>• Limited ventilation (small window-2 windows for the farm house )</li> <li>• Limited lighting</li> <li>• Lack of indoor well-ventilated cooking area</li> <li>• Lack of sustainable waste disposable indoor facilities</li> </ul> <p><u>Behavior/Practices</u></p> <ul style="list-style-type: none"> <li>• 61% will allow farm animals to infiltrate their homes, leading to potential health problems.</li> <li>• Although 90% have designated facilities to dispose of human excretion 45% households surrounded by animals or human waste</li> <li>• 59% have trash around the house and 66% of these population claimed no place to put regular waste</li> <li>• 73% household cook indoor.</li> <li>• 91% use biomass as Fuel.</li> <li>• 60% household has smokers</li> <li>• 29% all smokers always smoke indoor</li> <li>• 77% of the household had mosquitoes flying around their houses.</li> </ul>
2	<i>Awareness of individuals and community about health</i>	<ul style="list-style-type: none"> <li>• only 33% are concerned misplaced of human excretions</li> <li>• Only 58% of the household owners believe that smoking causes lung cancer and 42% of them believe that smoking causes heart disease. Also, 34% of the people believe that there is no difference between smoking outdoor and indoor; therefore, 29% the people will still smoke indoor.</li> <li>• For people who do not believe that meat is more nutritious than vegetables (44%), they are statistically significantly less likely to have a tendency to consume more meat and less vegetable (64%) (OR=18.57, p&lt;0.001)</li> <li>• 65% regular smokers.</li> </ul>

3	<i>Personal Hygiene</i>	<ul style="list-style-type: none"> <li>• 50% will wash their hands after they went to restrooms</li> <li>• 34% do not brush their teeth everyday and 14% never brush teeth in their lives</li> </ul>
4	<i>Health Care</i>	<ul style="list-style-type: none"> <li>• No formally doctors or nurses in the village. 1 barefoot doctor (with 2 years of training); 1 Traditional Chinese Medical Doctor (not formally trained); 1 store that sells drugs.</li> <li>• No Dentist or other allied health workers in the setting</li> </ul>
5	<i>Disease</i>	<ul style="list-style-type: none"> <li>• Worm problems (11% ) versus 0.1% (2003 MOH survey) Village 3 (17%), Village 4 (20%), Village 5 (25%)</li> <li>• GI problems (53%) versus 22.3% (2003 MOH survey) Village 7 (50%), Village 6 (57%), Village 3 (67%), Village 5 (75%), Village 1 (80%)</li> <li>• Respiratory problems (47%) versus 51.6% (2003 MOH survey) Village 1 (73%), Village 6 (57%)</li> <li>• Skin problems (25%) versus 2% (2003 MOH survey) Village 4 (33%), Village 1 (40%), Village 7 (50%)</li> <li>• Limited information about the prevalence of non-communicable diseases.</li> </ul>

*\* Based on health need assessment findings conducted on March 20-26<sup>th</sup> 2009*

Based on the findings of the health needs assessments and situation analysis, the collaborative team decided to formulate a plan of action in an attempt to improve the general health and well-being of the Ma'an Qiao community. In May 2009, a community health and sustainable village project titled: "Healthy Village: Ma'an Qiao Village Project" was established. The working party agreed the objective of the project was to develop Ma'an Qiao area into a WHO "Healthy Village" of China. A multidisciplinary working committee was formed to plan and implement the "Healthy Village: Ma'an Qiao Village Project". **Table 3** highlights the key members, sectors, role and their related expertise and Table 4 delineates a summary of the field site situation analysis for further program planning after the initial assessments in March 2009.

**Table 3 Key stakeholders and their roles in the "Health Village: Ma'an Qiao Village Project"**

Sector	Parties Involved	Roles	Expertise
Public Health, Medicine	Humanitarian Initiatives, School of Public Health and Primary Care, Chinese University of Hong Kong	Coordinates health need assessments; designs and provides "Health Village" program recommendations; recruits program volunteers and	Public Health Need assessments, Health Education Program Design, Program evaluation. Multidisciplinary health-related expertise.

		support program implementation and evaluation	
Architecture/Housing	Wu Zhi Qiao Foundation, Department of Architecture, Chinese University of Hong Kong	Involves in a sustainable development project for bridges, school and housing; facilitates field program implementation.  Recruits program volunteers	Geographic Area expertise, Socio-political expertise in the area, access to community,  Constructions and sustainable development  Coordinate with program volunteers
Political/ Government  Central Government	PRC Ministry of Housing and Urban-rural Development HKSAR and Liaison Office of Central People's Government of HKSAR.	Facilitate housing design and central political endorsement	Facilitate political endorsement
Political/ Government  Local level	Ma'an Qiao Village, PRC People Committee Group	Facilitates community development; participate in program planning; supports program implementations and recruits program volunteers	Geographic Area expertise, Socio-political expertise in the area, access to community
Local Stakeholders	Local Village Representatives	Support information collection, participate in program planning and facilitate implementation,	Geographic Area expertise, Stakeholders
Program Volunteers	College students from 12 university partners*	Human resources: Volunteers and expertise for the "healthy village project"	Manpower

\* 5 from Hong Kong (The Chinese University of Hong Kong, The Hong Kong Polytechnic University, The Hong Kong University of Science and Technology, The Open University of Hong Kong and the University of Hong Kong) and 7 from Mainland (Chongqing University, Hefei University of Technology, Nanjing University, Southeast University, Xi'an Jiaotong University, Xi'an University of Architecture and Technology, and Wuhan University of Technology).

Table 4 Results of the situation analysis in Ma'an Qiao Village

Indicator*	Findings
Population Characteristics	<u>Socio-economic:</u> <ul style="list-style-type: none"> <li>• Occupation: 91% are farmers</li> <li>• Income: 45% with household net income less than 300RMB per month</li> <li>• Education: 83% &lt;= primary school education</li> <li>• Household Size: 70% &gt; 6 persons household</li> </ul>



	<ul style="list-style-type: none"> <li>• 44% of head of household less than 40 years old (9% &lt; 30 and 18% &gt; 60 years old)</li> <li>• Ethnic Minority: 85%</li> <li>• 78% of the households had at least 1 family member who were migrant workers in the town/city</li> </ul> <p><u>Language</u></p> <ul style="list-style-type: none"> <li>• 70% speaks Mandarin</li> </ul> <p><i>Important issue</i></p> <ul style="list-style-type: none"> <li>• Because of the economic crisis, many unemployed migrant workers returned to Mann village.</li> </ul>
<p><b>Area Characteristics and Infrastructure</b></p>	<p>Population size: 1258</p> <p><u>Geographic</u></p> <ul style="list-style-type: none"> <li>• Remote area, 8 hours from main Panzhihua City (3<sup>rd</sup> class city)Village Characteristics: Composed of 7 villages; Villages distributed along Jinsha (the upper stretches of the Yangtze River), border areas of Sichuan and Yunnan.</li> <li>• Access to river water</li> </ul> <p><u>Community health-related Infrastructure</u></p> <ul style="list-style-type: none"> <li>• No hospital, no formally trained medical/health workers, 1 local school No bank</li> </ul> <p><u>Level of economic development</u></p> <ul style="list-style-type: none"> <li>• 95% of households had television, 30% had access to telephone (functional mobile/landline phones)</li> <li>• No local newspaper or radio station.</li> <li>• With electricity and water supply.</li> </ul> <p><u>Pollution</u></p> <ul style="list-style-type: none"> <li>• Not obvious although population expressed concern related to water quality for potential pollution from external sources e.g. commercial metal industry in the nearby area (where a river might be contaminated)</li> </ul> <p><u>Other Important Issue</u></p> <ul style="list-style-type: none"> <li>• Most housing are non-earthquake proof and build with environmental unfriendly, expensive, non-sustainable material.</li> <li>• 95% destructions in housing post-August 2008 earthquake. As of March 2009, the re-construction process remained low.</li> </ul>
<p><b>Policy and Political Environment</b></p>	<p><u>Political Leader and Environment</u></p> <ul style="list-style-type: none"> <li>• Stable political area</li> <li>• Not a main development priority area.</li> <li>• Village Chief</li> <li>• PRC Communist Party Official</li> </ul>

<i>Health needs</i>	<p><u>Medical perceived needs</u></p> <p>Communicable pattern much higher than MOH (2003) provincial statistics. Limited information about the prevalence non-communicable diseases.</p> <p><u>Community Perceived Need</u></p> <p>Wish to have doctor, schools and proper road system. Concern about the quality of their current health care provider (barefoot doctor).</p> <p>Please also refer to the next table 1</p>
<i>Services provided by, the non-health sector</i>	<p><u>Service Provided by non-local groups</u></p> <p>Limited. WZO foundation had planned to construct a community village center, a bridge and a clinic.</p> <p><u>Health services:</u></p> <p>Barefoot doctor was providing fee-for service vaccination and basic primary care to the population.</p>

## 2.2 Health intervention Design

Based on the local context, knowledge level, reported health habits, beliefs and disease patterns found during the initial needs assessment, certain health education topics were given priority in intervention planning. Table 5 summarises the main themes and methods of health needs assessment in the three phases. Specific aims were listed for each intervention, including: to try to reduce the incidence of gastrointestinal worms, or any other transmittable diseases, minimize the health consequences of first-hand and second-hand indoor smoking, and empower the community to prepare for survival upon possible future disasters.

