

Data Visualization and Interface Design for Public Health Analysis: The American Hotspots Project

JIHOON KANG, MFA

KEYWORDS Center for Disease Control and Prevention (CDC), data analysis, decision-support, government emergency response, Graphical User Interface (GUI) design, healthcare, information visualization, public health, user experience design (UXD), usability

ABSTRACT The American Hotspots Project is an emergency health-response system that allows operators to quickly ascertain insights and formulate appropriate responses respecting the spread of disease throughout geographic regions within their purview. Additionally, American Hotspots highlights polygons (such as a census block) where the most socially vulnerable demographic groups are located. This allows for: improved decision making respecting emergency response, aids provision, and prevention of the spread of contagious disease. This article describes how multiple information visualization approaches and techniques assist in enabling the interface users to accomplish these objectives. The system, in conjunction with effective visualization, also supports: intuitive data management, workflow collaboration, and, through visualization-enhanced analysis, the generation of reports and tangible outcomes.

INTRODUCTION The American Hotspots Project was initiated by The National Center for Disaster Preparedness (NCDP) at Columbia University, New York. The goals for the project included the ability to, "...develop measures of social vulnerability that can be mapped to hazard probabilities, to be used as a tool by policy-makers, emergency planners, and citizens...includes the development of computational models that permit interpolation of high-level data to smaller units of analysis, such as applying county-level data to census block groups."¹

In partnership with NCDP, The Parsons Institute for Information Mapping (PIIM), The New School University, New York, developed and presented the graphic user interface and user experience design, as well as interface related engineering, for the system. PIIM's involvement proceeded over two R&D phases, 2009 and 2010. These R&D phases were funded by The U.S. Center for Disease Control and Prevention (CDC). Under this funding, NCDP and PIIM

developed GUI design and interactive prototypes for Westchester County Department of Health (WCDOH), New York State—who served as the test-bed client for the design development. Therefore, the abbreviated name which we applied to this particular aspect of the American Hotspots Project was entitled: "Westchester Hotspots."

The objective for this paper is to discuss some of the interface, user experience, and interface design approaches within the project—particularly as they might apply to health-oriented interactive response tools. I will focus on such approaches in a "punch-list" manner with discussions related to unique contributions to the design. As the design lead, I was tasked with GUI and UXD efforts, as well as relevant engineering strategies. Task focus was information visualization supported through user requirements and usability studies.

WESTCHESTER HOTSPOTS

NCDP and PIIM were commissioned to research and provide solutions demonstrating how Westchester Hotspots could be utilized in the scenario of an H1N1 outbreak in Westchester County, New York. After research and team discussions the following major requirements were derived:

- Data Management
- Rapid High-level Overview
- Analysis 1: Detection of the Most Vulnerable Geospatial Units
- Analysis 2: Understanding Characteristics and Comparison Among Multiple Geospatial Units
- Analysis 3: Plans and Responses (Evacuation, Outreach, Vaccination)
- Reports and User Supports

Typical throughout the planning process, and regardless of the developing technologies that support interface design, the need for ease of use is always paramount. Having designed numerous interfaces over the last fifteen years, and having witnessed changes through dot-com bubble, the birth of Web 2.0, and the ever-evolving methods for interface design this one question has been a constant: "What are the ways to make the interface easy to use?"

Clearly, a good interface should have its interoperability to be, as best as possible, self-evident and self-explanatory.² Westchester Hotspots was to be no exception; our

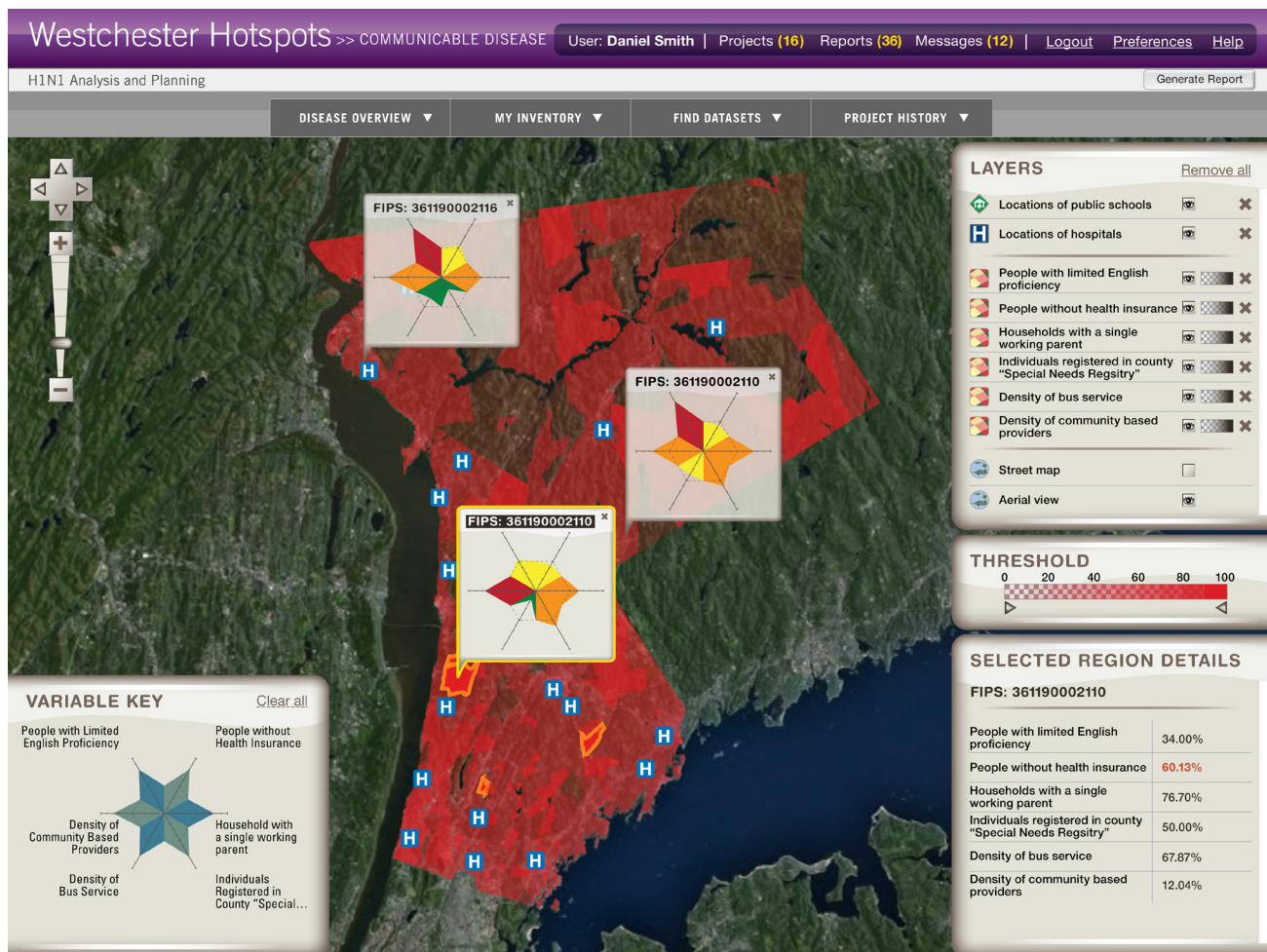


FIGURE 1: GUI for Westchester Hotspots

goal was ease of use, the aim being to support the users so that they could produce more through the most efficient use of their hours and efforts.

