



## Climate change and its impact on population health in Southern China: Implication for adaptation policy

### About the ACCC Project

The Adapting to Climate Change in China Project (ACCC) is an innovative policy research project, supporting China's response to the impacts of climate change and evidence-based adaptation planning. ACCC provides decision-makers with the policy –relevant information they require, taking into account current and future climate change and variability. ACCC aims to improve understanding and assessment of impacts, vulnerability and risk in key sectors in China by bringing together policy and research, national and subnational planning, social and physical science for an integrated response. The project shares this experience and lessons learnt with other developing countries in order to reduce their vulnerability to the impacts of climate.

#### ACCC does this by:

- supporting evidence-based adaptation planning through access to relevant and robust data, tools and information.
- mainstreaming climate change adaptation policies into development planning.
- producing comprehensive impact, vulnerability and risk assessments at the national and subnational level.
- building capacity and providing technical support on adaptation responses at the subnational level.
- sharing China's experience with other developing countries to enhance their own resilience to the impacts of climate change.

For more information, please visit our website at [www.ccadaptation.org.cn](http://www.ccadaptation.org.cn).

### Key messages

- The research on climate change and health conducted in Guangdong province indicates that extreme climate events, such as heat waves and cold spells, increases the risk of mortality and infectious diseases.
- Vulnerability to heat waves is higher in economically undeveloped regions; there is a large room to improve public awareness on the health risk and appropriate responses in dealing with heat waves.
- Meteorological and health departments should cooperate to build up and improve the monitoring systems on climate change and public health throughout Guangdong province.
- Establishing a multi-sectoral cooperation mechanism to develop and implement temperature early warning systems will substantially help to minimize adverse health impacts of climate change.
- Risk communication strategies, education and awareness projects and adaptation policies should be developed at a provincial authority level to improve risk perception and further reduce the adverse health impacts of climate change.

*This briefing is based on ongoing research conducted by Guangdong Center for Disease Control and Prevention as part of the Adapting to Climate Change in China project.*

## Background

China is experiencing noticeable changes in its climate. Annual average air temperature has risen by 0.5-0.8°C, slightly higher than the average global temperature increase (0.74°C), and most of these changes have been observed over the past 50 years. In the southern China province of Guangdong, the annual average air temperature increased from 21.4°C in 1960s to 21.9°C in 1990s, with an increase of 0.5°C and is predicted to increase between 1.0°C and 2.8°C between 2011 and 2100.

The widespread consensus that climate change is impacting human health has brought attention and initiated a response from policy-making, research and

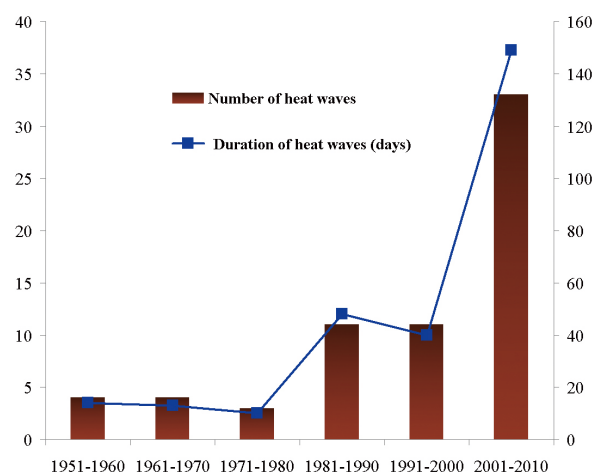
NGO communities worldwide. Public health concerns of climate change have become increasingly important within the Chinese context. Although climate change research in China has been supported by the government since 1990s and has focussed on areas such as agriculture and water, research on health has only recently begun. As a part of the Adapting to Climate Change in China (ACCC) project, Guangdong Center for Disease Control and Prevention (GDCDC) is undertaking the first comprehensive study in China into the health impacts and adaptation policy of climate change. This briefing summarises key findings from this research.