**Table 5 Main themes of health needs assessment of EMHP - Ma'an Qiao Village Project**

Phase	Disaster risk reduction themes	Health risk themes
Phase 2: Jan 2010 (CCOUC, 2010)	Disaster preparedness (earthquake)	<ul style="list-style-type: none"> <li>• Hand washing</li> <li>• Livestock and human separating</li> <li>• Anti-smoking</li> </ul>
Phase 3: Mar 2011 (CCOUC, 2011a)	Disaster preparedness (flooding)	<ul style="list-style-type: none"> <li>• Non-communicable diseases and nutrition</li> <li>• Waste management</li> </ul>

### Health education topics

#### *Health and Sanitation training*

The objective of the handwashing training was to educate the villagers on the relationship between hand-washing and good health, as well as healthy livestock separation management. Education content included the importance of maintaining good hand

hygiene, the adverse health effects of poor hand hygiene, when and how to wash hands properly, and awareness and approaches to keeping livestock (e.g. poultry) separate away from inside living quarters by building fences. During the health talk, an additional five sets of flip charts on hand-washing messages were circulated among the villagers.

### ***Anti-Smoking***

The objective was to emphasize the negative effects of smoking, create awareness, and persuade people to quit smoking. However, with the understanding that quitting smoking was an unfeasible short-term goal for the community with prevalent addiction and the limitation of the intervention team with not being local based, the aim of the education effort was thus focused on introducing the adverse impact of smoking on environment and issue with secondary hand-smoking on health. Impact of smoking-related diseases, including lung cancer, heart disease, chronic obstructive pulmonary disease (COPD), and gangrenes or peripheral vascular disease.

### ***Waste Management***

Session objective was to increase people's awareness of the possible health hazards existing in their environments and to teach waste management strategies. The message for this topic was: "It is important to establish a healthy environment –Environment can make you sick". The posters had two main messages (i) the risks associated with improper waste management and (ii) possible solutions. A flow diagram was created to show the association between misplaced excreta, vectors such as flies and ultimately illnesses such as diarrhea. The solutions flow diagram presented a picture of proper excreta disposal, a clean environment and good health outcomes. On the topic of kitchen waste disposal a similar layout was used to show the risks and solutions of burning garbage and dumping garbage indiscriminately. Solutions such as burying garbage were presented.

### ***Disaster Preparedness***

Section objective was to improve disaster risk awareness, literacy and enhance self-help capacity building in disaster preparedness. The intervention aimed to enhance awareness of earthquake preparedness and the immediate actions that should be taken post-disaster. The content was mainly divided into three parts. The first part was to emphasize the importance of preparing an emergency kit before disasters, which essentially should include a whistle, torch, lighter, identity card, and any necessary medication. Second, the participants were taught about appropriate self-protective actions during an earthquake. Lastly, methods for life preservation were suggested if they happened to be buried under rubbles after an earthquake.

Three main messages for health and disaster risks management for flood preparedness were emphasized. These included emergency kits preparedness, survival and evacuation skills during floods and health risks awareness precautions in post-floods context. Disaster preparedness kits items (e.g. to include in emergency kits such as water, whistle, mechanically-powered flashlight, fire starters (e.g. matches or firelighters), cash, medications for chronic illness and identity documents where displayed using pictures)

were discussed. Pictorial representations demonstrating appropriate survival skills such as staying away from floodwaters, power lines and mountain slopes were presented. Finally, post-flood Health-EDRM precautions such as beware of personal injury risks of damaged houses, the disease and health risks associated with floodwater exposed/contaminated foods, and the approach to evacuate (e.g. finding higher ground to await rescue) were emphasized.

### ***Non-communicable diseases (NCD)***

Section objective was to enhance awareness of the risks associated with an unhealthy diet and to provide information as to what constitutes an unhealthy diet. The messages for this topic were: reduce salt, reduce alcohol, and eat a balanced diet using 3:2:1 portions (Carbohydrates: vegetables: meat respectively). Each message was divided into three parts (i) risk factors leading to unhealthy outcomes (ii) good choice/behavior leading to healthy outcomes and (iii) advice on how to adopt good health behaviours. Pictures were the main source of communication for education. A drama was also included as a source of entertainment in addressing the 'reduce alcohol' portion of the education, as this was seen as a more difficult behavior to change.

## **2.3 Health evaluation**

### ***2.3.1 Immediate post-intervention evaluation***

Education program effectiveness were based on a serial of pre-post cross-sectional self-reported intervention evaluation surveys conducted throughout the project period. Two separate health education campaigns were held during the implementation of the Ma'an Qiao Healthy Village program in 2010 and 2011. Questionnaires were designed with the purpose of exploring the knowledge, attitude, and practices of the local villagers' health behaviors. A number of questions were asked in both the pre- and post-intervention questionnaire to measure effectiveness of the health educational sessions before and after the intervention. All the data collected was verified for completeness and entered into Microsoft Excel. Data analysis was performed on all results using descriptive statistics on the SPSS program. Comparison between groups was performed using the Pearson Chi-Square Test. In particular, the McNemar Test was used to compare differences before and after intervention/questionnaire on the same individuals. A statistical significance of  $p < 0.05$  was considered significant.

### ***2.3.2 Seven year-follow-up evaluation***

The re-evaluation study was conducted in Ma'an Qiao Village in January 2018. Household surveys were conducted using convenience sampling. Representatives of each of the village households were invited to fill in the evaluation questionnaire. Four local translators were invited to facilitate the participation of program attendees who could not speak Mandarin. Verbal consent was obtained from all study participants prior to the study. The evaluation tool consisted of 1) Hand and environmental hygiene, 2) Smoking, 3) Healthy eating, 4) Waste management, 5) Disaster preparedness.

### 3. Program Impact Results

#### 3.1 Environment and Housing prototypes and health (CCOUC, 2011b)

Three different housing prototypes within the village, the first one is the WuZhiQiao prototype (Fig.5a) built with mud which were completed in May 2010. It was constructed based on the traditional design of the minority people in the village but enhanced with the introduction of anti-seismic structural strengthening, improved ventilation and an integrated biogas system for cooking and heating. The second one is the governmental prototype (Fig.5b) built with bricks. The third one is actually built in the traditional way without special revision.



Fig.5a WuZhiQiao Prototype

Fig.5b Governmental Prototype

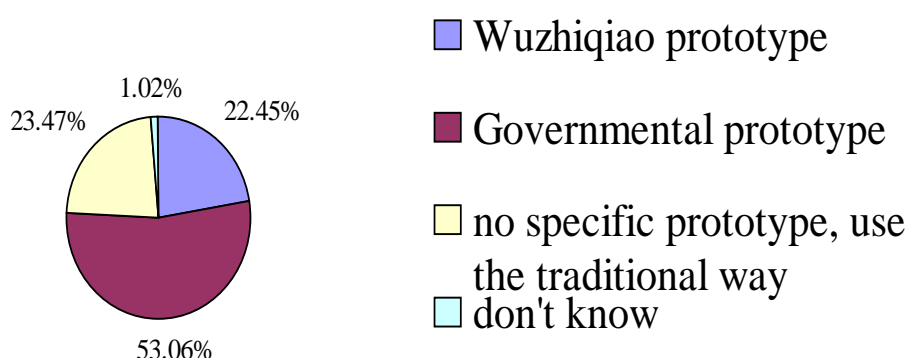
Fig.5 Housing prototypes within the village

##### 3.1.1 Basic information of the house

Of the 146 valid households, about 80.8% lived in the same place before the earthquake in 2008. Nearly 96.6% of the houses were damaged in the earthquake and 86.9% were unlivable. 69.2% of the villagers chose to stay in the previous houses and rebuild them. Lots of efforts have been put to rebuild the village as almost 99% of them claimed to have rebuilt their houses with 43.9% rebuilding the entire house. Fig.6 shows the proportion of each prototype that the villagers chose to rebuild on, from which we can see that over half of the households used the governmental prototype and 22.45% of the villagers rebuilt with the WZQ prototype.