*On the Web, if a site is difficult to use, most people will leave. On an intranet, if employees perform their tasks more slowly due to difficult design, the company bears the cost of the reduced productivity.*³

—Jakob Nielsen

DATA MANAGEMENT

A challenge in designing an information analysis system is to provide intuitiveness to the managing of data. Unlike software used to create new content (such as word processing or imaging applications), data analysis applications do not start with a nearly “blank page.” Instead, they display content. The analysts must immediately view,

compare, and interpret this data. Upon this foundation the analyst must find and retrieve useful supporting data—it’s important that users must see, or be able to find the right data in a timely manner. Utilization of an effective taxonomy (naming system), the presence of informative data, and the ability to have such data supported through intuitive navigation and interaction generates successful data management.⁴

During the user interviews (at WCDON) we recognized that data would be collected under multiple formats. These included: ESRI Shapefile, Excel Spreadsheet, MS Word, PDF, JPEG, various audio and video formats, and others. One challenge was to design a data managing visualization to support these multiple formats. The tool we developed was a widget device that could integrate all types of data. This allowed users to search and browse any format easily. The first step in this widget design process was to apply a taxonomy. For this we looked at the “type” of data: data

map, points, images, video, audio, spreadsheet, and text. These, in turn, are also identified through their formats: PDF, XML, ESRI Shapefile, .doc, etc. Additionally, each dataset has its unique title and metadata, this facilitates the search and browse functionality. Users have freedom to reconfigure the data collection by importing and removing datasets, or by entering or editing metadata throughout the datasets. Such customization permits the expansion of possibilities supporting the analyses across various topics.

Users may find it overwhelming and confusing while scrolling through a long data list. To mitigate this challenge icons representing the varying were created to lend

rapidly decipherable visual distinction. This permits users to make a fast visual scan on such long data lists.⁵

Yet even with data type, name, and file type, users can still have difficulty locating the “right data.” Users often try to ascertain what the data represents by its title, however, although many titles for datasets are self-explanatory, the title may contain vague words and indefinite abbreviations. If this occurs, the users will seek collaborating details to ensure that this is indeed the data that they are looking for. To resolve this issue, easily accessible metadata was paired with each dataset title. (Metadata include data title, creator, date/time of creation, keywords, description, etc.)

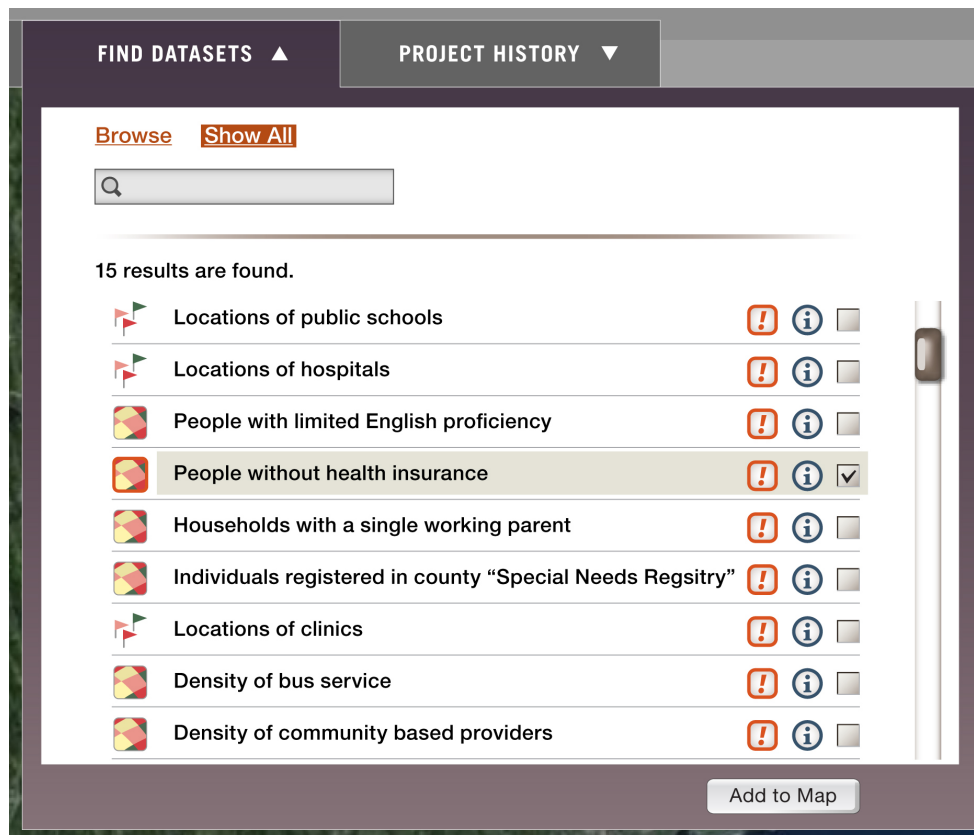


FIGURE 2:
*This panel helps
users manage and
select datasets.*

RAPID HIGH-LEVEL OVERVIEW

Upon the initiation of any new task the analyst needs to rapidly ascertain potential problems. Westchester Hotspots constantly monitors the spread of communicable disease.⁶ There are many communicable diseases, yet each can be identified by specific characteristics. Although the personnel at WCDOH are experts in public healthcare it made sense to display key factors on each communicable disease via a concise “information map,” each of these was designed akin a baseball card (FIGURE 3). As shown above, users can quickly gain knowledge about the selected communicable disease through a similar display and compare method.

The content for each disease information map included:

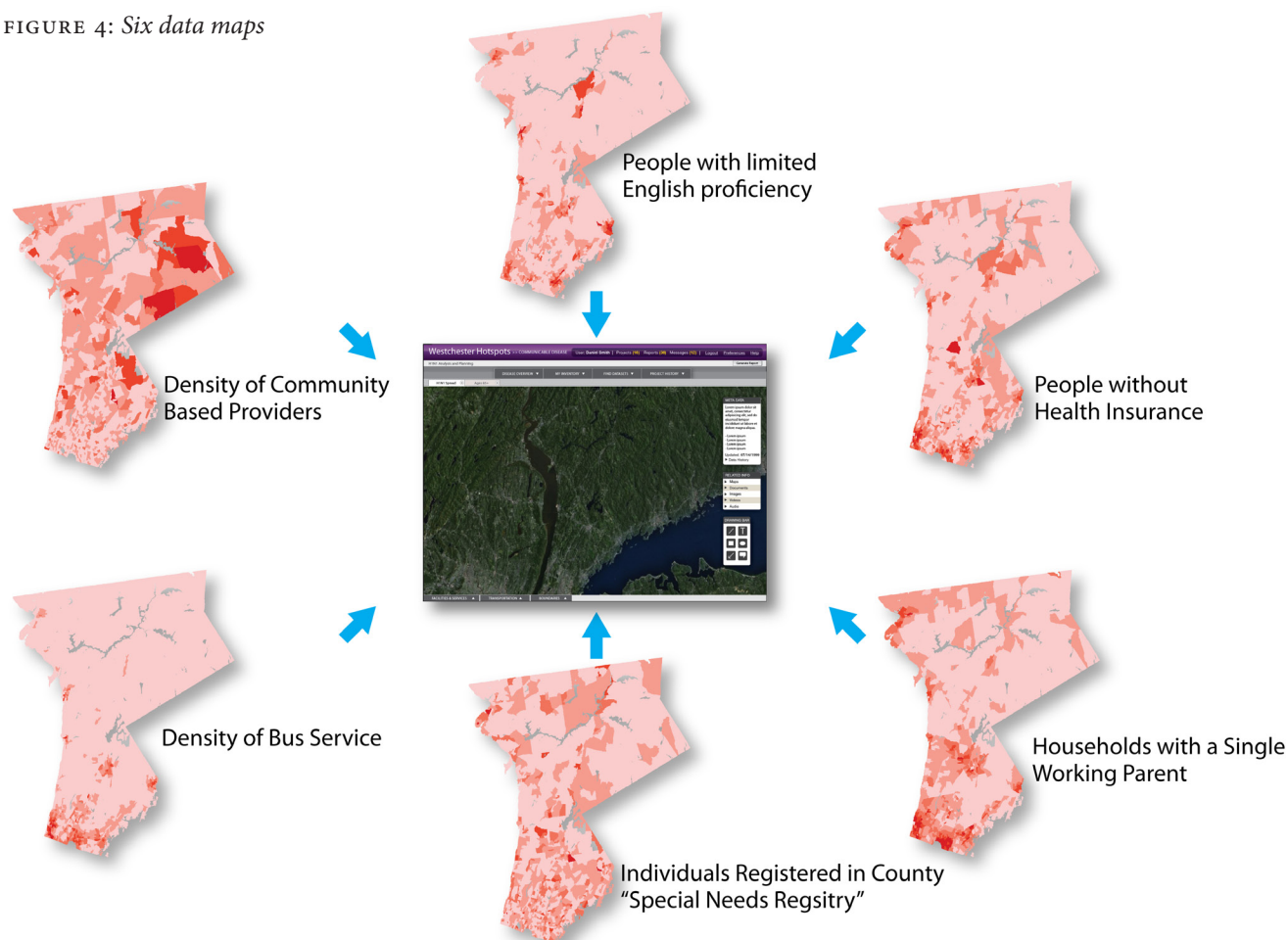
- *Transmission route(s)*
- *Presence of bacteria, or virus, etc.*
- *Symptoms*
- *Prevention*
- *Most vulnerable demographic*
- *History of occurrences (only within the County of Westchester, NY)*

