Public Health Preparedness: A Geographic Approach

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Why GIS?

When the public health is threatened, whether from natural, accidental or intentional events, the responsibility to act falls on the shoulders of public health preparedness professionals and their agencies.

They have to pull data together from countless, often unrelated, systems into a single framework to make timely and crucial decisions. Geography is often the only consistent element for all of these data and Geographic Information Systems (GIS) makes it possible.

* Images accessed from CDC Public Health Image Library (PHIL) on 7/3/2017

Drivers and Objectives

Public Health Preparedness Departments focus on key objectives to improve overall health security and minimize consequences during emergencies.

Key Objectives:
- Prevent epidemics and the spread of disease
- Protect against environmental hazards
- Prevent injuries, illness and death
- Respond to emergencies and assist in recovery

These objectives encompass the 6 preparedness domains (pictured right) outlined by the CDC*. By strengthening capabilities in these areas organizations can be better prepared for catastrophic incidents like...
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Community Resilience

The key to quickly recovering from an emergency is adequate preparation. Communities must understand their vulnerabilities and analyze their risk to be fully prepared.

A jurisdictional vulnerability review identifies critical infrastructure like health facilities and regional healthcare resources as well as vulnerable populations.
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* Center for Disease Control and Prevention. Public Health Preparedness Program

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A jurisdictional vulnerability review identifies critical infrastructure like health facilities and regional healthcare resources as well as vulnerable populations including children, seniors, and individuals with special needs.

Planners use techniques like historic risk modeling to understand factors like natural and biological hazards. This helps prioritize mitigation activities, develop comprehensive response plans, and predict the impact of different scenarios. ArcGIS provides tools like the Hazard Assessment and Analysis Solution Template to enable this type of planning and analysis. Learn More

Information Management

Having the right data is vital in public health preparedness to drive analysis, help inform decision making, and ensure effective planning.
Hurricanes and Tropical Cyclones Overview

Information Management

Having the right data is vital in public health preparedness to drive analysis, help inform decision makers, and support warning systems. However, because data comes in many forms (spreadsheets and web services to name a few) and from many sources it can quickly overwhelm.

Organizations integrate this data by leveraging location to uncover patterns and communicate in a way that all stakeholders, including partners and the public, understand. By using tools like Story Maps and Public Information Maps, health organizations can quickly get their message out and monitor public input.

The Hurricane and Tropical Cyclone Overview example pictured to the right integrates multiple “Live Feeds” from Esri to provide a detailed situational overview.

Countermeasures and Mitigation

It’s critical to safeguard the community’s supply of medicines and other supplies before, during, and after a hurricane. In areas the storm is expected to hit, emergency management offices can deliver mail-order medications directly to pharmacies. In areas not served by mail-order, getting medications can be a challenge. Information on potential access points can be shared using Story Maps to help residents find distribution locations.

This map is provided by the Esri Disaster Response Program.

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Atlantic Coast
Gulf of Mexico
Eastern Pacific
Hawaii
Asia
Indian Ocean

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Description

ArcGIS Online includes a living atlas of the world with beautiful and authoritative maps on many topics, including a rich collection of earth observation maps and layers that describe our planet’s current conditions, from earthquakes and fires to severe weather and hurricanes. To enhance and expand this collection, Esri has published a set of “live feeds” layers featuring frequently updated data from several sources, including NOAA, NASA, and USGS. This group includes this set of live feeds as both ready-to-use web map and map layers.

Latest Content
Countermeasures and Mitigation

It's critical to safeguard the community's supply of medicines and other supplies before, during and after an incident. Providing and maintaining services as well as the health and safety of response staff often require real-time data.

Being able to quickly assess the extent of an incident (e.g., vector-borne disease surveillance Operations Dashboard pictured right) and monitor your human and material assets lets organizations quickly and confidently make data-driven decisions. Learn More

Web-based and mobile GIS tools also allow an organization to crowd-source Health and Safety Reports from the public (click to login as guest and select a report type to view or submit an example issue) as another method to ensure resources are deployed when and where they are needed. Learn More

Surge Management

Organizations may have to expand the medical services provided within the community during an incident. Location is key to planning and monitoring these efforts. Learn More
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Organizations may have to expand the medical services provided within the community during an incident. Location is key to planning and monitoring these services whether providing seasonal cooling or heating centers, monitoring emergency shelter capacity, reuniting families or planning temporary medical clinics.

Providing tools to help both partners and citizens easily locate preparedness resources and potential hazards help ensure overall health security (click any point in the configured "My Hazard Information" map to the right to get a list of the closest resources and potential hazards with additional details and driving directions). Learn More

Biosurveillance

Identifying health threats and taking action requires the ability to recognize patterns in space and time using different analysis tools and methods. ArcGIS provides the analytic engine to turn raw data into actionable information by leveraging its location component.