## Which prototype does your rebuilt house based on?



**Fig.6 proportion of each prototype that the villagers chose to rebuild on in 2010**

For the 35.6% of household who reported the incompleteness of housing reconstruction, lack of financial resources appeared to be the biggest barrier (61.8%). Of the three prototypes, villagers living in WZQ prototype (Table 5) have a better confidence of safety.

**Table 5 Cross tabulation of different prototypes towards safety perception**

Do you think the new housing is safe?	WZQ prototype		Governmental prototype		Traditional prototype	
	Count	Percentage	Count	Percentage	Count	Percentage
Safe	17	77.3%	36	69.2%	13	56.5%
Acceptable	1	4.5%	9	17.3%	6	26.1%
Unsafe	2	9.1%	4	7.7%	4	17.4%
Don't know	1	4.5%	3	5.8%	0	.0%
Not Applicable	1	4.5%	0	.0%	0	.0%
Total	22	100%	52	100%	23	100%

### 3.1.2 Satisfaction towards the House

Villagers living in the WZQ prototype have the highest satisfaction towards the house (Table 6). They are more satisfied with the performing of size, facility, construction material, light, ventilation, temperature, room distribution and even cost.

Some of the households expressed concern about disasters as their houses were located in areas which made escapes route challenging. They were generally satisfied about the size at the houses but demand more social facilities. One specific item was drinking water as many of them did not have water supply in the house and household access to regular water sources. As for the construction materials, though WZQ prototype which used mud has a better satisfaction, villagers were worried that the mud was not concrete and strong enough. Ventilation was one of the points that the WZQ prototype paid attention to. The outcome was convincing as no one living in this prototype complained about ventilation.

The WZQ prototype was also performing well in lighting and temperature while the traditional prototype seems to have the biggest problem of temperature. Especially, no

household living in the WZQ prototype complained about the ventilation or temperature. The rehabilitation is a big burden to the household and 37 of them complained the cost was too expensive for them to afford.

**Table 6 Cross tabulation of distribution of satisfaction towards different prototype**

		WZQ prototype	Governmental prototype	Traditional prototype
Location	Satisfied	72.7%	61.5%	81.8%
	acceptable	22.7%	26.9%	18.2%
	unsatisfied	4.5%	11.5%	0
Size	Satisfied	68.2%	57.7%	60.9%
	acceptable	13.6%	25.0%	17.4%
	unsatisfied	18.2%	17.3%	21.7%
Facility	Satisfied	57.1%	50.0%	42.9%
	acceptable	28.6%	24.0%	28.6%
	unsatisfied	14.3%	26.0%	28.6%
Material	Satisfied	76.2%	67.3%	31.8%
	acceptable	14.3%	20.4%	50.0%
	unsatisfied	9.5%	12.2%	18.2%
Light	Satisfied	81.8%	74.5%	63.6%
	acceptable	13.6%	15.7%	22.7%
	unsatisfied	4.5%	9.8%	13.6%
Ventilation	Satisfied	86.4%	75.0%	60.9%
	acceptable	13.6%	19.2%	21.7%
	unsatisfied	0	5.8%	17.4%
Temperature	Satisfied	71.4%	63.5%	47.8%
	acceptable	19.0%	17.3%	21.7%
	unsatisfied	9.5%	19.2%	30.4%
Cost	Satisfied	52.4%	33.3%	23.8%
	acceptable	28.6%	35.3%	14.3%
	unsatisfied	19.0%	31.4%	61.9%
Room distribution	Satisfied	72.7%	60.0%	47.6%
	acceptable	18.2%	26.0%	42.9%
	unsatisfied	9.1%	14.0%	9.5%

Overall	Satisfied	77.3%	53.8%	36.4%
	acceptable	18.2%	32.7%	50.0%
	unsatisfied	4.5%	13.5%	13.6%

### 3.1.3 Health Impacts

By comparing the three means (Table 7), it's the WZQ prototype that has the best self-claimed health status compared with others.

**Table 7. Means comparison of health status within different prototypes**

Prototype	Mean	Number
WZQ prototype	3.50	22
Governmental prototype	2.96	52
Traditional prototype	3.17	23

When asking whether they think living in the new housing has improved family member's health (Table 8), villagers living in the governmental prototype have a better confidence.

**Table 8 Cross tabulation of whether living in the new housing has improved health**

Do you think the new housing is safe?	WZQ prototype		Governmental prototype		Traditional prototype	
	Number	Percentage	Number	Percentage	Number	Percentage
Yes	13	59.1%	36	72.0%	11	52.4%
No	5	22.7%	7	14.0%	6	28.6%
Don't know	2	9.1%	5	10.0%	4	19.0%
Not Applicable	2	9.1%	2	4.0%	0	.0%
Total	22	100%	50	100%	21	100%

## 3.2 Results of health education Intervention

### 3.2.1. Key Results of Immediate post education intervention (CCOUC, 2010; CCOUC, 2011a; Ho, 2011)

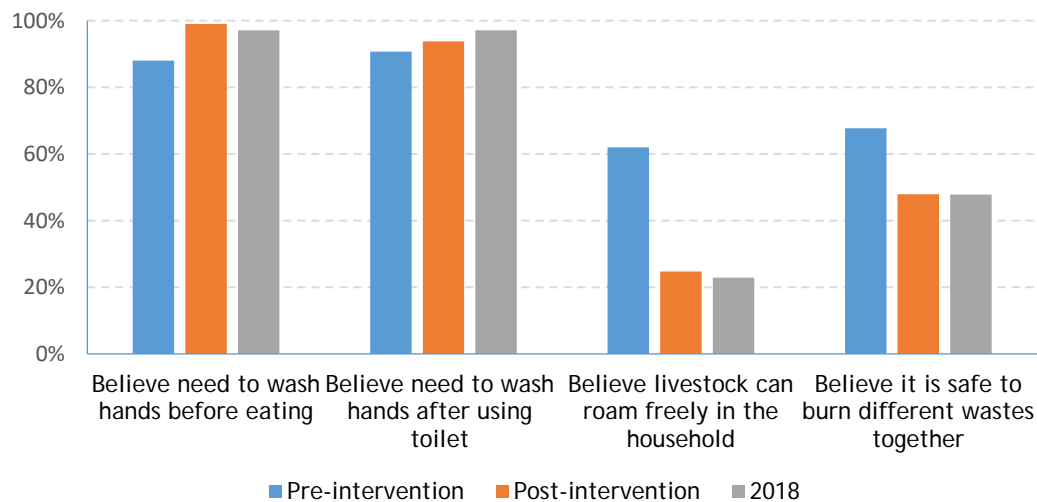
The evaluation in January 2010 focused on education intervention effectiveness of hand washing skills, the health effects of indoor smoking, and disaster preparedness in an earthquake event. A total of 110 participants were recruited on the day of the intervention program.

#### *Health and Sanitation: Hand-washing, Live-stock-human separation*

The objective of the health and sanitation intervention was to educate the villagers on the relationship between hand-washing and good health, as well as healthy live poultry

management. The content of the session included the importance of maintaining good hand hygiene, the adverse health effects of poor hand hygiene, when and how to wash hands properly, and learning to keep poultry away from inside the home by building fences. During the health talk, an additional five sets of flip charts on hand-washing messages were circulated among the villagers. Before the health education talk, 86.3% of the villagers recognized the need to wash hands before meals. After the health education, there was an 8% increase in villagers who recognized the need to do so ( $p < 0.01$ ). For hand-washing after defecation, 87% of them recognized there was such a need before education and there was a 2% increase after the education ( $p < 0.01$ ). The greatest change was 12% increase from 80% in knowing that poor hand hygiene could cause gastrointestinal problems such as diarrhoea and worm infestation ( $p < 0.01$ ).