DISEASE OVERVIEW	
Salmonellosis	
TRANSMISSION ROUTE	MOST VULNERABLE PEOPLE
Gastrointestinal (Foodborne illness)	Age 5 and younger, age 65 and older, pregnant, people with: cancer, blood disorder, chronic lung disease, diabetes, heart disease, liver disorder, etc.
PRESENCE OF	HISTORY OF OCCURRENCES (WITHIN WC): <u>1973</u> , <u>1982</u> , <u>1985</u> , <u>2005</u> , <u>2006</u> , <u>2007</u> , <u>2008</u> , <u>2009</u>
Bacteria (Salmonella)	
SYMPTOMS	
Diarrhea, fever, nausea, vomiting, abdominal cramps	
PREVENTION	
Proper harvest and post-harvest handling, food irradiation, sanitization, cooking temperature and time	

FIGURE 3:
These overviews help users quickly gain knowledge on the disease, the subject of the analysis.

DISEASE OVERVIEW	
H1N1 Influenza A virus subtype H1N1	
TRANSMISSION ROUTE	MOST VULNERABLE PEOPLE
Respiratory	Age 5 and younger, age 65 and older, pregnant, people with: cancer, blood disorder, chronic lung disease, diabetes, heart disease, liver disorder, etc.
PRESENCE OF	HISTORY OF OCCURRENCES (WITHIN WC): <u>1904</u> , <u>1936</u> , <u>2009</u>
Virus	
SYMPTOMS	
Flu-like: fever, cough, sore throat, nasal congestion, body aches, fatigue	
PREVENTION	
Hygiene, vaccination	

FIGURE 4: Six data maps



It is also crucial for users to gain knowledge on the geospatially-defined units within the county. The Westchester Hotspots interface displays a map of Westchester County broken down into census block groups. As there are over eight hundred census block groups in Westchester County the system must help users quickly obtain general information about each of these geospatial units. To do so the user can click on a unit (census block) to reveal an overview of the unit. The data upon doing so includes census block group ID, total population, and other specific characteristics in terms of geography, infrastructure, demography, politics, economy, etc.

ANALYSIS 1: DETECTION OF THE MOST VULNERABLE GEOSPATIAL UNITS

As part of their mission, WCDOH must monitor and control the spread of communicable diseases. They must also assure the availability of community health services. One of the most significant requirements is to rapidly define the

most vulnerable demographic groups—they must be able to locate such groups in the event of an outbreak. While building a prototype for proof of concept, we modeled a H1N1 spread in Westchester County. To do so the research team at Columbia University gathered various data maps for socially vulnerable populations within Westchester County. These included demographics such as: “people with limited English proficiency,” “people without health insurance,” “households with a single working parent,” “individuals registered in the county’s ‘Special Needs Registry,’” “density of bus service,” “density of community based providers.” As shown in FIGURE 4, each data map has been divided into census block groups within Westchester County, then a density color value, a choropleth, or opacity, is assigned within that particular polygon.

For example, if “people without health insurance,” is 3.2% for a census block group, this geospatial unit on the map is displayed as 3.2% of the solid color. Areas with higher opacity are therefore the ones with higher risks.

