

# A Spatially Intelligent Disease Surveillance System using ESRI's Web-based Geographic Information System (ArcWeb)

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## Introduction

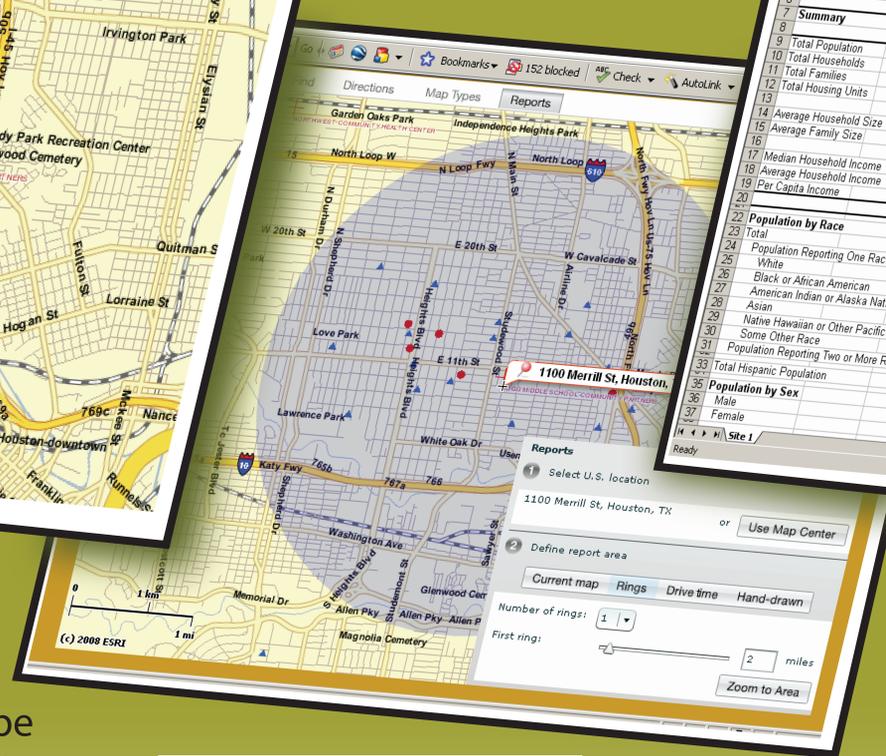
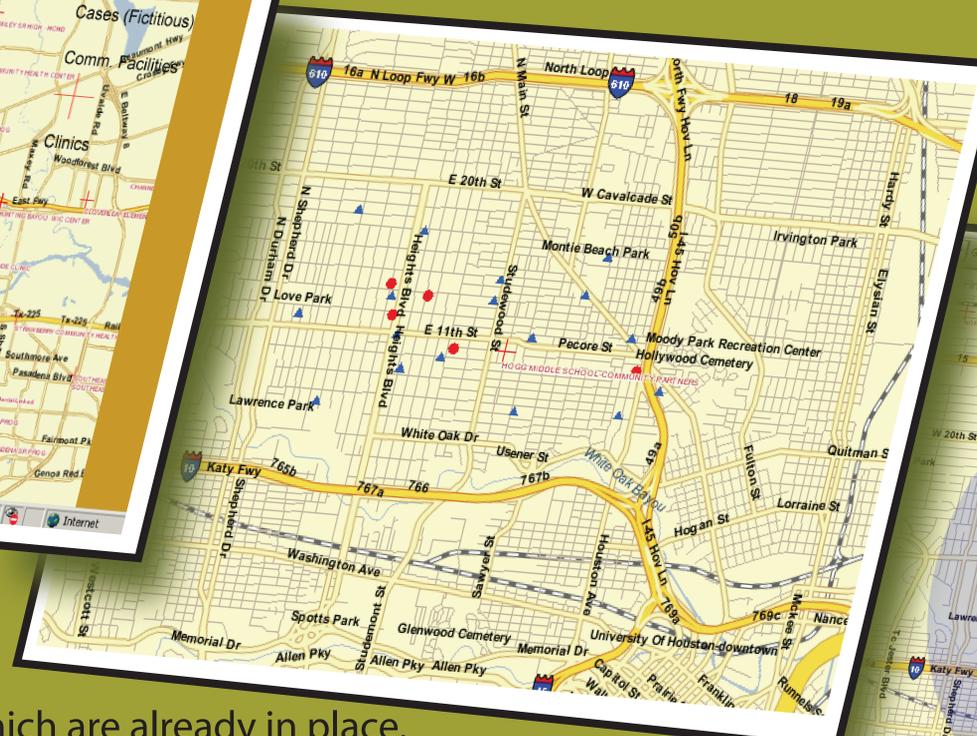
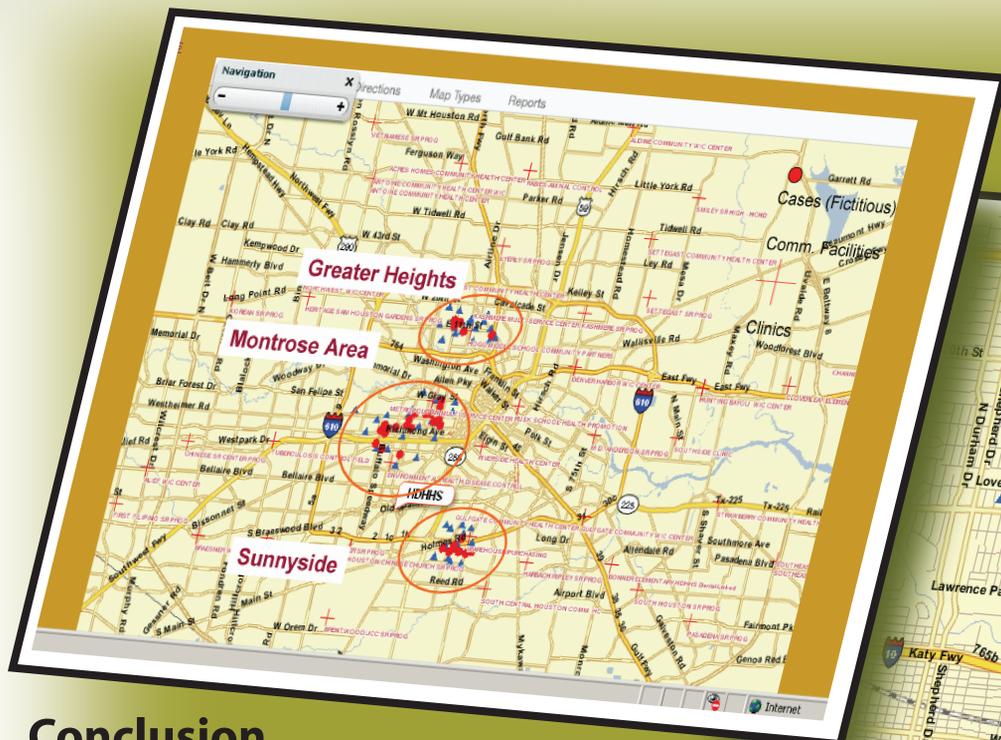
Intervention during the times of disease outbreaks not only requires special knowledge but also spatial knowledge. Knowledge about the locations of the outbreak, the spatial relations between the medical or other facilities and the outbreak locations, and the demographic profile of the area are essential elements for an effective intervention plan. Gathering the spatial information takes considerable time, the absence of which might lead to a lack of spatial resolution thereby wasting resources over a larger area than what would be required. Depicting spatial relationships on a map which is accessible to all levels of decision making would enable a more focused, and effective intervention over the outbreak locations. A web based GIS program enables users to upload their custom layers and view them in the back ground of other base layers. ESRI's ArcWeb is a solution that offers great potential to disease surveillance. The demographic data bundled with the web GIS enables the decision makers to estimate the required personnel and supplies.