For livestock and human separation (e.g. poultry management), before the intervention although 95% of participants reported they were aware of the necessity of hand washing after contact with poultry, only 72% of participants reported they actually did wash their hands after contact with poultry. After the education, 89% of participants reported that they would carry out proper hand washing procedures after contact with poultry in the next 7 days ( $p < 0.01$ ). The data also illustrated an increase in perceived susceptibility and perceived health benefits for the villagers. A 10% increase from 73% to 82% was found for the knowledge that live poultry could affect their health ( $p < 0.01$ ). A 37% change from 24% to 61% believed that live poultry should not be allowed to walk around in their homes ( $p < 0.01$ ). Yet, only 46% of participants reported the ability to keep live poultry away from their homes and only 40% reported they would actually try to keep the poultry away from home in the next 7 days ( $p < 0.01$ ).



**Fig. 7 Household hygiene & Waste management**

All the results above were found to be statistically significant improvement. Overall, the data supported that the hand-washing promotion activities had improved knowledge regarding hand-washing and poultry management. Of the total 100 valid cases, 65% reported that they had inadequate water source for hand-washing, a barrier to practicing regular hand washing. On the other hand, improper management of poultry was a

concern in rural areas especially since data showed that nearly 40% villagers lack self-efficacy in the control of their poultry. Thus, health promotion activities for poultry management should be further followed up in the program.

### ***Indoor environment: Impact of Smoking, Secondary smoking Anti-Indoor Smoking***

The objective of this intervention was to emphasize the negative effects of smoking, create awareness, and persuade people to quit smoking. However, with the understanding that smoking is a well ingrained facet of villagers' everyday life, and due to time limitations, the team realized that a secondary objective of the session to persuade smokers to smoke outside their homes or in open areas would be useful. The content of the session included information about smoking-related diseases, including lung cancer, heart disease, chronic obstructive pulmonary disease (COPD), and gangrenes or peripheral vascular disease. Out of a total of 110 participants, 98 were valid cases and 12 were missing cases. Out of the 98 participants, 67 of them never smoked, 20 smoked half a pack of cigarettes or less per day, and 11 smoked a pack of cigarettes per day. 58% of them reported at least one family member that smokes within the household. Before education, 44% of non-smokers believed that smoking can cause lung cancer, and 63% believed so after the education, indicating a 19% increase ( $p < 0.01$ ); 17% of smokers believed this was true before education and 22% after education, an increase of 5% ( $p < 0.01$ ).

In terms of smoking causing gastrointestinal disease, 45% of non-smokers believed so before education and 57% after education, which was a 12% increase ( $p < 0.01$ ); 22% of smokers believed so before education and 24% after, showing a mere 2% increase ( $p < 0.01$ ). In terms of smoking causing heart disease, 28% agreed it does before and 63% after for non-smokers, which was a 34% increase ( $p < 0.01$ ); 18% before and 23% after for smokers, a 5% increase ( $p < 0.01$ ).

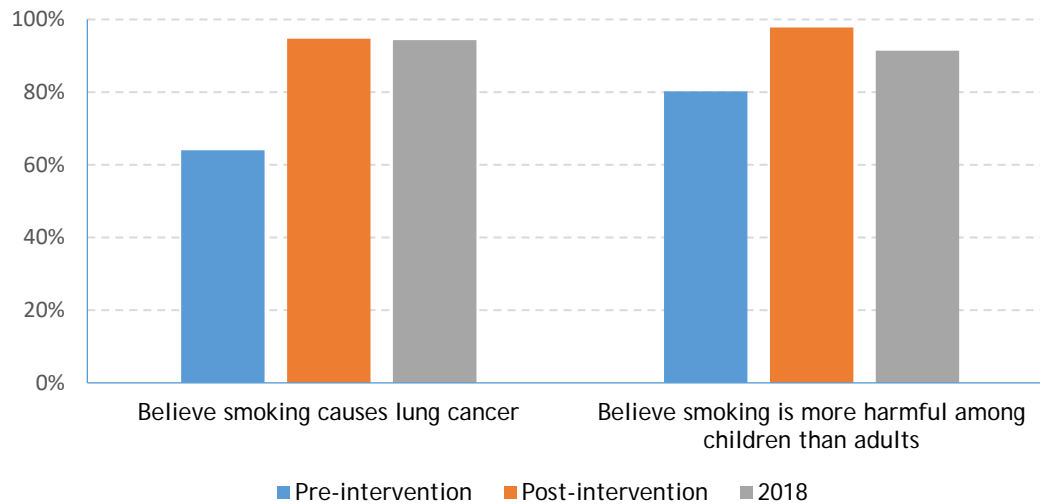
In terms of smoking causing emphysema, 44% agreed before and 61% after for non-smokers, a 17% increase ( $p = 0.19$ ); 20% before and 24% after for smokers, a 4% increase ( $p = 0.01$ ). In all four questions, the results were statistically significant except for the pre-education question on emphysema. Nonetheless, in general there was a gain of knowledge in both groups from the health education.

In exploring their attitudes towards smoking in front of children, 72% believed that that would make children more likely to imitate their behaviour and smoke. When asked whether they had ever smoked outdoors for the sake of their families, only 33% of them said yes. 42% of them thought it was inconvenient and 3% thought it was too cold to do so outdoors. Before and after the health education talk, 51% and 62% of non-smokers respectively believed that children smoking is indeed worse than adult-smoking, indicating an increase of 11% ( $p < 0.01$ ); it was 27% and 25% of smokers respectively, a 2% decrease ( $p = 0.01$ ). Lastly, 85% said they will smoke outdoors in the future. 78% said they will start trying not to smoke indoors in the subsequent week. Overall, 94% of the



participants believed the health educational talk could help increase their knowledge on adverse effects of smoking inside their homes.

Fig. 8 summarised the changes after the intervention. Overall, the data supported that smoking is prevalent in the community and that there is a lack of motivation in regards to smoking outdoors. The health intervention proved to be successful in creating awareness of the harmful effects of smoking for individuals as well as their families.



**Fig. 8 Smoking**

All the results above were found statistically significant. Overall, the data supported that smoking is prevalent in the community and that there is a lack of motivation in regards to smoking outdoors. The health intervention proved to be successful in creating awareness of the harmful effects of smoking for individuals as well as their families.

### *Disaster risk reduction and Preparedness*

The objective of this intervention was to teach the importance of effective disaster preparedness and increasing the coping capacity in disaster situations. The intervention aimed to enhance awareness of earthquake preparedness and the immediate actions that should be taken post-disaster. Content was mainly divided into four parts. The first part was to emphasize the importance of preparing an emergency kit before disaster, which essentially should include a whistle, torch, lighter, identity card, and any necessary medication. Second, the participants were taught about appropriate self-protective actions during an earthquake. Third, methods for life preservation were suggested if they happened to be buried under rubbles after an earthquake. Finally, post-flood precautions such as avoiding damaged houses and foods that have been exposed to flood water, and finding higher ground to await rescue were emphasized.

### *Impact of the earthquake and disaster risk awareness*

The pre-intervention questionnaire included questions on the impacts of the 2008 Panzhihua earthquake on the participants. Results showed that 86% participants had their homes severely destroyed or collapsed, and 24% of them were injured during the acute

phase of earthquake. In addition, at the time of data collection, nearly half of the participants (51%) had already moved back to their home after the earthquake. Among those participants who had their houses destroyed in the earthquake, 70% of them believed that disaster preparedness is essential, and this was statistically significantly ( $p < 0.01$ ) higher than those whose houses were not destroyed (5%). Participants who were injured in the earthquake also provided a similar result. Among them, 58% of them believed that work for disaster preparedness is necessary, and this result was significantly ( $p < 0.01$ ) higher than those who were not injured in the earthquake (19%).

### *Knowledge on preparing a disaster preparedness kit*

Regarding the preparation of an emergency kit (Table 9) there was an increase from 45% of participants prior to intervention, to 65% post-intervention, who reported they knew how to prepare an emergency kit ( $p < 0.05$ ). More than two thirds of participants (67%) reported they knew what to include in the emergency kit. People had an increased awareness of the necessity of disaster preparedness but knowledge on how and what to include into emergency kits was not high.