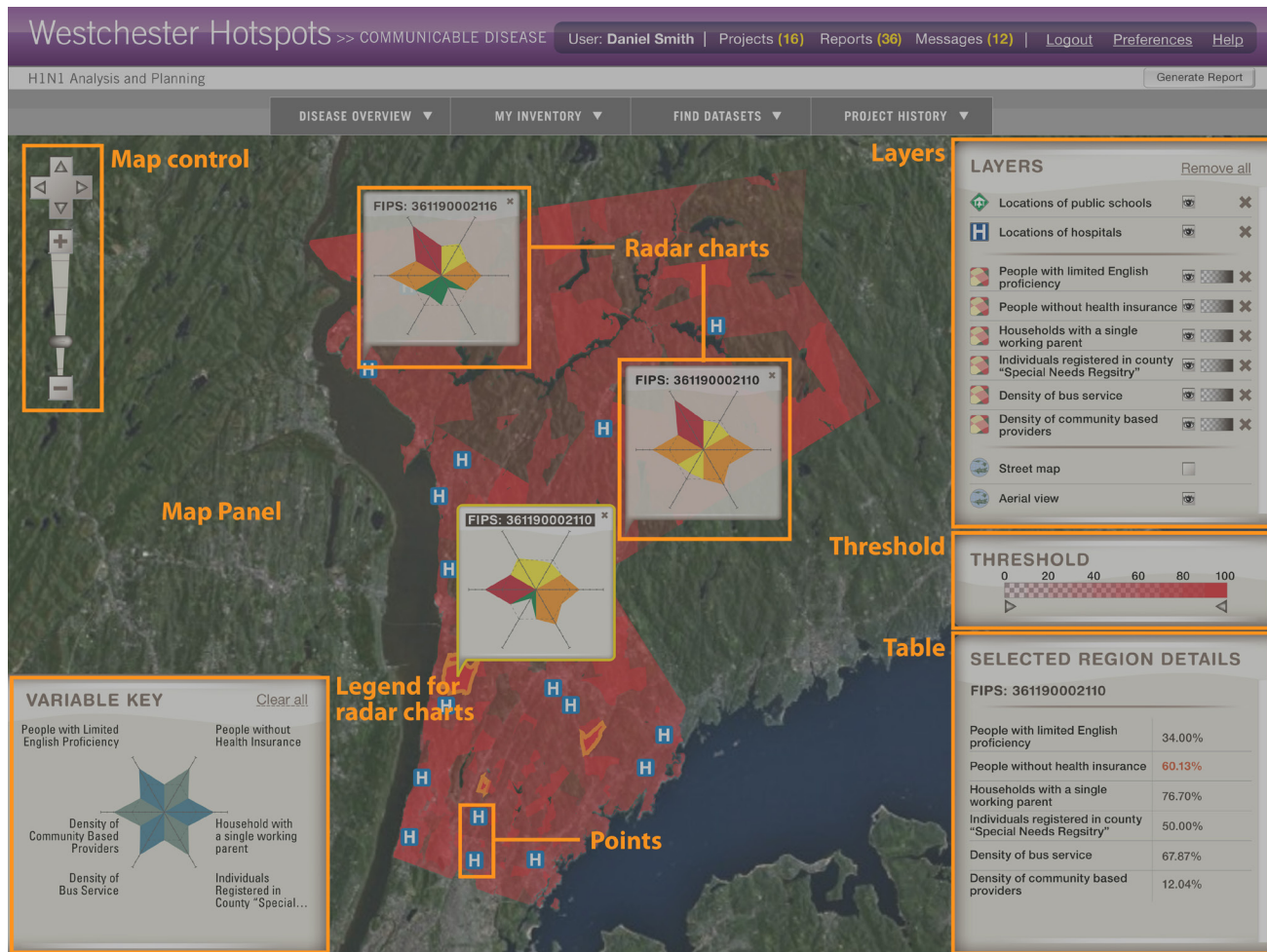


FIGURE 5: Identification of GUI sections and components

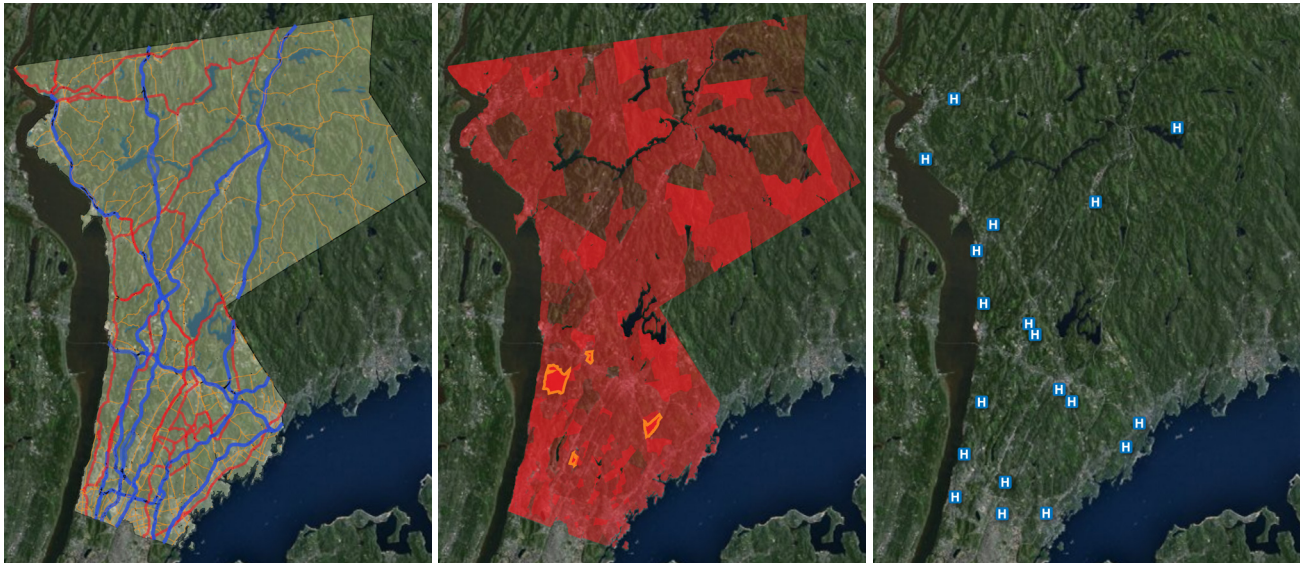
The map panel is the primary work space is used for viewing geographically referenced quantitative data (i.e., data maps), locational data (i.e., point data), multivariate data (i.e., radar charts), small multiples (i.e., a set of juxtaposed radar charts) on geographic imagery (i.e., street map, satellite imagery). This is the highlight of the GUI.

These features are then supported through research respecting usability objectives. This permits the findings and requirements to allow users ease of navigation while viewing maps and apprehending data and locations.

The selected maps are displayed on the Maps panel. These are functionally similar to the way other popular

online map products work (Google Maps, Yahoo Maps, etc.) Also provided are basic map controls, such as zoom and move functions. By default users can view Westchester County through the, now typical, base map layers (street map and aerial view [satellite]). These base maps are always underneath any other layers. Although users can toggle between street and aerial views, both layers can also be made invisible. Boundaries can also be overlaid on top of any maps. The data map layers are placed above the base map layers—these include the points layers (details are explained later in the paper).

FIGURE 6: Comparison among Base Map, Data Map, and Points

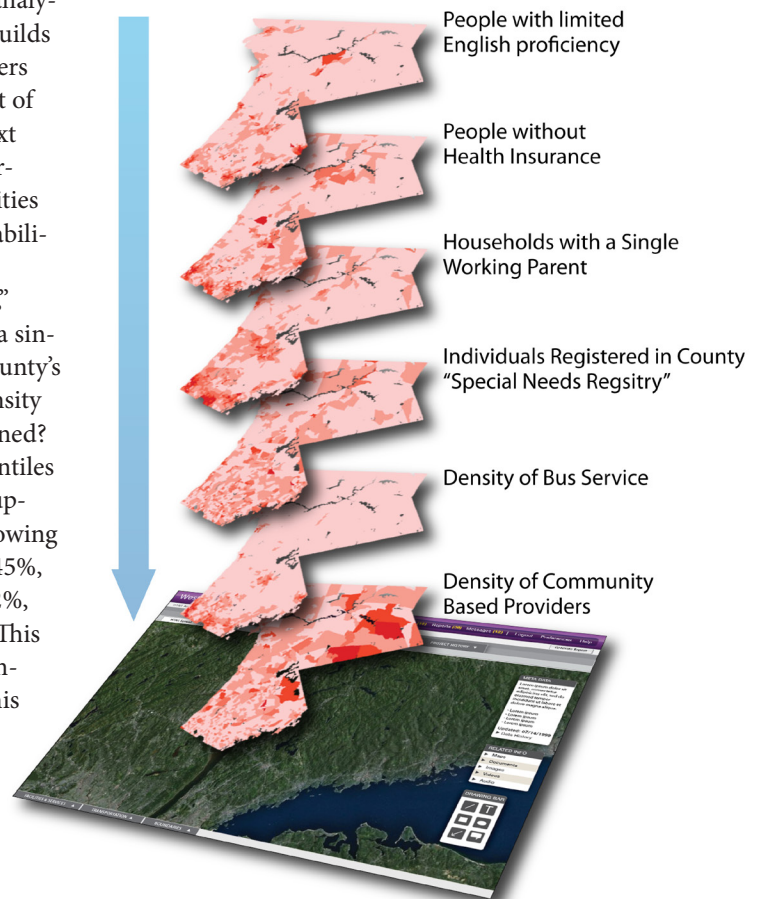


BASE MAP » DATA MAP » POINTS

The concept and application of data maps has existed over hundreds of years. Over time, the methods and technique to design these maps have better aided information analyses and careful investigations.⁷ American Hotspots builds upon the logic of data maps to provide benefits to users (and through these user/analysts, citizens) in support of information gathering and in-depth analysis. The next challenge was how to take one area in which a vulnerability was displayed and place additional vulnerabilities within it—in short, how to combine multiple vulnerabilities (see FIGURE 7).

What if, “people with limited English proficiency,” “people without health insurance,” “households with a single working parent,” “individuals registered in the county’s ‘Special Needs Registry,’” “density of bus service,” “density of community based providers” all need to be combined? One approach might be to simply “add” all the percentiles together. For example, assume the system has data supporting a census block (361190119023) with the following percentages for six datasets: 2.7%, 4.21%, 4.97%, 32.45%, 2.59%, and 5.68%. The sum of all six datasets is 46.92%, and this is the new opacity value for 361190119023. This addition method could function, but assume the combined data value surpasses a 100% value? To solve this problem, the user can choose an average equation as opposed to an additive one. If this equation is applied, the opacity for FIPS: 361190119023 will be 7.82%. When this is applied across the entire system, the densities nominalize to provide many layers of data concurrently.

FIGURE 7: Concept diagram for the map overlay illustrating the multiple layers involved in determining social vulnerability for H1N1.



Upon selecting datasets compatible with maps (e.g., geocoded data) from a data selection panel, they appear on the map panel. There is a component that allows users to control the display of maps. The component is identified as “Layers” because it works in conjunction with the map panel. All map items on the map panel are navigated through Layers. (The layers again are: base map, data map, and points.) Layers also allow users to control what they observe on the maps panel. Users can arrange layers by putting desired layers above, below, or in-between other layers within the same group.

Layers includes the following important functions:

- *Visible/invisible*
- *Opacity*
- *Remove*

Visible/invisible is a common tool used in many graphic applications that handle multiple layers. This tool is particularly useful when users are visually overtaxed by the complexity of multiple data overlays, or when users want to read data maps one-by-one. Another advantage of this tool is that it will continue to “hold” the selected data even while they are invisible, the data will not be removed from the layer even if the layer is made non-visible. Thus they can always be turned back on to retrieve the data.

