RISK REDUCTION GUIDANCE

HEAT-HEALTH SURVEILLANCE

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ABSTRACT

Surveillance is the systematic collection, analysis, utilization, and sharing of health data with stakeholders in order to support public health programming. Surveillance for heat-related disease and death supports the efficiency and effectiveness of public health interventions to reduce risk. Common early indicators include emergency medical service calls, emergency department utilization, and hospitalization; mortality is a lagging indicator. Information on hazard exposure and population vulnerability are important additional data streams. Surveillance for heat-health impacts can be incorporated into existing surveillance platforms; implementation typically takes several years. While there are no cost-effectiveness estimates for heat surveillance, specifically, surveillance activities are highly cost effective, particularly for commonly encountered hazards with high mortality risk in large populations.

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What is the intervention?

Public health surveillance is the continuous collection, analysis, and interpretation of health data, distribution of these data and analytical insights to stakeholders and decision makers, and linkage of surveillance to disease prevention and control (Lee 2010). Surveillance allows for tracking of disease burden over time; gaining insight into factors that affect disease outbreaks; planning prevention, preparedness and response activities; and evaluating the effectiveness of interventions. Surveillance for indicators of disease associated with extreme heat takes a number of different forms and allows for insights into population-level patterns of exposure and heat-related disease burdens, identification of relevant risk factors in specific populations, and for evaluation of the effectiveness of short- and longer-term preventive measures.

Surveillance for heat-related illness includes collection of data on health outcomes affected by environmental heat exposure, data on the heat hazard, and data on risk and protective factors. These data should be collected at sufficient spatial and temporal resolution to ascertain spatiotemporal patterns, and analyzed with understanding of and appropriate methods for identifying the timing of health outcomes in association with heat exposure. These data streams may come from outside the health sector, and effective surveillance for climate-sensitive health impacts typically requires intersectoral collaboration and coordination (Moulton and Schramm 2017).

Common leading, or early, indicators used in heat-health surveillance include calls for emergency medical assistance and emergency department visits and hospitalizations for acute heat illness (heat exhaustion and heat stroke), other heat-sensitive conditions (dehydration, electrolyte disturbances, and kidney injury), and flares of chronic disease. Mortality associated with extreme heat is also commonly tracked, but typically lags other indicators due to data availability (Mathes et al. 2017). Heat hazards vary significantly at small spatial scales, from the neighborhood (Schuster et al. 2014) down to the street level (O'Brien et al. 2020). Appropriate methods for examining associations between temperature and heat-sensitive health outcomes include distributed lag nonlinear models (Gasparrini et al. 2010; Lo et al. 2022) and case-crossover studies (Stafoggia et al. 2006; Sun et al. 2021).

How effective is the intervention at protecting people's health?

Surveillance is one of several assessment functions carried out by public health agencies; it enables other essential public health functions. Its effectiveness as an intervention is indirect, allowing for more efficient and effective planning, outreach, implementation, and evaluation of preventive measures (Chirico and Magnavita 2019). Expanded surveillance capabilities allows for dramatically increased sensitivity in local detection of prioritized health outcomes, including heat-related illness, as well as reduced time lags in identifying cases (Morbey et al. 2019). Collecting information on climate change health impacts, including those on health, is considered an essential component of climate-resilient health systems (World Health Organization 2015) and urban adaptation actions (Sheehan et al. 2021).

How long does the intervention take to implement?

There are no standardized estimates of the time required to implement a surveillance system or to integrate new indicators into an existing platform. Most public health jurisdictions carry out surveillance, and adding surveillance for heat-related illness is a matter of leveraging existing systems to collect, analyze, and interpret data representative of heat-related disease burden and relevant associated risk factors. Securing the appropriate data, with adequate spatial and temporal resolution, and analyzing and interpreting the data properly are all potential challenges. Determining appropriate case definitions for leading indicators can also be a challenge (Yoon et al. 2017; Ranadive et al. 2021). In the author's experience, incorporating heat-health indicators into existing surveillance activities to support heat management decisions takes several years at a minimum.

How much does the intervention cost?

There are very few studies on surveillance system costs or cost effectiveness (Groseclose and Buckeridge 2017), and no studies of heat surveillance system costs specifically. Studies of surveillance system cost effectiveness have generally found very favorable ratios (Herida et al. 2016). Cost-effectiveness generally increases with the size of the population under surveillance, the certainty of hazard exposure over time, and the severity of the health outcomes averted (Herida et al. 2016).

Are there downsides to consider?

Potential downsides for robust heat-health surveillance are generally the same as those for surveillance of other conditions, including privacy violations and opportunity costs for surveillance system investments.

What other strategies should be considered?

As noted, surveillance systems enable the efficiency and effectiveness of other public health programming, and surveillance complements other strategies. There are no direct substitutions for local surveillance activities, and while strategies are available for estimating disease burden in observation-poor areas, such estimates are generally less reliable than direct observation.

What are some good sources of additional information?

https://ephtracking.cdc.gov/Applications/heatTracker/

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