**Table 9 Summary of the results for disaster preparedness**

Question / Measurement	Pre	Post	Change by	p-value
Health education increased knowledge on disaster preparedness	/	97.5%	/	/
Disaster preparedness perceived as important	88%	95.8%	+7.8%	0.146
Intend to prepare an emergency kit	58.1%	93.2%	+45.1%	<0.001
Knows that emergency kits should include drugs for chronic illnesses	60%	90.6%	+30.6%	<0.001
Emergency kit should NOT be placed in concealed places	40%	61.9%	+21.9%	0.01
Knows how to escape from floods (by going to higher ground and avoiding floodwaters)	94%	98.3%	+4.3%	0.219
Would NOT enter damaged houses	58.0%	66.4%	+8.4%	0.078
Would NOT consume contaminated food	81.8%	84.5%	+2.7%	1.000
Confident in coping with future disasters	89%	95.7%	+6.7%	0.021

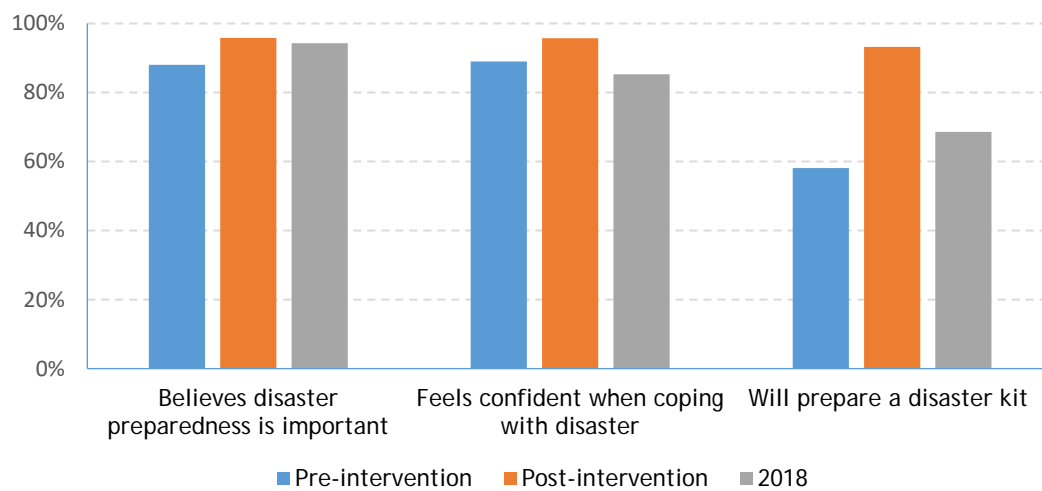
### *Knowledge on emergency response*

Regarding emergency response during the occurrence of earthquakes, 78% of the participants expressed that they knew preventative measures to stay safe from hazards prior to the intervention; 66% of participants knew to hide under firm furniture to protect themselves, 99% of them knew they should wait for rescue under firm furniture after the event and 81% of participants knew to escape from the mountain slopes or riversides after

the intervention. However, the results were not statistically significant in the pre- and post- intervention ( $p= 0.47$ ).

### *Resilience from disaster*

Overall, results showed that respondents are aware of the disaster risks they face, and they believe that disaster preparedness is important to mitigate future events. Although the Ma'an Qiao community has experienced many disasters, only a few have actually made any preparations for disasters. Most of the participants showed good resilience post disaster. Results indicated that 77% and 99% of participants showed confidence to cope with the disaster before and after the intervention respectively and the difference was significant ( $p=0.01$ ). Most people agreed that the preparation of an emergency kit was necessary but failed to take necessary action to prepare one (Fig. 9).



**Fig.9 Disaster preparedness**

### *Satisfaction of the health intervention*

Results showed that 83% of participants believed that the health intervention enhanced their awareness towards disaster preparedness and knowledge of emergency response. Overall, the data shows that people in Ma'an Qiao Village were resilient after the earthquake, and that they have good knowledge of disaster preparedness. However, for people whose previous earthquake experience was minimal, results showed that they did not think disaster preparedness measures were of immediate importance. The health intervention proved to be successful in promoting the importance of future disaster preparedness.

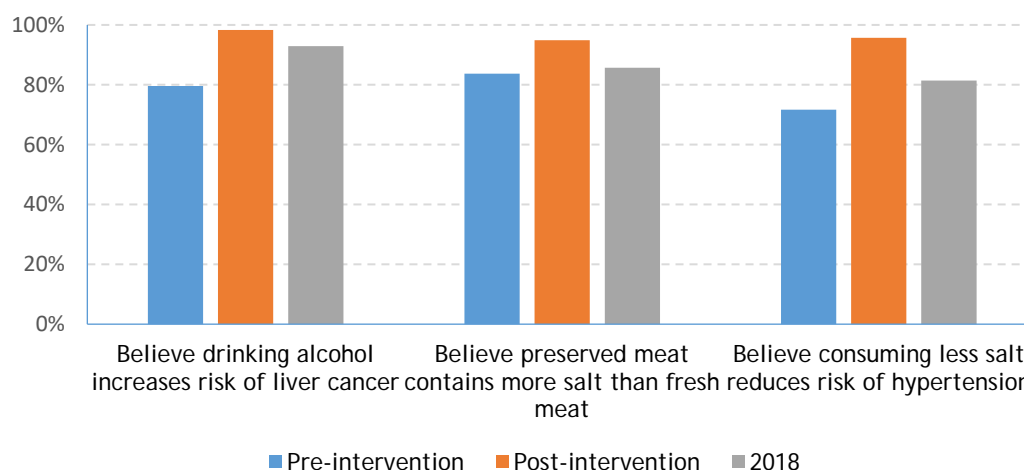


**Fig. 10 Disaster kit distribution**

**Health risks: Non Communicable Disease (NCD)**

The objective of this intervention was to enhance awareness of the risks associated with an unhealthy diet and to provide information as to what constitutes an unhealthy diet. The messages for this topic were: reduce salt, reduce alcohol, and eat a balanced diet using 3:2:1 portions (Carbohydrates: vegetables: meat respectively). Each message was divided into three parts (i) risk factors leading to unhealthy outcomes (ii) good choice/behaviour leading to healthy outcomes and (iii) advice on how to adopt good health behaviours. Pictures were the main source of communication for education. A drama was also included as a source of entertainment in addressing the 'reduce alcohol' portion of the education, as this was seen as a more difficult behaviour to change.

The evaluation in March 2011 focused on the dangers and risk factors of NCD's, waste management issues, and disaster preparedness during floods. A total of 125 people were recruited on the day of the education campaign. Respondents had a moderate level of knowledge of the risk factors of NCD (Fig. 11). Overall, there was a significant increase in knowledge of NCD's and the risk factors for developing NCD's.



**Fig.11 NCD**

Respondents had a moderate level of knowledge of the risk factors of NCD (Table 10).

**Table 10 Comparison of people's knowledge and attitudes before and after health intervention (NCDs)**

NCD Topic	Questions	Findings			
		Pre (%)	Post (%)	Change by (%)	P-value (x <sup>2</sup> )
Salt Reduction	Preserved meat has higher salt content than that of fresh meat	83.7	94.9	+11.2	< 0.01
	Hypertension is a serious disease	57.3	85.5	+28.2	< 0.001
	Consuming less salt reduces the risk of getting hypertension	71.7	95.7	+24.0	< 0.001
Reduction in Alcohol Consumption	Drinking too much beer increases my risk of getting liver cancer	79.6	98.3	+18.7	< 0.01
	Drinking less beer makes me healthier	73.4	91.9	+18.5	< 0.01
	Drinking 3 bottles of beer each day causes damages to our body	61.3	86.3	+25.0	< 0.001
Having Healthy Diet with 3:2:1 proportion	Consuming more meat increases the risk of getting diabetes	41.1	79.0	+37.9	< 0.001
	Consuming fewer portions of vegetables does not affect my health	No: 54.0	51.6	-2.4	< 0.005
		Yes:22.6	41.9	+19.3	

Overall, there was a significant increase in knowledge of NCD's and the risk factors for developing NCD's.



**Fig. 12 Health interventions related to NCD**

### ***Environmental Health Risks Waste Management***

The objective of this session was to increase people's awareness of the possible health hazards existing in their environments and to teach waste management strategies. The message for this topic was: "It is important to establish a healthy environment –Environment can make you sick". The posters had two main messages (i) the risks associated with improper waste management and (ii) possible solutions. A flow diagram was created to show the association between misplaced excreta, vectors such as flies and ultimately illnesses such as diarrhoea. The solutions flow diagram presented a picture of proper excreta disposal, a clean environment and good health outcomes. On the topic of kitchen waste disposal, a similar layout was used to show the risks and solutions of burning garbage and dumping garbage indiscriminately. Solutions such as burying garbage were presented.