In addition to being able to average data layers, analysts may weigh certain attributes more than others. Suppose there is a geospatial unit with 2.7%, 4.21%, 4.97%, 32.45%, 2.59%, and 5.68% on respecting the factors previously listed. Here this data is presented in a simple table:

ATTRIBUTE	VALUE
People with limited English proficiency	2.70%
People without Health Insurance	4.21%
Households with a single working parent	4.97%
Individuals registered in county ‘Special Needs Registry’	32.45%
Density of bus service	2.59%
Density of community based providers	5.68%

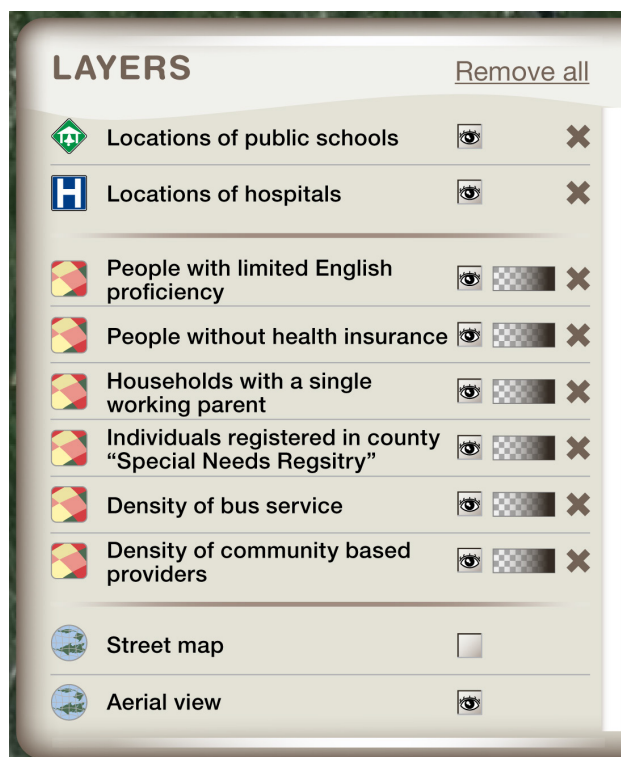


FIGURE 8: Control panel for attribute layers.

FIGURE 9:
Tablular break-down of six layers.

How can the user emphasize or de-emphasize certain of the factoring attributes? An opacity tool, functioning as a slider control can facilitate this. The default opacity for all data map layers is 100%. It is possible for users to manipulate the overlay through the opacity control. For example, if “individuals registered in county ‘Special Needs Registry’” is reduced to 50% opacity, its new opacity value will be recalculated to 16.225%. The new opacity of the overlay (combined values) is now 36.375%, this being shifted from the original amount of 46.92%.

These features quickly permit WCDON analysts to detect the most vulnerable areas within the county. Although the data overlay is a very good starting point because analysts can see the geospatial units associated to characteristics of combined vulnerability, visual complexity still remains. We found that it was difficult to differentiate summed values for the geospatial units represented by opacity values of the same color, even when there was a contrast in the summed values. To solve this a control device called “Threshold” was developed. With threshold users could also apply filtration to the overlay. Threshold includes two sliders that permit users to set the minimum and maximum range of the opacity. Any geospatial units with opacity that are out of the range of the set threshold, are simply not noted through a color opacity. This feature assists users in filtering out the non-essential noise of data and focusing on those areas of their concern.

ANALYSIS 2: UNDERSTANDING CHARACTERISTICS AND COMPARISON AMONG MULTIPLE GEOSPATIAL UNITS

The efforts to continually improve the visualizing of information in the pursuit of clarity toward good decision making has been shared by practitioners in multiple fields. Artists, scientists, and their cross-over fields of design have developed ways to enable users toward greater efficiencies. This is effected through attention to detail and analysis of the data at hand, as well as obtaining feedback from users; skillfully crafted information visualization will enhance a viewers’ experience. This enhancement will yield better outcomes through comprehension, conciseness, and enjoyment, this in turn, leads to better conclusions and decision making.⁸ Decision-supporting features affiliated with information visualization was developed as a key component of Westchester Hotspots; not only was this the case during the evolution of the tool’s design, but the need for alternate views was considered essential as well. In this manner users can learn about geospatial units through three different levels of information displays: maps, charts, and tables.

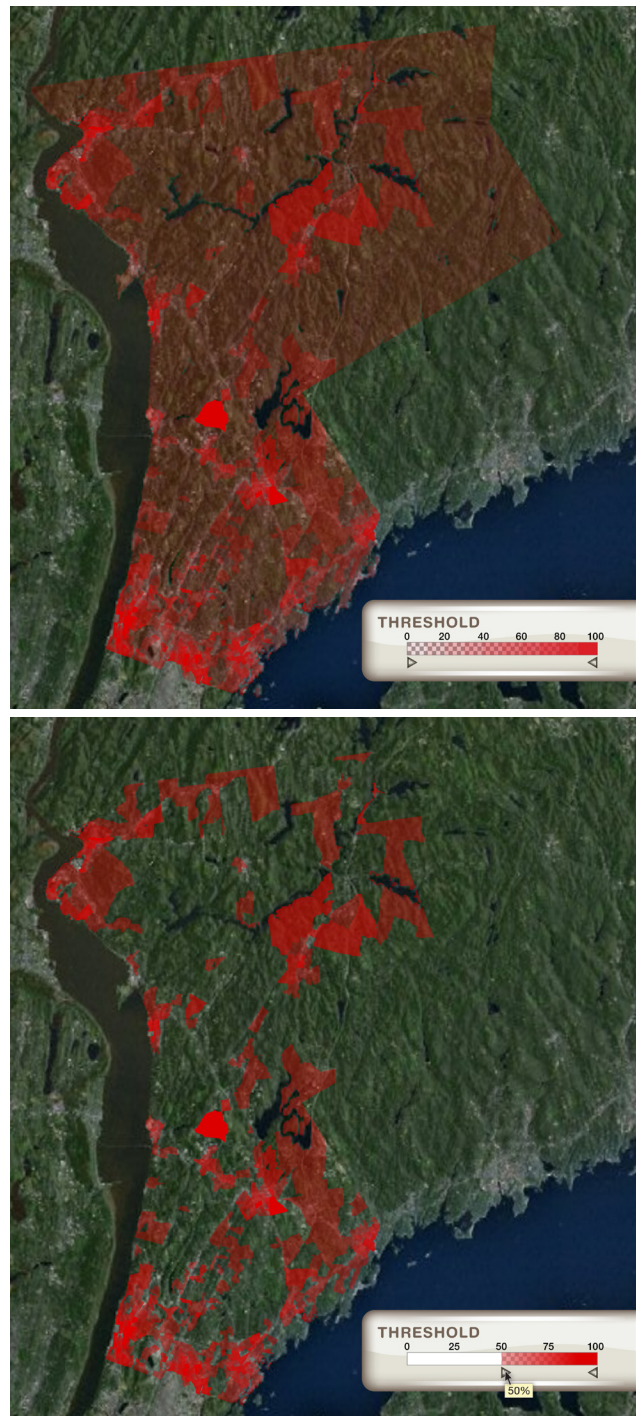
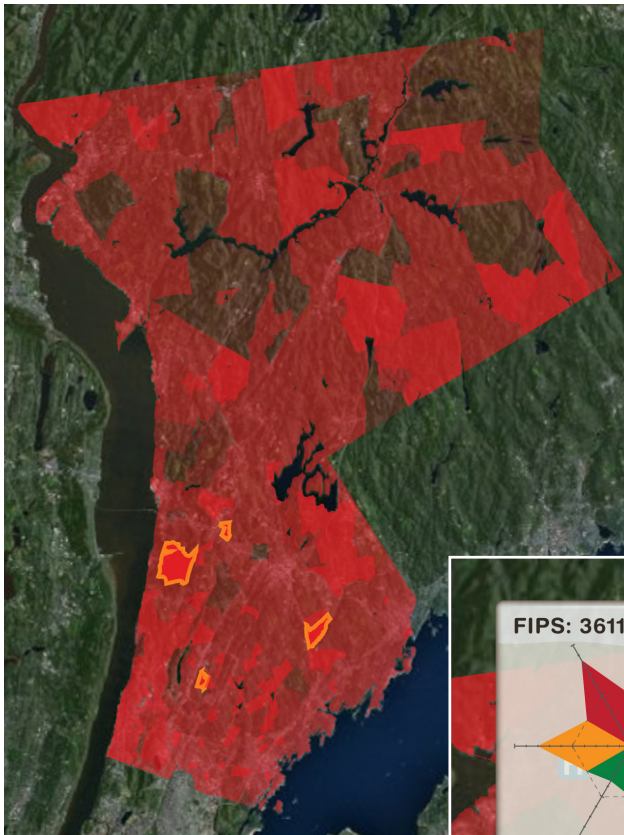


