CASE STUDY

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Evaluation

EARLY WARNING SYSTEMS

HEAT WAVE AND HEALTH RISK EARLY WARNING SYSTEMS IN CHINA

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CONTEXT

Climate change is increasing the frequency, intensity, and duration of extreme ambient temperature, especially heat waves. There is worldwide evidence that extreme high temperatures are associated with excess deaths in summer (67–69). All these deaths are preventable. Early warning systems are a key approach to reducing the morbidity and mortality associated with heat waves. This project, which is part of a broader WHO/UNDP Global Environment Facility (GEF)-funded project, developed and implemented a heatwave early warning system to reduce the health risks and to increase the capacity of health systems and community residents to prepare for and cope with periods of extreme temperatures. The National Steering Committee leading the project was composed of officials and experts from the National Health and Family Planning Commission (NHFPC), National Development and Reform Commission, Ministry of Finance, Meteorological Bureau, Ministry of Environmental Protection, Ministry of Technology and Science, WHO, the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP), and was headed by NHFPC. The committee is responsible for reviewing and supervising the workplan, implementation and progress of the project.
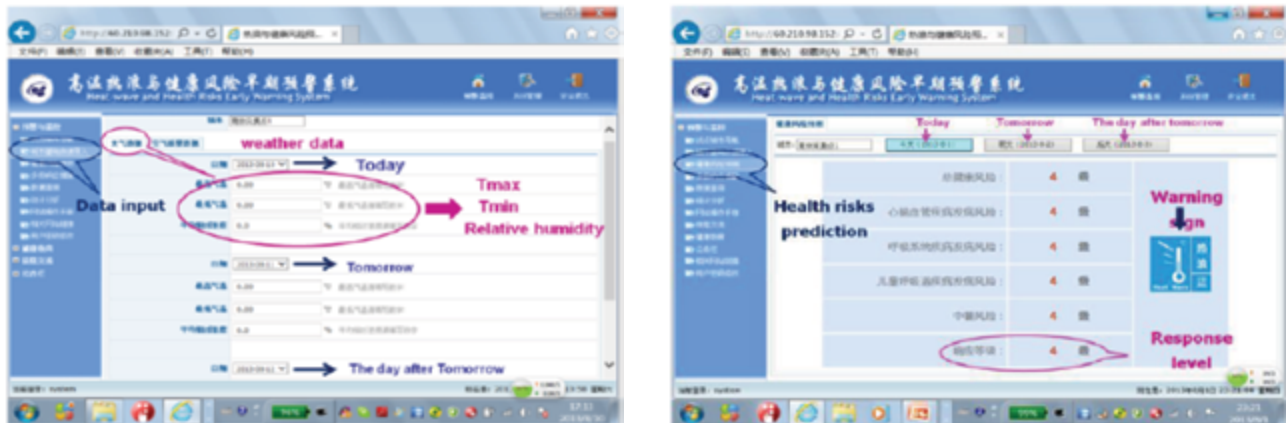
The project was piloted in four cities: Harbin, Nanjing, Shenzhen and Chongqing, located in different climate zones within China.

NEW APPROACHES

The heat wave early warning systems were developed by:

— **Establishing city-specific health risks models** to describe the associations between daily mortality and hospital outpatients with meteorological (daily minimum and maximum temperature and humidity) and air pollutants data (PM_{10}, SO_2, NO_2). Analyses were conducted using generalized additive models. The health monitoring data, meteorological and air pollution data were collected from the health system, meteorological bureau and environmental protection agency, respectively. Grading the health risks into four levels was done to help enhance understanding of the risks by the public. These levels were used to develop guidance for multi-level responses to health risks.

— **Risk models** were used to develop and pilot the heat wave early warning system in the selected communities. The system includes data input, the health risk models, and communication modules for multi-level response measures. The predicted health risks include total health risks, the risks of cardiovascular disease, respiratory disease, children's respiratory disease, and heatstroke.

Figure 5.27 Heat Early Warning System online platform. a) data input module; b) heat risk prediction tool.

The early warning system was implemented through the local centres for disease control in the project cities. The system was designed for timely issuance of warnings of health risks due to extreme heat. Information on health risks was delivered to the community health service centres and community residents (especially vulnerable populations with cardiovascular disease, respiratory disease, diabetes, etc.). Information also was communicated through fixed electronic display screens in the community, mobile text, instant messaging groups, and television through the daily weather forecast. At the same time, health education on how to read the early warning information and how to protect health during heat waves was provided in various forms, such as posters, fliers, internet, newspapers and a painting contest among students on adaptation to heat waves, etc.

The risk models were partially verified by comparing registered daily health outcomes, such as the observed daily deaths, with predicted parameters.

The specificity, reliability and practicality of the early warning system, including the establishment of the model, the multi-level response guidance, and health risk information issuing and health education, were evaluated by experts in different fields of statistics, health, meteorology, environmental protection, and health education through expert evaluation meetings.

BENEFITS AND LESSONS

The early warning system provides the health system and community residents with information about health risks before a heat wave occurs, providing valuable time to take appropriate action to prepare for and reduce potential risks, thereby decreasing morbidity and mortality. Multisectoral cooperation is an indispensable element for the smooth design and implementation.

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