

Developing a Web-based Data Mining Application to Impact Community Health Improvement Initiatives: The Virginia Atlas of Community Health

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This article describes how a team from the Virginia Department of Health (VDH) and the Virginia Center for Healthy Communities (VCHC) attended the UNC Management Academy for Public Health to learn skills to address Virginia's commitment to using technology to improve the public's health. After creating a business plan for a food-safety information Web site, team members used that experience as well as Management Academy training in information technology, the management of data and finances, and strategic partnering to create a comprehensive tool with which to place customizable population data in the hands of anyone interested in pursuing population health improvement. The Virginia Atlas of Community Health, launched through the VCHC in 2003, places clear, compelling data in the hands of those who can influence decisions at the local level and create the most impact for health. Since the program's inception, more than 2,000 individuals have registered as ongoing users of the Virginia Atlas. Initially funded by a Turning Point grant from the Robert Wood Johnson Foundation, the program is sustained through a series of smaller grants and funding from the VDH.

KEY WORDS: information technology, management training, public health

Historically, a significant shortfall in the application of core public health services to reduce or eliminate public health concerns has been the lack of broad access to information about health indicators and the vari-

ables making an impact on health that could enhance research and data-driven decision making. In Virginia, customers internal to the Virginia Department of Health (VDH) have had easy access to quantitative data about the overall health of the population; however, critical public health partners—small nonprofit organizations, members of the media, policy makers, educators, researchers, and others—have been stymied in their attempts to obtain population health data specific to their area or interests in a customizable format. The available paper reports published by the VDH or other state agencies present data aggregated by political subdivisions that make sense to governmental public health agencies, but are not in a format that others could customize. Furthermore, small nonprofit organizations are increasingly asked by funding organizations to rigorously demonstrate both the need for, and the impact of, their public health programs when they apply for ongoing financial support. This is a difficult requirement for community-based organizations without easy access to sophisticated trend data useful for their purposes.

Through Turning Point Initiative, a program sponsored by the Robert Wood Johnson Foundation to strengthen and transform public health, the Virginia Center for Healthy Communities (VCHC) was launched in 2000. This entity was created to be a structure outside of governmental public health whose goal was to improve health through innovative means. In

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1999, the Virginia Turning Point Initiative conducted a survey to assess the needs of community health organizations in Virginia. A wide range of organizations, including hospitals, health departments, free clinics, community health centers, and others, were asked to describe their level of interest in various types of technical assistance for community health improvement. Of the more than 160 respondents from across the Commonwealth of Virginia, 80 percent (or 128) said they would be “very or somewhat” interested in help obtaining demographic and health-related data on their communities.¹

The major weaknesses of existing data sources uncovered by the survey were that (1) the data must be obtained from multiple sources, with sometimes incompatible reporting formats; (2) the data are not always accompanied by adequate narrative to help local organizations interpret it for their area; and (3) the data are typically provided at the local, regional, or state level, and not useful for planning projects within smaller geographic areas. Consequently, local organizations with an interest in community health improvement were forced to proceed without adequate information or spend thousands of dollars in staff or consultant time to develop the information they needed. Clearly, the Commonwealth of Virginia needed a tool with which to place customizable population data, analyzed to the ZIP code level, in the hands of anyone interested in pursuing population health improvement.

In 2000, a team from the VDH attended the UNC Management Academy for Public Health to learn skills and design a program to address Virginia’s commitment to using technology to improve the public’s health. The team was composed of the VDH Director of Human Resources, the Executive Advisor to the Deputy Commissioner for Community Health Services, and the Turning Point and Strategic Planning Coordinator, who also served as the Executive Director of the VCHC. A long-term goal of Turning Point was to create a comprehensive health information resource and referral system, which would incorporate a Web-based application to provide information on public health issues, communicable disease, chronic disease management, and other resource information and instruction.