Post-intervention more than 90% of participants provided correct answers pertaining to the relationship between misplaced excreta and bad health outcomes. More specifically, before the intervention, 84% of them believed that having misplaced human faeces in the environment is a health hazard, and 99% believed so after the intervention, indicating a 15% increase ( $p < 0.01$ ). In terms of misplaced animal excreta, before the intervention, 92% believed that misplaced animal faeces can cause disease, and 99% believed so after the intervention, a 7% increase ( $p = 0.03$ ).

In regards to kitchen waste, before education, 81% of respondents believed that misplaced kitchen waste could make people sick, and 96% believed so post education, which showed a 16% increase ( $p < 0.01$ ). In addition, 79% of respondents thought it was important to store all kitchen waste in a tightly sealed container to avoid attracting animals. With respect to burning solid waste, pre- intervention results showed that only 32% of respondents thought it was unsafe to burn all types of garbage (including plastics and glass). After the intervention, the figure amounted to 55% ( $p < 0.01$ ).



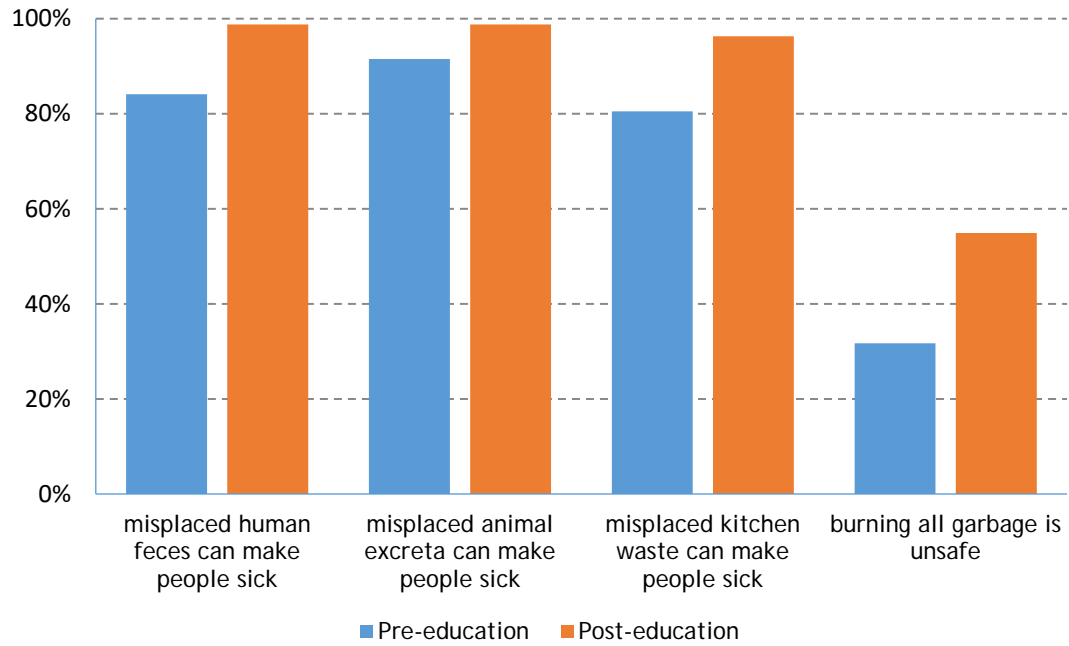


Fig.13 Percentage of respondents who acknowledge various risk of waste disposal

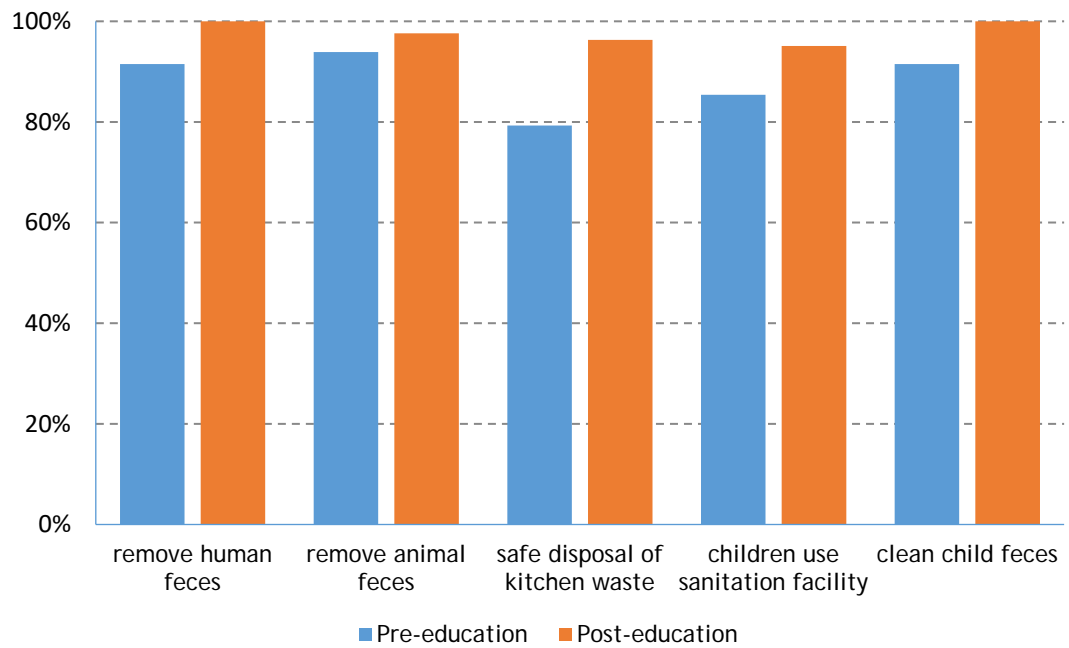