## Extreme temperatures and mortality

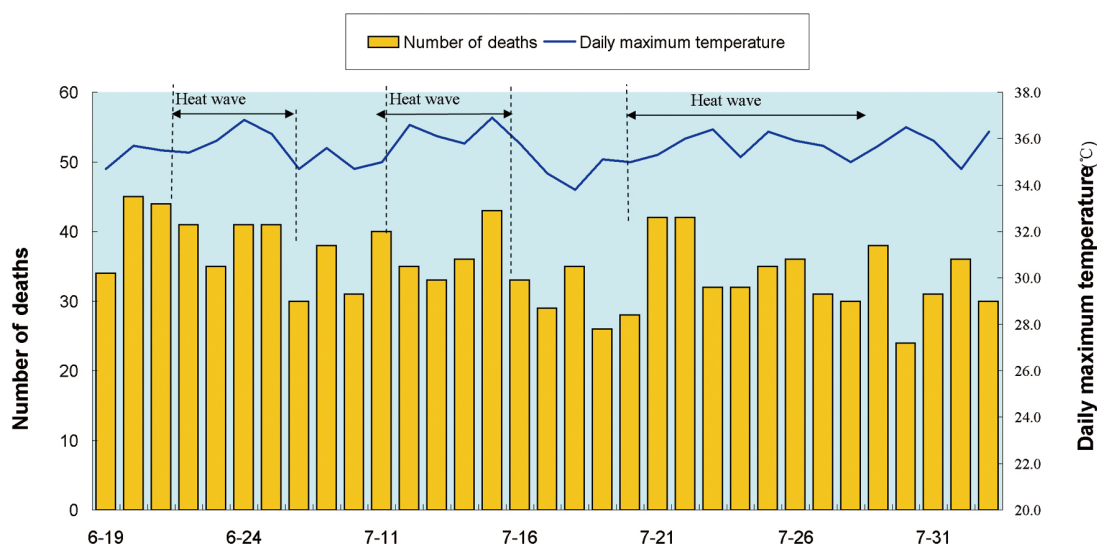
The potential impacts of climate change on public health in China are significant. Projected impacts include the spread of infectious disease, increased mortality and other health implications such as heatstroke. Research undertaken for the Adapting to Climate Change in China project has identified these as areas of potential concern for public health in Guangdong Province.

Heat waves have been and are predicted to remain a significant problem in Guangzhou. A total of 66 heat waves in Guangzhou from 1951 to 2010 were observed with significant increases being recorded during the first decade of the 21st century (Fig 1).

The potential health impact has been significant. Data for Guangzhou between 2006-2008 has illustrated a significant link between daily maximum temperature, total mortality, cardiovascular disease, respiratory disease and cerebrovascular disease, especially among elderly at risk populations (Figure 2).



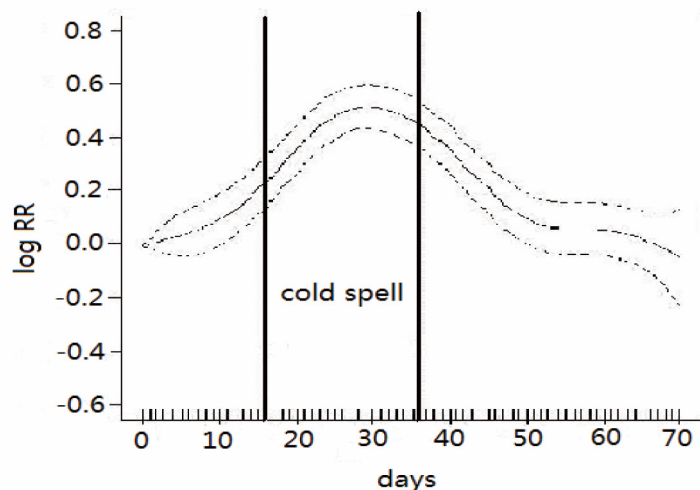
**Figure 1:** Decade trend of heat wave during the last 60 years in Guangzhou.



**Figure 2:** Daily maximum temperature and mortality during heat wave in Guangzhou, 2007.

Apart from heat waves, cold spells are also likely to have a significant impact on population health. Data from Guangdong showed that the impact of a period of excess cold weather in 2008 had a significant impact on mortality in three cities of Guangdong. In Fig. 3, the x-axis indicates the duration from 15 days before the start of cold spell to

the 35 days after the cold spell end, and the two Vertical lines define the cold spell duration. The y-axis indicates the risk of death during the corresponding temperature variations. These results reveal that the number of deaths during cold spell increased dramatically.