● Management Academy Experience

The Management Academy introduced the VDH team to business planning, strategic management, finance, and the application of innovative technology to program design. The team practiced these skills through the business plan they wrote for the Management Academy, a plan for *safefoodva.com*, a Web-based sys-

tem that would provide information on food safety, education and training courses for food handlers, results of health department restaurant inspections, regulatory updates, and links to other available resources that focus on food-safety issues, to be financed by licensure fees paid by restaurants.

● Applying Management Academy Training to the Development of a Health Information Resource System

Staff in the Office of Environmental Health declined to implement the business plan created by the Management Academy team, which had not included a staff member from that office. The VCHC identified a broader need for health information, and the executive director of that organization, who *had* been a member of the Management Academy team, applied learning from the Management Academy to creating a health information resource and referral system for Virginia.

Information technology

The Management Academy training in information technology proved most pertinent in designing a comprehensive health information resource. Taught by William Yasnoff, MD, PhD, FACMI, the Associate Director for Science in the Public Health Program and Practice Office at the Centers for Disease Control and Prevention, the Management Academy Informatics course provided an introduction to public health information systems, information architecture, and database design. Particularly relevant were Geographic Information System (GIS) mapping capabilities, through which users can aggregate real-time information from disparate databases and spreadsheets, build individual ad hoc queries and formatted reports, and then instantly transform their results onto geographic maps. Such capabilities would facilitate accessing data and maximize its utility for a wide variety of users.

Managing data

Basing an understanding of need on the 1999 Turning Point survey of community organizations’ technical assistance needs, a concept proposal was developed to use the Virginia Hospital & Healthcare Association triennial report, *Indicators of Healthy Communities*, to provide community health data to a broad audience via the Internet. This report provides community (city/county-level) health data that are also aggregated into five regions across the Commonwealth of Virginia. In addition to the paper document, the report

includes raw electronic data that allow users to manipulate the information for their own purposes. Coupling this report with GIS mapping capabilities, the VCHC Director presented a proposal for a health information resource and referral system to the Executive Committee of the VCHC Board of Directors in October 2001. The board of directors supported developing a proposal, which would provide compelling community health data in a customizable format (thematic maps and trend data) that could make a visual impact and illustrate problems at a local level.

Managing finances

Research for the Management Academy business plan had indicated a strong market for Web-based information among the general public, VDH staff, and business, government, and not-for-profit entities. Staff from the VCHC partnered with a known public health consultant to conduct a research on the competition and market to assure that a new initiative would have the potential to generate revenue and help the organization stay solvent. Two primary target constituencies were identified: small nonprofit organizations and health conversion foundations. The system could be marketed to both public and private entities as a health information service for constituents, members, and employees. Grant funds and governmental funding would support the start-up, and user fees were projected to generate cash flow for the system. The business plan included a staffing proposal that recognized the need to divide the key duties of content development, training and marketing, and fundraising between staff and outside consultants. Costs related to the development and launch of the program would be covered entirely by the Robert Wood Johnson Foundation, through the VCHC’s Turning Point grant (Table 1).

Strategic partnering

The VCHC Board of Directors represented key stakeholder groups and could help legitimize the new data source. These members are influential leaders in the areas of business, government, philanthropy, and health-care (Table 2). Their buy-in and support of the project would pay dividends in terms of marketing and actual utilization by the target audiences. Another key function performed by the board of directors was assuring that the data included in the project would be comprehensive (collected throughout the Commonwealth of Virginia), consistent (data available from all across the state), and collected with rigor (methodology and analysis).