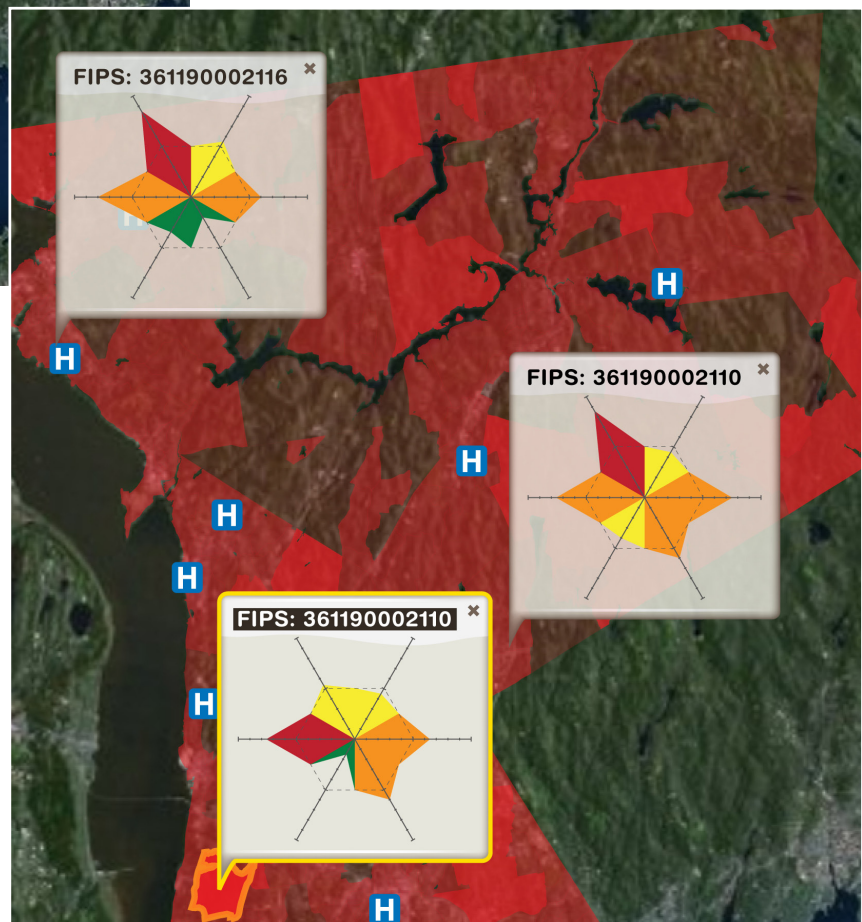
FIGURE 10: *Threshold filter, “before” and “after.”*



MAPS » CHARTS » TABLE

Each level, and type, of visualization provides different depth of details. Maps (in this application) are expected to be the first step for the analysis. The maps permit the analysts to see the forest for the trees; the maps provide the high-level view and prevent the user from getting too caught up in the detail before they have the big picture. Users can gain broad knowledge across the entire region, they can detect the areas in which they need to pay particular attention. The layer-organization (as discussed) and filtering functions embedded in these layers, and threshold tools, permit a rapid detection of potential (and actual) “hot spots.” However, maps cannot deliver the same detailed level of informativeness that users, who are now ready for in-depth analysis on each hot spot, require. Maps in this venue do not provide adequate details.

FIGURES 11 A, B, & C:
*A comparison of the Hotspots’
maps, charts, and tables*



SELECTED REGION DETAILS	
FIPS: 361190002110	
People with limited English proficiency	34.00%
People without health insurance	60.13%
Households with a single working parent	76.70%
Individuals registered in county “Special Needs Registry”	50.00%
Density of bus service	67.87%
Density of community based providers	12.04%

FIGURE 13:
Once clicked, the GUI
displays the radar
chart for the selected
FIPS is displayed.

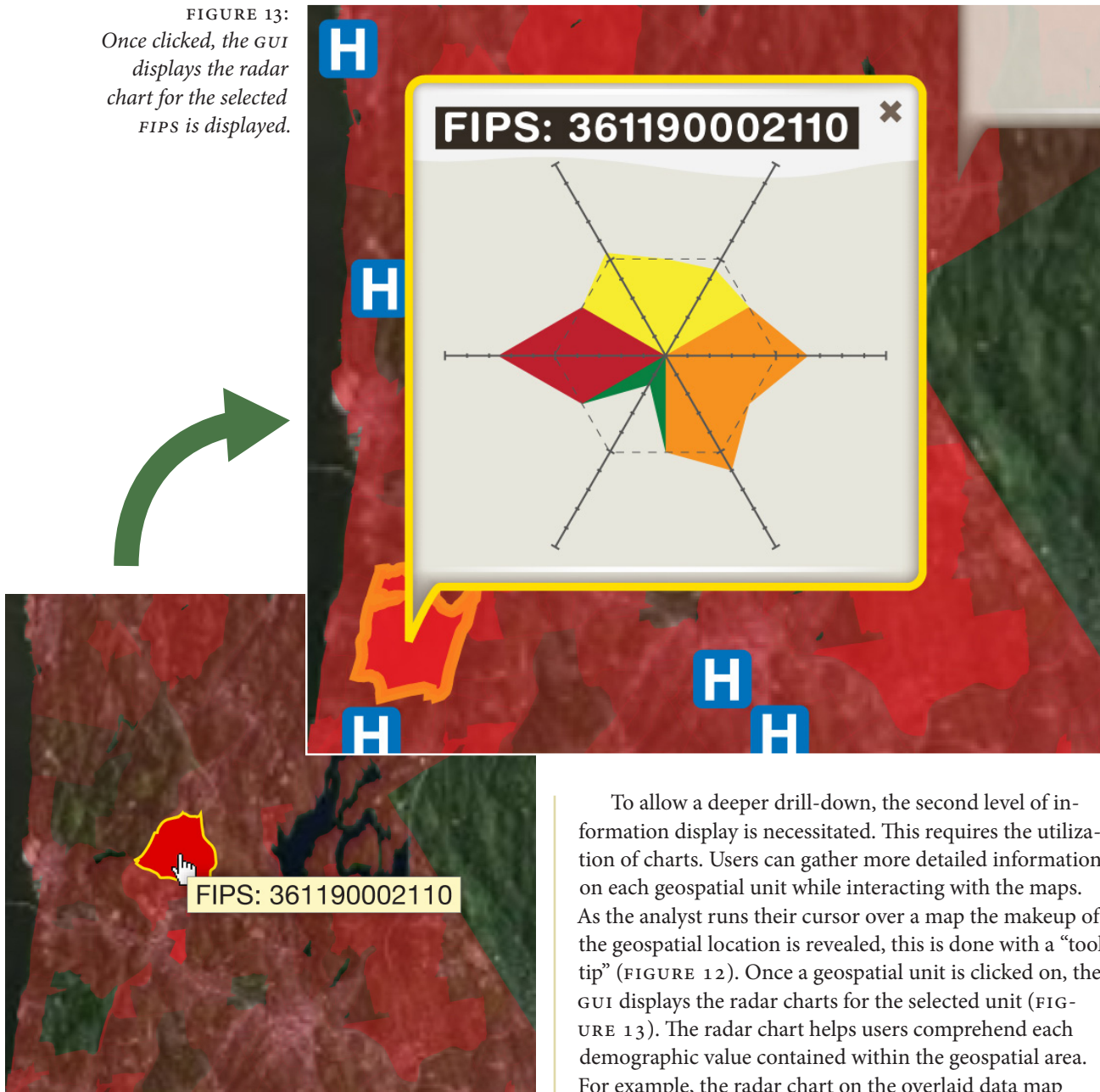


FIGURE 12: The user mouses over a geospatial unit, displaying a tooltip with FIPS (a census block group).

