

Criteria for the Evaluation of Heat Event Early Warning Systems

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BACKGROUND

Heat events are associated with marked short-term increases in mortality. In regions where extreme hot weather is infrequent, populations have experienced major heat events that strained public services. Because heat-related illness and death is preventable, there is increased interest in implementing heat event early warning systems that link meteorological forecasts with effective responses. However, most systems are implemented without including criteria for their evaluation.

Objectives

To propose criteria for evaluating heat event early warning systems

HEAT EVENT EARLY WARNING SYSTEMS

A heat event early warning system is a system that uses meteorological forecasts to initiate public health interventions designed to reduce heat-related impacts on human health during atypically hot weather.

Components of a system include:

- Sufficiently reliable meteorological forecasts for the region and population of interest
- Robust understanding of the cause-and-effect relationships between the thermal environment and health outcomes at the population level
- Effective response measures to implement within the window of lead-time provided by the warning
- A community that has sufficient public health or social infrastructure to undertake the specific response measures

Issues with developing these systems include:

- How to define a heat event. Often there is no clear threshold at which deaths increase dramatically.
- How to determine which measures to initiate within each identified response level. There is little published information on qualitative or quantitative assessments of the effectiveness of individual intervention measures.
- How best to design and disseminate public health messages to all age and risk groups. Passive dissemination of heat avoidance advice is insufficient to prevent many deaths.

CRITERIA

Evaluate the system for:

- Simplicity
 - Type of information needed to issue a warning
 - Number of people and agencies involved
 - Time spent maintaining the system
 - Time spent issuing a warning
- Acceptability
 - Interaction between agencies
 - Participation of agencies other than the one issuing the warning
 - Completeness of response in participating agencies
- Sensitivity
 - Number of times a warning is issued and the forecast weather conditions occurred
 - How often was a warning not issued but adverse weather conditions occurred?
- Timeliness
- Effectiveness of individual measures

Describe the components and operation of the system

- What is the indicator/threshold used to issue the warning and how was it derived?
- What is the indicator/threshold used to end the warning period?
- Who is the target population?
- Who monitors the forecasts and provides the warning? How often?
- How is the information transferred to the relevant agencies?
- What is the lead time of the warning?
- How often have warnings been issued?
- What data need to be collected in order to evaluate the system?
- The roles and responsibilities of the participants need to be described
- Development of a communication strategy is important

Describe the resources used to operate the system

- Costs of setting up the system
- Annual cost of system maintenance
- Estimate costs per warning (direct and indirect)
- Criteria for estimating benefits

PUBLIC HEALTH INTERVENTIONS

There is limited information on interventions that have been implemented as part of a heat event early warning system.

Examples of public health interventions often implemented: media announcements; bulletins or web pages (sometimes access is restricted to relevant professionals); electricity companies cease disconnection for non-payment; and fan distribution (although there is evidence that fans are not effective and can potentially increase heat stress under some conditions)

Examples of public health interventions rarely implemented: home outreach visits to vulnerable persons; outreach to homeless; and alerts to hospital emergency rooms and ambulance services (this needs to be carefully evaluated)

For effective outreach, high risk individuals need to be identified and outreach services initiated early. This requires understanding of human behavior and physiological responses to hot weather.

DISCUSSION

A key barrier to effectively implementing a heat event early warning system is the lack of clear decision-making protocols among the relevant institutions.

Clear performance standards and regular performance evaluations can help to build public awareness and confidence in the system.

It is important to involve the system's end users when developing and implementing the warning system.

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