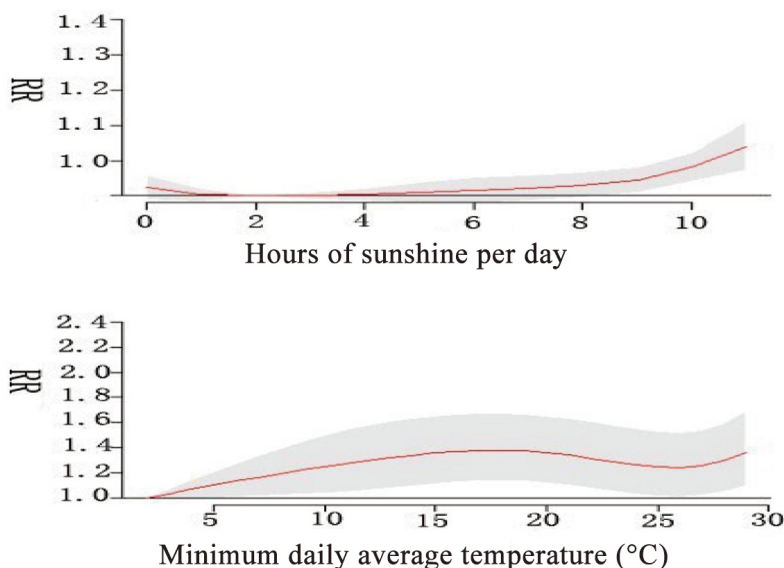


**Figure 3:** Comparing mortality during 2008 cold spell with that of the corresponding period in 2006, 2007 and 2009 in Guangzhou.

## Meteorological factors and Infectious diseases

Whilst extremes in temperature are likely to have the most serious impact on public health in general, it is meteorological impacts that pose the greatest risk for the spread of infectious disease. Research conducted in Guangzhou from 2008 to 2010 has found a significant association between the sunny time (cumulative hours of

sunshine per day) and temperature on hand-foot-disease (Fig. 4). The graph below indicates the risk of hand-foot-disease as hours of sunshine increase, with the grey area denoting 95% confidence of RR. This finding indicates that intestinal infectious disease is likely to increase in the context of global change and variation.



**Figure 4:** The relationship between climate factors and incidence of hand-foot-mouth disease.

# Assessing Vulnerability for Public Health

## What is vulnerability?

Within ACCC's joint research framework, vulnerability is defined as a characteristic of people and human systems, depending on their exposure (EI) to a particular hazard and how susceptible to harm by that hazard they are. Susceptibility is determined by sensitivity (SI) and capacity to adapt or cope with a hazard (AI).

$$VI=f(EI,SI,AI)$$

### For example:

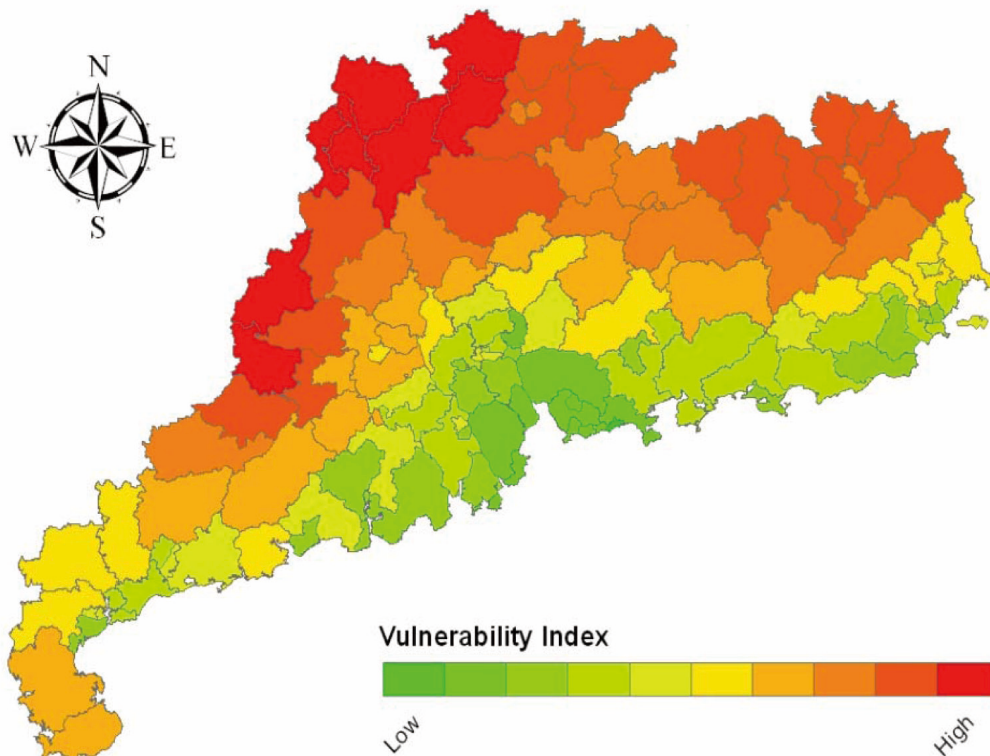
Elderly people might be more vulnerable because their sensitivity is high; they are medically more sensitive to the effects of heat;