Fig.14 Percentage of respondents who perceive waste disposal is important

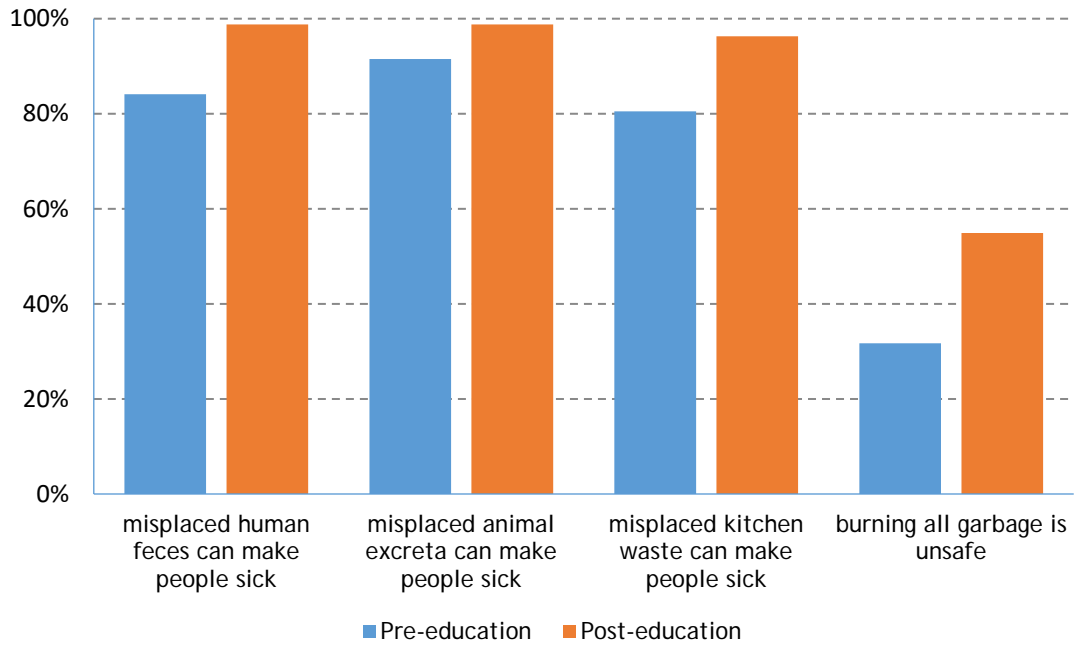


Fig.15 Percentage of respondents who acknowledge various risk of waste disposal

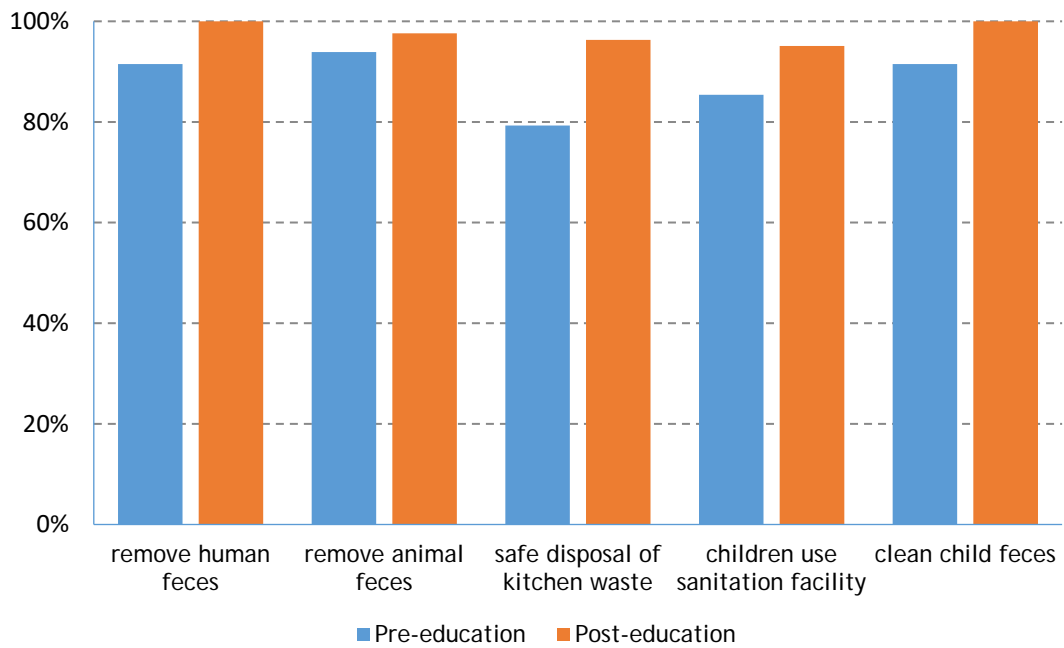


Fig.16 Percentage of respondents who perceive waste disposal is important

Overall, results showed that knowledge of waste management increased post health education. In addition, people reported a higher intention to practice proper waste management.

### 3.2.2 Key Results of Long-term evaluation of health education intervention

The evaluation in January 2018 focused on the findings of the 2018 re-evaluation program in Ma'an Qiao Village to assess the long-term knowledge retention of the 2010 and 2011 health education interventions. As a result, 71 household representatives responded to the evaluation questionnaire.

**Findings demonstrated improved knowledge in water and sanitation, food and nutrition, and disaster preparedness immediately after the Health-EDRM education interventions. Knowledge retention was observed in household hygiene & waste management and smoking beliefs seven years post-intervention.**

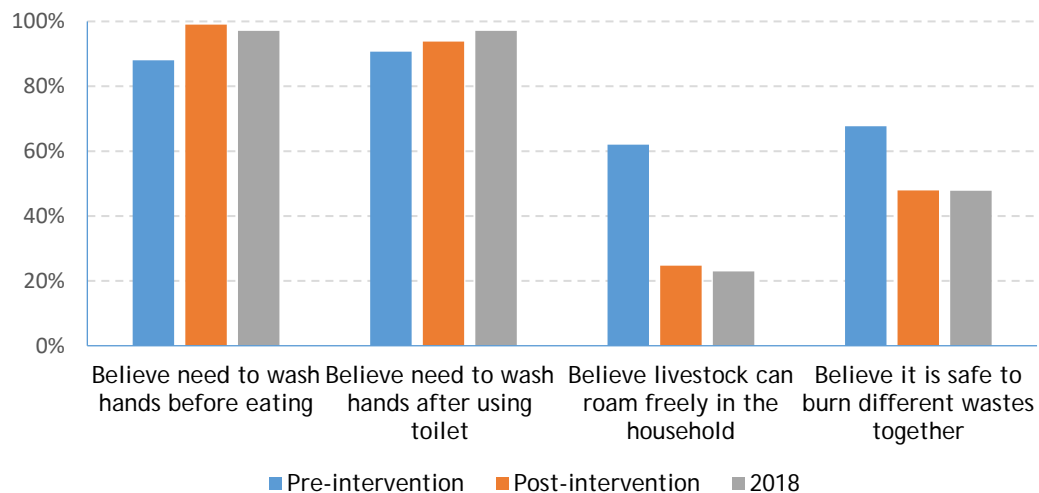


Fig.17 Household hygiene & Waste management

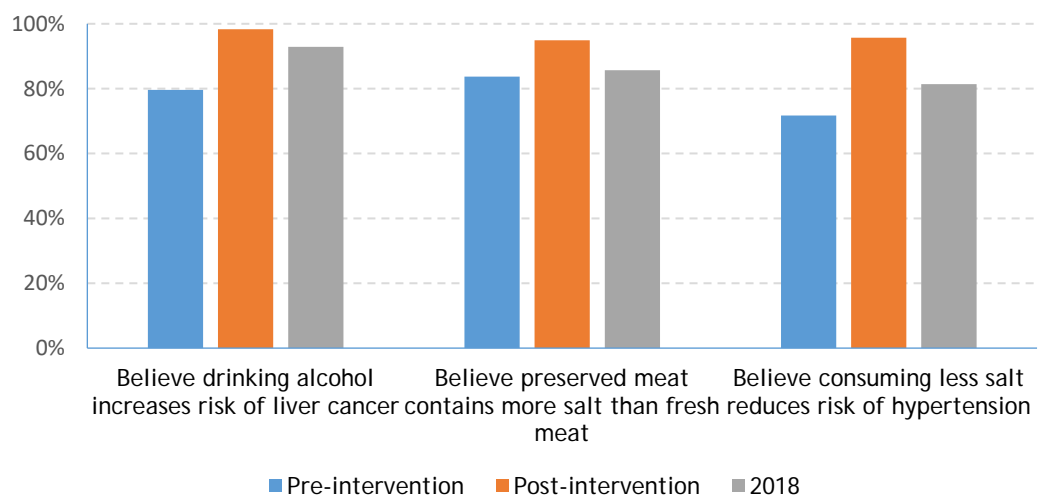
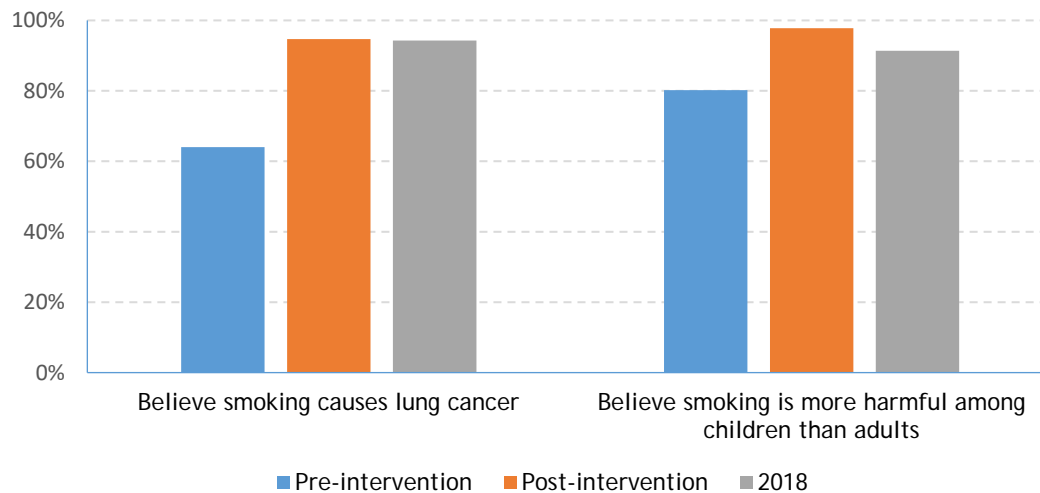
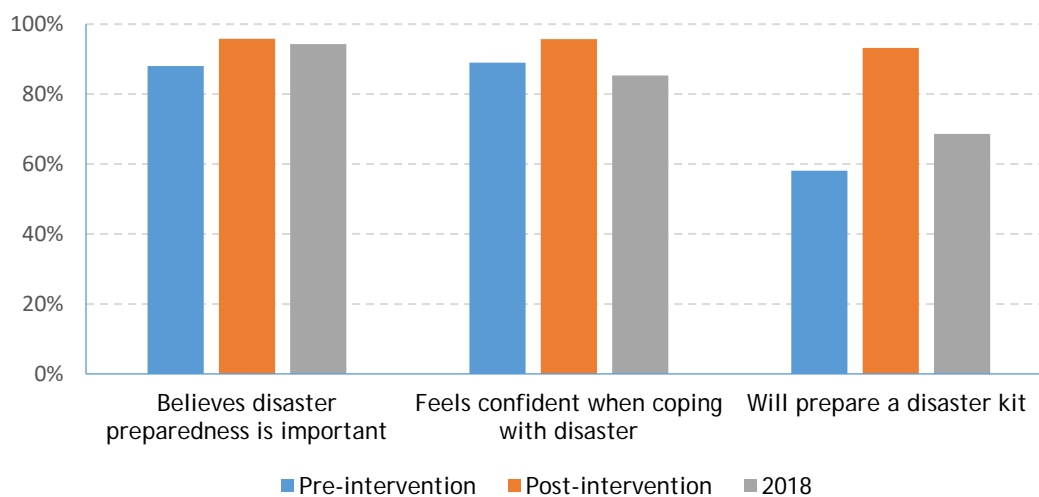


