ISAAC – A Data Source for Modeling Public Health System Operations

ISAAC (Indicators for Stress-Adaptation Analytics) is a PHASYS tool for analyzing resource allocations and organizational stress during emergency response periods. ISAAC provides generalizable measures of how organizations comprising a public health system adapt from their normal daily activities to the needs of an emergency response. Its metrics are appropriate for use at the organizational level as well as at the system (multi-organizational) level.

ISAAC defines five categories of stress ranging from minimal to maximum disruption of normal activities. Stress is defined as the degree of a response and its duration. The five categories have been developed in previous studies from observed patterns of change in staffing and infrastructure. ISAAC outputs are graphics that visually map stress over the response period.

Exhibit 1 shows a conceptual model of the ISAAC graphic. Each row represents a functional unit, which could be a division within a local public health department or an organization within a public health system. The vertical height of each row denotes its relative contribution, as measured by budget share. The horizontal rows extend for the emergency duration (here, 4 months), and the changing color-coded blocks in each row reflect the pattern of stress measured within each functional unit over time. By comparing ISAAC graphic displays among functional units, decision makers can see opportunities to redistribute deployments, relieve the stress of deployments on organizations as necessary, and plan for future events—such as by inclusion of personnel from previously non-participating units and organizations.
The significance of ISAAC for public health practice has numerous dimensions:

- First, by measuring at the function level (i.e., a functional unit within a health department), ISAAC can be used to compare local public health department response data across other health departments responding to the same or similar emergencies.

- Second, ISAAC can be used to measure adaptive responses at the system-level (i.e., comparing adaptive stress to the same emergency in different types of responding public health agencies—such as a public health department and an emergency medical service).

- Third, ISAAC combines organizational data that are both descriptive and behavioral to produce profiles of adaptive response to emergencies, thus illustrating patterns of response under various emergency conditions. In this way, ISAAC is an all-hazards approach to preparedness and response research since it monitors response behavior regardless of the type of emergency.

- Fourth, ISAAC produces longitudinal data for assessing the effects of changes in structure and funding on response capacity. For example, comparing a current profile with a previous one after a period of budget reduction and reorganization, simulated emergencies measured by ISAAC revealed earlier onset and higher levels of response stress in the later budget period.

- Finally, ISAAC is being used to develop its potential as contingency planning tool through simulation of alternative scenarios. Accumulation of agency profiles and response data will improve accuracy by simulating alternative adaptive responses at all public health system levels.