People in a particular county might be vulnerable because their exposure (EI) is high; particular counties have a higher incidence of heat waves, meaning higher exposure for their populations;

People in rural areas might be more vulnerable because their adaptive capacity (AI) is low; they are less likely to be aware of the risks of heat waves.

## Vulnerability assessment of heat wave

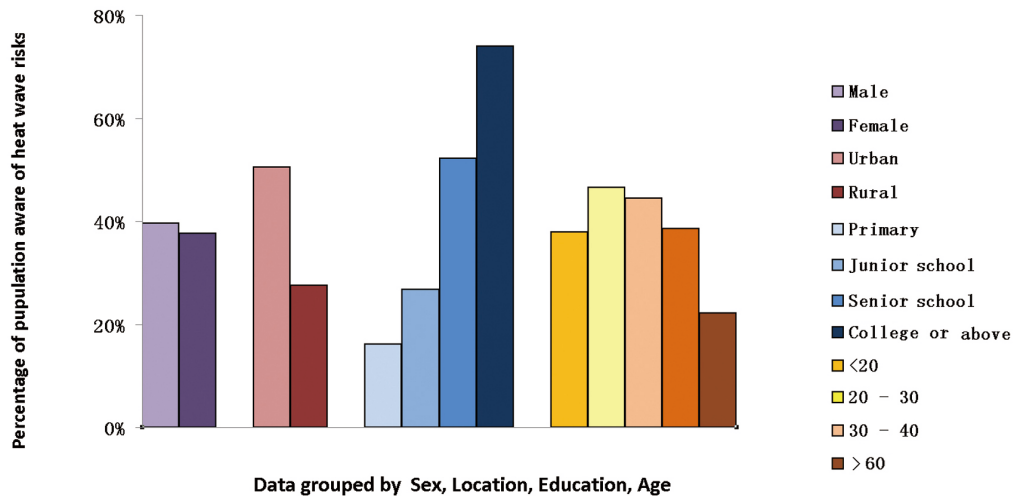
Vulnerability to heat waves in 124 counties or districts of Guangdong province shows a gradient of change from north to south (Fig. 5). Economically undeveloped regions in the north of Guangdong are more vulnerable to suffering negative health impacts during heat waves than the population of the more economically developed regions on the Southern Coast (The Pearl River Delta).