TABLE 1 ● The Virginia Atlas creation annual budget*

Staff	
The Virginia Atlas coordinator’s (60%) program operations, technical assistance, and training	\$19,800
Benefits (30%)	\$5,940
VCHC coordinator (25%) program oversight, training, and outreach	\$15,000
Benefits (30%)	\$4,500
Program assistance (administrative and fiduciary support provided by the VDH and the VHHA, respectively.)	In-kind
Staff subtotal	\$45,240
Application development (consultants)	
Web hosting	\$4,800
Web site development	\$60,000
Collection and analysis of data elements	\$15,000
Application subtotal	\$79,800
Training and outreach	
Ongoing training courses and presentations (travel, materials, refreshments)	\$5,000
Marketing the application	\$30,000
Training subtotal	\$35,000
Indirect cost at 9%	\$14,404
Total costs	\$174,444
In-kind contributions	
VDH office space, computer, phone (estimated at \$875/mo)	\$10,500
VDH administrative support (estimated at \$18/h for 200 h)	\$3,600
VHHA fiduciary support (estimated at \$25/h for 50 h)	\$1,250
VCHC Board of Directors oversight (quarterly meetings/travel time for 15 members at \$50/h)	\$9,000
Total in-kind contributions	\$24,350

*VCHC indicates Virginia Center for Healthy Communities; VDH, Virginia Department of Health; and VHHA, Virginia Hospital & Healthcare Association.

● Results

The Virginia Atlas of Community Health

The Virginia Secretary of Health and Human Resources, an ex-officio member of the VCHC Board, officially launched the Virginia Atlas of Community Health in February 2003. The Virginia Atlas of Community Health is a Web-based application that includes more than 120 population, economic, and health indicators for each of 887 Virginia ZIP codes. The community health status indicators include indicators of population demographics, births, mortality, disease, hospitalization, health insurance status, and other important measures of community health status. The community health service indicators include indicators of the supply of community health services for each locality. The application is supported by a dedicated Web server and utilizes AltaMap software linked to a massive file of data obtained from public and private sources, including the US Census, Virginia hospital discharge

TABLE 2 • Affiliation of VCHC Board members (current)

- Senate of Virginia
- Virginia House of Delegate
- Eastern Virginia Medical School
- Sentara Health Management
- Bon Secours Richmond Health System
- City of Norfolk
- Virginia Board of Health
- (Independent) Consultant
- Virginia Department of Health
- Virginia Hospital & Healthcare Association
- Baptist General Convention
- Virginia Health Care Foundation
- Department of Environmental Quality
- Greater Richmond Chamber of Commerce

data, Public Health birth and death records, Virginia Department of Education, Virginia State Police, Economic Development Partnerships, Claritas, and other sources. Data continue to be updated at least on an annual basis and functionality enhancements are included periodically.

One of the special features of the Virginia Atlas is the availability of ZIP code-level indicators. In many localities that are highly populated and/or geographically large, city- or county-level statistics can mask important geographic variation in health status within the locality. ZIP code-level analysis allows the user to look within city or county boundaries for community health “hot spots” that might not be apparent from city- or county-level statistics. ZIP code-level analysis also allows adjacent cities and counties to identify community health problems that cross city and county borders.

The Virginia Atlas users can either generate a report or create a thematically colored planning district map. These products allow users to quickly evaluate the health of their community at the local and zip code level and assess how these variables interact to produce pockets of high and low morbidity and death. The indicators are accompanied by text explaining how to interpret the data at the local level. The user may also download tables into Microsoft Excel files for local-level analysis.

The Virginia Atlas of Community Health places clear, compelling data in the hands of those who can influence decisions at the local level and create the most impact for health. Since the program’s inception, more than 2,000 individuals in Virginia and across the United States have registered as ongoing users of the Virginia Atlas application. Hundreds of individuals have received in-depth training on the application, and presentations have been made to the VDH personnel, legislative oversight committees, gubernatorial com-

missions, master’s level public health academic courses, and philanthropic organizations. Data from the Virginia Atlas application is being included in grant applications, quoted by newspaper reporters, professional presentations, and public hearings. The Virginia Atlas allows anyone to be his or her own public health data consultant—at least in the initial stages of data collection. It provides community data in a customizable format at the click of a button, 24 hours a day.