Fig.18 Food and nutrition



**Fig.19 Smoking**



**Fig. 20 Disaster Preparedness**

As shown in the figures above, various health emergency and disaster risk-mitigating practices were measured in the 2018 evaluation. Knowledge retention was found in many areas of health beliefs and practices. Around 80-90% of respondents generally agreed to health risk-mitigating practices related to handwashing. The incorrect beliefs that livestock can roam freely in the household, and burning different wastes together is safe, declined immediately after the 2011 intervention and maintained similar levels in 2018. However, decreases in knowledge were also observed. For example, the number of people who believed the relationship between unhealthy diet and the risk of NCD, decreased significantly in 2018. For disaster preparedness, the confidence in dealing with disaster decreased from 95% in 2010 to 85% in 2018, while the intention to prepare a disaster kit was dropped from 93% in 2010 to less than 70% in 2018.

## Summary of intervention evaluation

Disasters are often perceived as unpredictable (Chan, 2017), yet the occurrence of disasters is often the result of complex interaction between natural hazards, the exposure to such hazards amongst people and assets, and their vulnerability to damage.

Health interventions regarding Hand-washing, Anti-Indoor Smoking, NCD management, waste management, and disaster preparedness was successfully completed at Ma'an Qiao Village. Results indicated that the Ma'an Qiao community had good knowledge but little efficacy in terms of proper hand-washing, anti-indoor smoking, disaster preparedness, NCD, and waste management. Availability of waste management facilities is a contributing factor for this lack of appropriate behavior and knowledge. It is important to emphasize there was no reported disaster nor implementations of similar health program in this village between our intervention years. And the study findings in 2018 show some of our interventions, not only improved the immediate knowledge, but persisted temporal stability seven years afterwards in this ethnic minority-based community. Although some of the knowledge levels decreased over time, they were still higher than the pre-intervention levels. For the interventions with immediate effects are easier to sustain. For example, if livestock can go around freely in the household, the smells in the house were terrible and animal faeces were everywhere. So, the villagers will feel happy to conduct human-livestock separation. While the other interventions, such as the promotion of eating less salt, are more difficult because it is against their preference for salty diet, which seems more attractive for them. And the effect of noncompliance is chronic. And for disaster preparedness, because the last disaster occurred there ten years ago, their vigilance of disaster was declining.

Key remaining gaps were also identified. Firstly, poor waste management practice (e.g. plastic burning). For example, waste burning remained a dominant waste management practice because it is hard to transport waste outside the village. And the situation may become worse since increasingly more plastic package products entering into rural areas (World Bank, 2005) with the income increase. Secondly, the decreased intention of disaster kit preparation, which may suggest inadequate disaster awareness and preparedness. Between these time periods, the Ma'an Qiao village had increased access to electrical appliances and internet technology. Future health intervention programs should consider rural economic development as well as the gaps above for the protection of the community's well-being.

## 4. Key considerations for future programs (CCOUC, 2016)

The following 4 key points should be seriously considered for future programs.

### (1) Partnership

Multidisciplinary partnership and involvement of local community stakeholders are key success determinants to the implementation of field-based Health-EDRM program.

## (2) Relevance to local needs and development

With the constant evolution of socioeconomic context, continuous assessment efforts with a commitment of follow-up actions are essential components to ensure relevant and appropriate local needs to be identified and addressed.

## (3) Sustainability

One-off intervention is found to be insufficient to sustain knowledge retention beyond 1 year. Future project initiatives should explore the application of new technology (such as internet and mobile technologies) to maximize the sustainability of program impact.

## (4) Gaps

A number of education and training needs remain to be addressed for future Health-EDRM programs. 1) The decreased intention of household disaster kit preparation suggests decreased community sensitivity towards health and disaster risks. 2) Poor waste management practice (e.g. plastic burning) remained a dominant waste management practice because of the logistic limitation of waste management beyond the village. With the increasing amount of package in rural areas (World Bank, 2005), the potential health and environmental risks deserve special attention. 3) Interventions should also address new health and disaster risks related to urbanized lifestyle. For example, the increasing use of electrical appliances might present new fire risks (Chan et al., 2018b). Relevant education and training should be developed and implemented.

Between these time periods, the Ma'an Qiao village had increased access to electrification, appliances and internet technology. Future health intervention programs should consider rural economic development as well as the gaps above for the protection of the community's well-being.

## 5. Conclusions for the project

Ma'an Qiao Village provided valuable insight into the work of a multidisciplinary team on improving health and disaster preparedness post-disaster, and building resilience for a vulnerable population against future disasters. The concept of building back better was important for workers in the post-disaster rehabilitation phase, where the intrinsic risk of the community would be comprehensively assessed and action planned to eliminate these risks. By offering an alternative housing prototype, healthy behaviours was encouraged and health interventions were provided in the appropriate window for changes to sustained healthy behaviours.

It has previously been recognised in the disaster and humanitarian field that the provision of hardware and infrastructure should go hand in hand with the promotion of healthy behaviours. Classic examples with hygiene promotion include the water and sanitation provision (WHO, 2013), and also the case during the distribution of non-food items. As villagers move into their new homes and making sense of their daily routines, appropriate empowerment delivered in key intervention sessions allow for the effective changes seen.



The EMHP - Ma'an Qiao Village has demonstrated the use of evidence-based interventions to build field-based bottom-up resilience for Health-EDRM at the community level. This also provides the basis for the communication of the disaster risks and the appropriate mitigation strategies. With the partnership of providing earthquake resistant critical infrastructure, the health interventions provided the knowledge and skills for villagers to reduce the mortality and morbidity from future disasters. This project provides a solid example highlighting the importance and success of disaster risk reduction in ethnic minority rural communities for the SFDRR and the S/T roadmap.

## 6. Project Partners

Collaborating Centre of Oxford University and CUHK in Disaster and Medical Humanitarian Response (CCOUC), International Centre of Excellence, IRDR

Centre of Global Health, Faculty of Medicine, Chinese University of Hong Kong

JC School of Public Health and Primary Care, Faculty of Medicine, Chinese University of Hong Kong

Department of Architecture, Chinese University of Hong Kong

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## 9. Related Outcomes

Jury Commendation of Innovation in the 2011 UNESCO Asia-Pacific Heritage Awards for Cultural Heritage Conservation

Best Project of the 51 entries from Hong Kong and Macau in the 12<sup>th</sup> National Challenge Cup of China in 2011

Best Interdisciplinary Award of The Chinese University of Hong Kong Awards of Excellence in Social Engagement 2013

Chan, E. Y. Y., Ho, J. Y., Huang, Z., Kim, J. H., Lam, H. C. Y., Chung, P. P. W., Wong, C. K. P., Liu, S., & Chow, S. (2018a). Long-term and immediate impacts of Health Emergency and Disaster Risk Management (Health-EDRM) interventions in a rural Chinese earthquake-prone transitional village. *International Journal of Disaster Risk Science*.

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