Spatial analysis provides the ability to detect an
Biosurveillance

Identifying health threats and taking action requires the ability to recognize patterns in space and time using different analysis tools and methods. ArcGIS provides the analytic engine to turn raw data into actionable information by leveraging its location component.

Spatial analysis provides the ability to detect an emerging threat or disease outbreak, model its spread and predict where it’s likely to happen next (opiod Insights for ArcGIS example pictured to the right). Learn More

Incident Management

Organizations have traditionally combined their disparate data together in, often cluttered, web-based common operating pictures (COP). ArcGIS allows access to information using focused intuitive apps to streamline decision making and action while ensuring that everyone has access to the latest most accurate data.

Configurable apps like the Situational Awareness Viewer are an example of this approach. Click the “Add” icon and learn more about configuring apps.

Insights for ArcGIS

Insights for ArcGIS is a web-based, data analytics marketplace where you can explore spatial and non-spatial data. Answer questions you didn’t even know you had; quickly identify powerful trends.
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Configurable apps like the Situational Awareness Viewer are an example of this approach (click the "pin" icon and enter a buffer distance under "Locate Incident" in the map to the right and then click anywhere in the map to return a tabbed list of facilities, impacted populations and assistance requests). Learn More
Vermont Social Vulnerability Index (SVI)

Vermont Social Vulnerability Index (SVI)
*Based upon 2011-2013 American Community Survey data

This map shows the number of vulnerability measures above the 90th percentile for Vermont census tracts. For each of the vulnerability measures, census tracts in the 90th percentile of vulnerability were assigned a flag. This SVI exhibits the sum of all flags for each census tract. There are a total of 16 measures in the SVI.

For More Information (PDF) About the SVI...
For More Information (Video) About the SVI...

View maps showing individual SVI Measures:
Socioeconomic Theme
Demographic Theme
Housing/Transportation Theme

Vermont has 138 populated census tracts. These are divided into 6 groups by vulnerability measure flags:
- 57 tracts have 0 flags
- 48 tracts have 1 flag
- 37 tracts have 2 flags
- 17 tracts have 3 flags
- 10 tracts have 4 flags
- 3 tracts have 5 flags
- 5 tracts have 6 flags
- 4 tracts have 7 flags
- 1 tract has 8 flags
- 2 tracts have 9 flags

The darker blue categories on this map are census tracts where there are more tagged socioeconomic variables, while the lighter yellow categories have fewer flags.

Census tracts marked with a yellow triangle have 50% or more of their SVI flags from estimates with high Relative Standard Error. These flags may be less accurate than the others.

The underlying population in each Vermont census tract may affect the SVI measures. For more information on Vermont's population density and college-aged populations Click Here.

Source: U.S. Census ACS 2011-2015
Download the SVI Data

Public Health Preparedness Examples

Every community has their own set of emergencies to prepare for and many Public Health Preparedness Departments are already leveraging the ArcGIS Platform.

At the Vermont Dept. of Health they have mapped out where the most vulnerable populations are located (pictured to the right) to identify populations that need more help with response and recovery. Learn More

The Center for Disease Control and Prevention has also made their authoritative Social Vulnerability Index (SVI) data available through the Esri Living Atlas so it can be easily overlaid and analyzed by any ArcGIS user.

The California Department of Public Health Emergency Preparedness Office is using ArcGIS to develop Situational Awareness Tools that provide a real-time common operating picture for rapidly unfolding events. Learn More

Many Health Departments are also actively mapping and analyzing the location of health care facilities, hazards and community demographics to produce static maps to address their emergency support functions and optimally allocate resources.
Demonstrations:
ArcGIS Pro Situational Awareness Viewer
Community Resilience Survey
My Hazard Information
Community Resilience Surveys

Deploy solution
Community Resilience Surveys can be deployed using the ArcGIS Solutions Deployment Tool, which will deploy the solution onto all the required components into your ArcGIS organization.

Set up with Deployment Tool

1. **Load Data**
   - Depending on the ArcGIS Solution you've deployed and the format of your source data, choose one of the following methods to load your data into the Solution:
     1. Copy/clone your source data into the ArcGIS Solution feature layer. Learn More
     2. Use the Append tool to append your source data to the ArcGIS Solution feature layer.

2. **Configure an ArcGIS Solution**
   - You may need to add one, or more, fields to the feature layer(s) provided with the ArcGIS Solution. Use this tool to add field(s) required by your organization.
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Develop Your Preparedness Strategy with ArcGIS