To allow a deeper drill-down, the second level of information display is necessitated. This requires the utilization of charts. Users can gather more detailed information on each geospatial unit while interacting with the maps. As the analyst runs their cursor over a map the makeup of the geospatial location is revealed, this is done with a “tool tip” (FIGURE 12). Once a geospatial unit is clicked on, the GUI displays the radar charts for the selected unit (FIGURE 13). The radar chart helps users comprehend each demographic value contained within the geospatial area. For example, the radar chart on the overlaid data map portrays, a makeup of 6 different attributes with the variables of each broken down. Radar charts are particularly helpful for cases of comparing multiple geospatial units sharing the similar summarized (overlaid) values. Here, for example, is a use case: there detected two hot spots of Unit A and Unit B through the overlay of six data maps as you see on the table below.

ATTRIBUTE	UNIT A	UNIT B
People with limited English proficiency	2.70%	5.40%
People without Health Insurance	4.21%	14.24%
Households with a single working parent	4.97%	6.32%
Individuals registered in county “Special Needs Registry”	32.45%	14.53%
Density of bus service	2.59%	3.65%
Density of community based providers	5.68%	8.02%
Total (Opacity value)	52.60%	52.16%

FIGURE 14:
*Tabular break-down
of six layers illustrating
how different layer
make-ups can result
in the same total
opacity value.*

*Radar charts are
used to illustrate
this difference.*

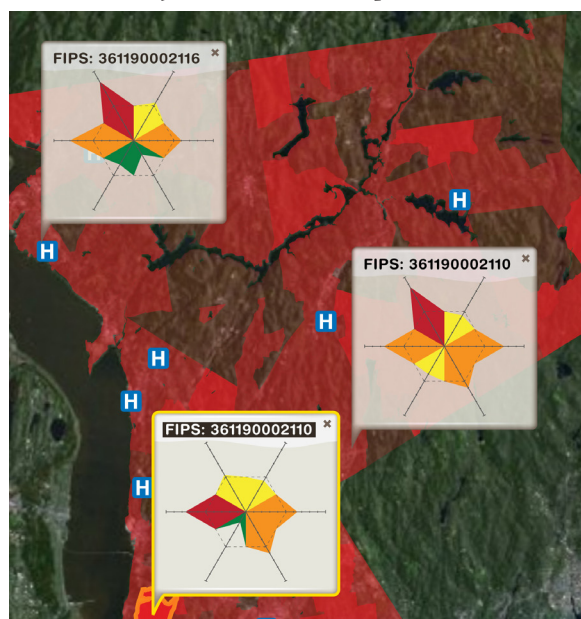
The overlay values (opacity value) for both units are very similar, but as you can see on the table, the compositions of these values are very different. A radar chart generates a visualization of this data that effectively display its multivariate nature—this rapidly allows users to access and compare the regions in question.

Another benefit for displaying multivariate data on a radar chart is that such display devices require minimal real estate. A well-thought-out radar chart is a compact data visualization not only in the fact that it requires minimal space, it also is an excellent device to show comparative data, many radar charts can be presented simultaneously. This takes us to the next platform—users can perform more in-depth analyses through small multiples. *Small multiples* is a display of a series of compact charts that permits users to compare multiple attributes with efficiency and effectiveness. Edward R. Tufte explains the best practices and benefits for displaying quantitative information through small multiples as following:

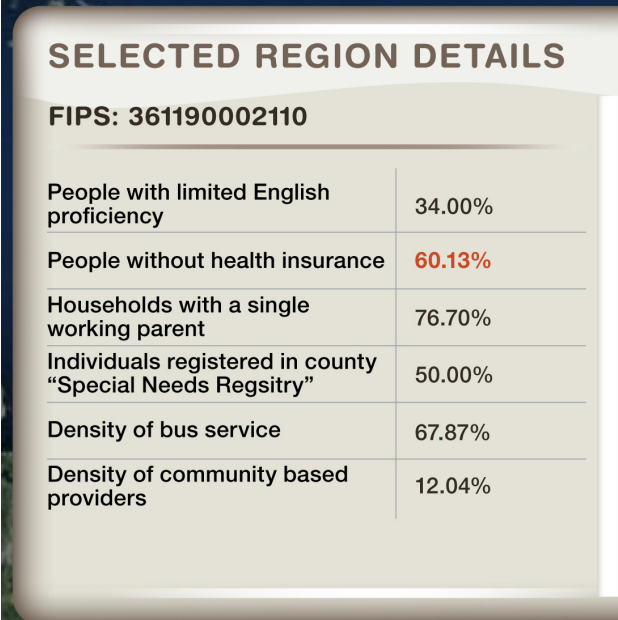
Well-designed small multiples are...

- Inevitably comparative
- Drawn almost entirely with data-ink
- Deftly multivariate
- Efficient in interpretation
- Shrunk, high-density graphics
- Often narrative in content, showing shifts in the relation between variables as the index variable changes (thereby revealing interaction or multiplicative effects).⁹
- Usually based on a large data matrix

FIGURE 15: *Juxtaposition of Radar charts that
enable an analysis with small multiples.*



In the GUI world we need to see forests and trees, sometimes simultaneously. It is an important requirement that the GUI let users ascertain detailed values for each variable on each geospatial unit. As explained above, the interface displays the radar chart for the click-selected geospatial unit. When the radar chart is presented, users can also view the values for all active attributes on the table located in the right column.



FIPS: 361190002110	
People with limited English proficiency	34.00%
People without health insurance	60.13%
Households with a single working parent	76.70%
Individuals registered in county "Special Needs Registry"	50.00%
Density of bus service	67.87%
Density of community based providers	12.04%

FIGURE 16: Table displaying active attributes.

Obviously, this table provides the greatest level of detail because it contains specific text and numbers.

ANALYSIS 3: PLANS AND RESPONSES

(EVACUATION, OUTREACH, VACCINATION)

Assume that through the interface users have been apprised of a disease, detected the most vulnerable areas, and learned about the specific characteristics which reveal that these areas are vulnerable. What is the next step?

The next step is to come up with plans for resolutions. Local health departments like WCDOH must act quickly in response to a crisis that may threaten their residents. The research team at Columbia University has gathered the important questions including:

- Where are the locations for treatments?
- Where are the locations to which people can be evacuated, and what are the routes?
- Where are the locations people can receive aid?
- Where are the possible points of distribution for vaccinations?

For the H1N1 model, during an outbreak, WCDOH must decide where to place patients for treatments (e.g., local hospitals within or around the detected areas) and determine where to distribute vaccinations for those who are not infected. This system utilizes facility point-data as an available layer referenced to the base and data maps. Users have access to important facilities such as schools, hospitals, clinics, etc. After selecting a facility the user can click on each icon to access information about the selected facility. Information can include: name of the facility, contacts, ID, address, size, and any other notable characteristics.

The case above shows how the point data and markers can be utilized for emergency responses. Such data and methods of access can be instrumental in planning for potential response scenarios. Analysts can create new plans and/or evaluate the existing planning methods against various cases that have happened, or might happen, in Westchester County. Many types of emergency response planning scenarios, such as: hurricanes; floods; insect borne illness, such as West Nile virus; earthquakes; water contamination; operational failure at a nuclear power plant, etc. may be modeled. Users may take advantage of relevant datasets such as evacuation point, path, capacity of shelters, medical facilities, and others, in the process of generating "what-if" scenarios.

REPORTING AND OTHER SUPPORT (GENERATING REPORT, TRACKING THE HISTORY OF RESEARCH)

We have studied multiple user cases in order to be familiarized with the workflows at WCDOH. In order to bring the intuitiveness of such heuristics into the toolset we have established a goal of letting the system speak the users' language and simulate the process of their real-life tasks.¹⁰ In addition to the functions supporting subject-specific analyses, there are two important functions closely associated with the workflow of WCDOH: collaboration and reporting.