**Figure 5:** The vulnerability of heat wave in 124 districts of Guangdong.

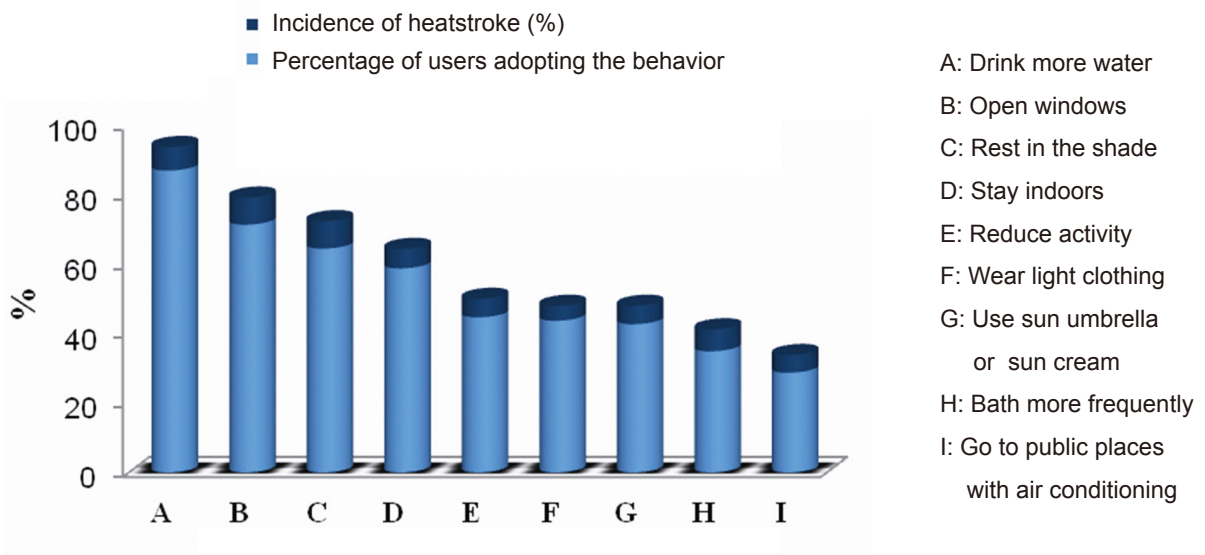
## Risk perception and adaptation behaviours to heat wave risks

As part of the ACCC research conducted in Guangdong in 2010, how people in Guangdong perceived the risk of and how they responded during heat waves was analysed. It was found that the level of awareness about the health risks associated with heat waves was low, and especially among vulnerable populations such as the elderly and rural populations (Fig. 6).



**Figure 6:** The percentage of population aware about heat waves risks in Guangdong province, by socioeconomic status.

Adaptation behaviours to reduce heatstroke risks were evaluated by a multiple choice questionnaire with answers containing nine possible adaptation behaviors (see Fig 7 below). Results show that the three most common behaviors to cope with heat wave were drinking water, opening windows and staying indoors. However, as shown in Fig 7, there are varying rates of heat stroke incidence in relation to each of the adaptation behaviors. This suggests that there should be a closer examination of the effectiveness of each, or combination of the adaptive behaviors towards reducing risk of heat stroke from heat waves.



**Figure 7:** The incidence of heatstroke in relation to each of the adaptation behaviors to cope with heat wave .



## Implication for public health and adaptation planning

Based on the research findings, the main recommendations for adaptation planning are:

1. To assess the health impacts of climate change, Guangdong Province should develop monitoring systems not only on climate change, but also with reference to the health impacts, particularly within identified vulnerable regions.
2. To develop climate change adaptation plans that minimize adverse health impacts, it is crucial to first identify vulnerable populations and regions in order to prioritize areas of special interest and efforts to reduce health risks.
3. To reduce adverse health impacts from extreme temperature events, provincial authorities should develop real time temperature warning systems based on the integration of meteorological and health data and emergency management plans.
4. Both heat waves and cold spells are important risk factors for public health. In subtropical regions in particular, vulnerable populations should be given special attention during cold spells due to the potential negative effects.
5. A risk perception survey in Guangdong revealed the need for government to develop an action plan with a risk communication strategy to promote public awareness of the potential risks of heat waves and the corresponding adaptive measures.

## Lessons learned

The ACCC project is integrating impact, risk and vulnerability assessments into adaptation planning in China. While the project is still ongoing, key progress has been achieved already. The capacity building stage of the project is complete and significant progress has been made in bringing together research and policy-making communities across the sectors to develop shared methodology, research and policy planning to respond to the impacts of climate change. From the activities in the health sector, several important lessons have been learned:

- Improving the surveillance system of climate change related health outcomes is very important to assess the health impact of climate change;
- Information and knowledge sharing among governmental departments is not easy, and an information sharing mechanism across sectors should be established.
- multi-disciplinary expertise should be integrated into health impact assessment and adaptation planning of climate change;
- Stakeholder involvement is critical when we plan adaptation policies.
- Adaptation planning is a process of learning, and international cooperation provides us an opportunity to communicate and learn with others.

## References

This briefing is based on ongoing research conducted by Guangdong Center for Disease Control and Prevention. The second edition of the briefing was produced in June 2012. Other references cited are:

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