Addressing the problem of health improvement

The major strengths of the Virginia Atlas are the following: (1) the data are obtained from multiple sources and put into compatible reporting formats; (2) the data are accompanied by adequate narrative to help local organizations interpret the data for their area; (3) the data are useful for planning projects within small geographic areas; and (4) the data present a comprehensive picture of community health both as a snapshot of what is happening and over specified periods.

With these data, myriad activities may be undertaken:

- Local leaders can compare their community’s health status to that of other communities, stimulating political interest in community health improvement.
- Local organizations can identify their community’s most pressing health needs.
- Policy makers and others can identify community service gaps.
- Nonprofit organizations can justify funding requests from federal, state, local, and private sources.
- Researchers can evaluate improvements in community health over time.
- Anyone can gather information at a fraction of the cost of consultants or internal staff time.

Recently, the VDH contracted with the VCHC to add new data that reflect results from the Behavioral Risk Factor Surveillance System. Responses to consistent questions were aggregated for several years to ensure that there was sufficient number of responses to meet the rigor test. Community-based nonprofit organizations have used information in the Virginia Atlas to successfully apply for grant funding from health conversion foundations. Specifically, a Richmond-based organization used data about the number and percentage of individuals who were overweight or obese to gain financial support for an initiative that works with local elementary schools to educate children about nutrition and physical activity. Data from the Virginia Atlas was used to identify which elementary schools should implement the pilot program. The level of analysis made possible by the Virginia Atlas allowed organizers to

base decisions on data as opposed to biases or anecdotal evidence.

Sustainability

The Virginia Atlas was initially developed through a Turning Point grant from the Robert Wood Johnson Foundation. Sustainance of the Web site for its first 3 years was realized through a series of smaller grants from members of the Consortium on Health Philanthropy (Virginia's health conversion foundations) and a contract from the VDH to incorporate additional data elements into the Virginia Atlas. Funding has allowed the Virginia Atlas to expand the number of indicators and increase its functionality, so that users can continue to access the Web site free of charge.

The Virginia Atlas of Community Health continues to expand and broaden in its use. The Council on Virginia's Future, an organization created by Virginia law to focus on long-term planning, intends to integrate the data and functionality of the Virginia Atlas application into its work on revitalizing Virginia's approach to education, transportation, health, and economic development to assure that Virginia remains competitive in these areas. Discussions are under way to retroactively add existing data elements to the Virginia Atlas in order to gain a perspective on trends over a longer period. It is expected that additional data elements will continue to be added to continuously expand the scope of information available to individuals interested in community health improvement.

● Conclusion

The Management Academy for Public Health is a valuable program that enhanced the skills of Virginia's public health professionals, particularly in the areas of entrepreneurial thinking, strategic management, fi-

nance, and application of innovative technology. Although the Virginia Atlas of Community Health was not the business plan developed through the Management Academy, lessons learned from that program were integral to its development and successful implementation. These include the course content that was applied to the Virginia Atlas and the budgeting expertise gained through producing the business plan for *safefoodva.com*. One important lesson retrospectively learned was about partnering—specifically, the fate of *safefoodva.com* highlighted the importance of including key partners early in the planning process. Although Management Academy team members had routinely met with environmental health staff during the planning process, and the environmental staff had approved of the concept and approach, it quickly became clear that conceptual buy-in does not equate to ownership of a project. The team recognized that a champion internal to the Office of Environmental Health should have been made a part of the Management Academy team, or been identified and charged with successful implementation of the completed business plan after it was developed.

The impact from the Management Academy for Public Health will continue to be felt across the southeast United States because innovative public health programs with a foundation in solid business practices will continue to be developed by those who were exposed to this educational experience.

For more information about the Virginia Atlas of Community Health please visit the Web site at www.vahealthycommunities.com. Registration is free thanks to the generosity of a number of Virginia's health philanthropies.

REFERENCE

1. Virginia Turning Point Initiative. *Technical Needs Assessment Survey*. 1999.