Collaboration is useful for team analyses and to consider performance over time. This includes both on-going, recurring, and long-term investigation. The collaboration mode begins through the selection of a collaboration enablement. Each discrete analysis (i.e., each unique project) is assigned to a single user by default (referred to as private status)—it can only be shared with other users upon the activation of a “share” option. If a project is shared, there are three security levels possible to set respecting such sharing: public, semi-public, and private. The public setting permits all users within the same domain (e.g., the entire department) to access the project. Semi-public allows specifically selected, or other authorized persons, to access the project. Finally, private does not allow anyone else to access the project (this is also the default status).

The interface also records the history of the application's use—this helps users easily track what they have analyzed, whether they are maps, charts, and other datasets. History offers an easy access to previously viewed contents, as well as an overview of the way the project has progressed, over time.

In addition to some of the features mentioned the system has the capability to archive projects. Through the archiving feature users can save the project or retrieve (open) a saved project. In this manner the user may edit the project, or they can continue investigating. Users may document their projects through generating tangible

outcomes (e.g., PDF documents); users can create reports with text, maps, charts, data, or any kind of files or types employed during the analysis.

CONCLUSION

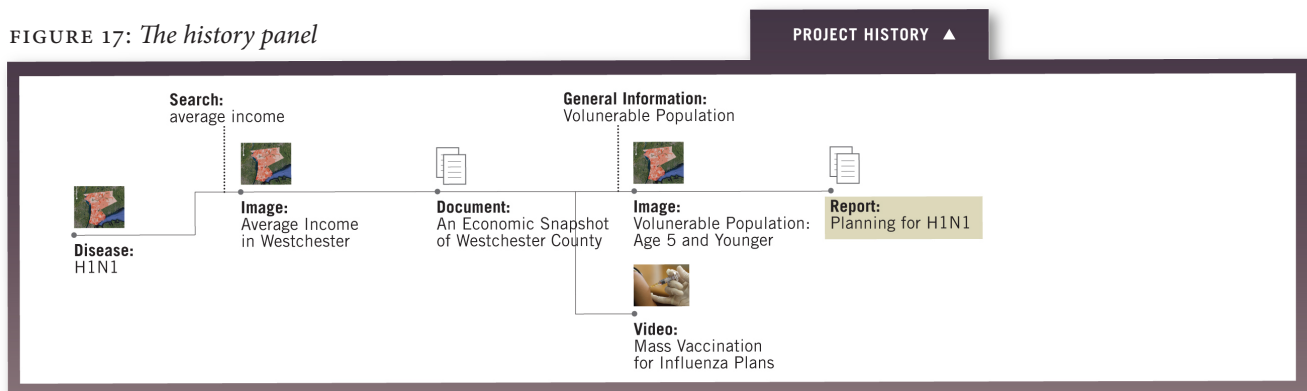
There is great significance to the empowerment, of “knowing.” The aspect of knowing continues to fascinate me because of the manner in which it continually evolves one's ability to make decisions in everyday life.

The generally slow, yet continuous growth of knowledge alters how we make decisions and take action; interface design is fascinating because it provides a platform for Knowing as well, however, it functions as a synthetic and rapid paradigm of knowing. An interface, such as the American Hotspots Project, or, more specifically Westchester Hotspots, is a “knowing device” and through the knowledge it conveys, based on the data that is being continually monitored, the public is safeguarded, or minimally its dangers are mitigated.

The scope and scale of knowing has an impact upon ourselves, but perhaps more importantly, on others. I provide a personal example here—recently, my five-year-old son enquired about dinosaurs, he wanted to know about their specific characteristics: size, diet, appearance, and so forth. As I prepared to answer I simultaneously, and somewhat sadly, recognized that I knew of only one type, the *Tyrannosaurus rex*, to any significant detail. I spoke of the “king of the terrible lizards” in some detail, but I realized that my conversation was somewhat redundant, I was unable to compare the T-rex meaningfully to other dinosaurs. The next day I delved into the taxonomy of dinosaurs meaningfully. I took the time to “know.” Later, when the question arose again, I was able to provide some depth to my son's inquiry. I feel that this is, in one way, what it means to be a parent; to share an aspect of “knowing.”

We gain a great deal of parallel knowledge in the pursuit of the core thing we are after; this is part of what

FIGURE 17: *The history panel*



insightfulness entails. Each new discovery leads us, of course, to more discoveries. In life this is more scattershot than it should be in an application; an interface tool requires depth for appropriate decisions. However, Web 2.0 has both scattershot aspects (beyond anyone's imagination not long ago) and also depth. As the methods by how we visualize data expand so shall this capability—studying Dinosaurs “101” takes a traveler far beyond the species themselves into the whole “age of reptiles” and the multiple theories of the context surrounding their time on earth.

Ultimately to assist others in learning through information design modeling is a superb way to learn as well. For me there is no pleasure as great as that of helping users making better decisions through effective “manifestation” of data. Information, precisely and rapidly gathered, is a thing of beauty. It is not really easy to create ever better tools, first the designer has to become familiarized with the information his or her clients will need to respond to. This is a critical learning curve, going through it often provides some of the best answers—the struggle, too, is a good teacher.

For the “hotspots” projects it was necessary to undertake a fair amount of public health related research, and to understand how healthcare practitioners generally function. Every interface we work on can be the roots of another, at PIIM many of our projects have, or will contribute to the empowerment or safety of society—this too, makes the effort its own reward. All of these benefits are lost, however, if a “knowledge tool” is too difficult to use. All the purpose and all the data becomes strained or totally unavailable if the challenge of using the tool overwhelms the intended users. It simply becomes a waste of time and effort. Yet, creating this ease-of-use, and maintaining the highest level of utility is a challenge; it is not easy to do. When all the aspects of the tool, including the final mile of visual clarity and ease-of-use come together, it is a rewarding effort in every respect. This is why we put our intense efforts into every aspect of building better interfaces and creating better tools for those who must rely on them, from research to deployment; it's all about the power of “knowing.”

ACKNOWLEDGEMENTS

Brian Willison, the then-Director of PIIM, oversaw the project for design and engineering development, as well as the design, usability, and technical teams at PIIM; the research team at NCDP, Columbia University, was the lead principle investigators for the project.

BIOGRAPHY

Jihoon Kang currently serves as Associate Director at the Parsons Institute for Information Mapping (PIIM), The New School, New York. His background experience includes creative and program leadership, project management, Graphical User Interface (GUI) Design, User Experience Design (UXD), usability, information architecture, and developing user interaction models. At PIIM, he has worked on projects from the National Geospatial-Intelligence Agency, Center for Disease Control and Prevention, The Telemedicine and Advanced Technology Research Center (U.S. Department of Defense, U.S. Department of Veterans Affairs), The United Nations Development Programme, and Macmillan Publishers. Mr. Kang's former capabilities were in the publication, communication design, and illustration, working for brands such as: Esquire, Cosmopolitan, and Good Housekeeping. He has taught at Parsons, The New School For Design. He obtained both Bachelor and Master degrees from the Parsons School of Design with focus in Design and Technology, Illustration, and Digital Animation.

NOTES

1 The National Center for Disaster Preparedness, Columbia University, “Vulnerable Populations,” 2010, http://www.ncdp.mailman.columbia.edu/program_resiliency.htm.

2 Steve Krug, *Don't Make Me Think*, Second Edition (Berkeley, CA: New Riders Publishing, 2006), 11–19.

3 Peter Morville and Louis Rosenfeld, *Information Architecture for the World Wide Web*, Third Edition (Cambridge: O'Reilly, 2006), xi.

4 Ben Shneiderman and Catherine Plaisant, *Designing The User Interface*, Fourth Edition (New York: Pearson Education, 2005), 598–601.

5 Ibid., 236–238.

6 Andrew J. Spano, *Department of Health Annual Data Book 2008* (County of Westchester, NY: 2008), i.

7 Edward R. Tufte, *The Visual Display of Quantitative Information*, Second Edition (Cheshire, CT: Graphic Press LLC, 2001), 16–27.

8 Edward R. Tufte, *Beautiful Evidence*. (Cheshire, CT: Graphic Press LLC, 2006), 12–45.

9 Tufte, *Visual Display of Quantitative Information*,
170–175.

10 Jakob Nielsen, “Ten Usability Heuristics,” *Useit.com*: Jakob Nielsen’s Website (2005), http://www.useit.com/papers/heuristic/heuristic_list.html.