## ESRI's ArcWeb Application

ESRI's ArcWeb Application is a web based GIS which can be accessed through a JavaScript API (Application Programming Interface). The JavaScript is embedded in an .html file in a URL registered to the local port. Custom layers can be uploaded and overlaid on other layers provided by ESRI such as roads and POI (points of interest). These files are accessed using an Access Key embedded in the html file. The html file can display the spatial information as a web page. It is not only helpful to see the spatial relationships but also provides a wealth of demographic data as per the user's selection.

## Description of a Hypothetical Outbreak Scenario

The hypothetical scenario depicts that Houston has several cases of a fast spreading epidemic. The locations are exactly marked using address location in desk top GIS. The point files are then uploaded in the web GIS so that it is viewable in all levels of decision making. This is helpful to see the facilities available in the immediate vicinity of the outbreak location and to get the demographic data (over 400 variables are available through ArcWeb). A community based intervention becomes easier with all the information (spatial as well as demographic).



A screenshot of a 'Census 2000 Summary Profile' report for 1100 Merrill St, Houston, TX. The report is displayed in a table format with columns for '1990', 'Census 2000', and '1990-2000 Annual Rate'. The data includes population, households, families, housing units, average household size, family size, median household income, average household income, per capita income, and population by race and sex.

Summary	1990	Census 2000	1990-2000 Annual Rate
9 Total Population	51,957	51,174	-0.15%
10 Total Households	19,500	20,235	0.37%
11 Total Families	11,210	10,854	-0.32%
12 Total Housing Units	22,805	22,367	-0.19%
14 Average Household Size	2.64	2.48	-0.62%
15 Average Family Size	3.52	3.38	-0.41%
17 Median Household Income	\$18,625	\$33,861	6.16%
18 Average Household Income	\$25,953	\$46,863	6.09%
19 Per Capita Income	\$9,900	\$19,745	6.5%
<b>Population by Race</b>			
22 Total			
23 Population Reporting One Race			
24 White	51,133	49,666	100.0%
25 Black or African American	49,666	29,441	57.6%
26 American Indian or Alaska Native	29,441	7,939	15.5%
27 Asian	7,939	343	0.7%
28 Native Hawaiian or Other Pacific Islander	343	30	0.8%
29 Some Other Race	30	30	0.1%
30 Population Reporting Two or More Races	11,490	1,467	22.5%
31 Total Hispanic Population	30	1,467	2.9%
<b>Population by Sex</b>			
32 Male	25,577	26,406	51.6%
33 Female	26,406	24,722	48.4%

## Conclusion

The GIS based intervention can be used in conjunction with the current available interventions mechanisms which are already in place. The advantages of the web based GIS program is that accurate location can be conveyed to the decision making levels and at the same time other relevant spatial information including clinics and demographic data can be extracted based on an arbitrary selection criteria. The intervention efforts can be focused in a relatively smaller area so that the wastage of resources by expending them over a larger area can be avoided.