Public Technology Institute
2009-2010 Solutions Award Competition Entry

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For each of these categories, please select one:

Population of Your Jurisdiction
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__ 350,000 to 749,999
_**X**_ 750,000 and above

Technology Category you are Entering (If a category is not marked, PTI will assign a category)
_ _ Web Services and E-government
__**X**_ GIS
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__ Public Safety and Emergency Management
__ Sustainability (energy, environment, public works and transportation)

Project Title & Abstract:

Mapping School Absenteeism for Managing H1N1 Influenza Outbreak

The Montgomery County, Maryland, Department of Technology Services - Geographic Information Systems (DTS-GIS) team, in cooperation with the County's Department of Health and Human Services (DHHS), Public Health Services (PHS), developed an ArcGIS based Mapping School Absenteeism Application (MSAA) to provide the Public Health Emergency Planning and Response team from the DHHS (staff) with useful geographic and attribute data information and to improve Public Health staff efficiency for obtaining information about absenteeism in schools and student exclusions due to flu-like symptoms in school during the H1N1 influenza pandemic. The MSAA application functionality includes geographical data display, and information from Public Health Services databases, including School Service Areas, High School Clusters, all school locations, number of excluded students from the school due to flu-like illness symptoms, and percentages of individual school absences. Staff need only call up the application to develop daily maps that can update to depict the school absenteeism patterns across the county, provide delineations by school enrollment area, and update the percent absent for each reporting school excluding schools with no submitted absenteeism rates. The Montgomery County (MC) geographic information data presented in the MSAA reflects information downloaded daily by a DTS-GIS staff member. This joint effort was part of the Incident Command System, under the Planning Section, put in place to address the H1N1 pandemic in Montgomery County.

Problem:

MSAA was developed to improve Public Health staff efficiency for disease identification and containment and to provide useful geographic information to the participants in a Public Health incident for data compilation and mapping of the data system Children's Health Alert Network (CHAN). This application extends the ability of PHS staff to quickly and efficiently access the County's

geographic database information features. Prior to the development of the application, there was no user friendly way to translate the CHAN data into ArcGIS maps. Consequently, epidemiologists and school health management staff with DHHS/PHS asked DTS-GIS to create the application to reduce the complexity of creating the data and to provide a sophisticated, yet simple, application to allow PHS staff to quickly update and maintain current maps for Montgomery County. As a result, DTS-GIS developed the MSAA to enable staff to quickly find patterns in Montgomery County based on the input of absenteeism data by a staff member and the number of excluded (dismissed) students due to flu-like symptoms. The application was also created to print out 4 daily maps including a composite map of all 3 school levels combined during the flu monitoring season.

Response:

The MSAA was designed and tested on the ESRI GIS software ArcGIS 9.2. After a few demonstrations and revisions, the MSAA was approved by PHS. The following sub-section describes the process used to develop and maintain the MSAA.

Mapping School Absenteeism Application

Step 1: Establish functional requirements

DTS-GIS was provided with functional requirements for the MSAA in August, 2009. The application was to provide quick access to geographical data of the County and information for databases in Montgomery County's GIS including Elementary School Service Areas, Middle School Service Areas, High School Service Areas, Elementary School locations, Middle School locations, High School locations and High School Clusters in Montgomery County (n= 139,237 students). DTS-GIS database attributes provided include school names and school ID numbers. Absenteeism data provided to DTS-GIS from Public Health were the dates the absentee data was edited, percentage of absences, total enrollment and number of exclusionary absences. The map layers needed for the mapping project are listed in the ArcMap Table of Contents and can be turned on and off by a check mark, to display one of four different maps to be created.

The application is installed on one designated secure PC, in a Montgomery County DTS-GIS staff member office. The application can be invoked by an epidemiologist for map making at anytime so that they can access the data live or have the most current data downloaded to the application on the hard drive for ease and speed of use. The data provided by the MSAA is to be downloaded daily by a DTS-GIS staff member.

Step 2: Collect data, documents, and information

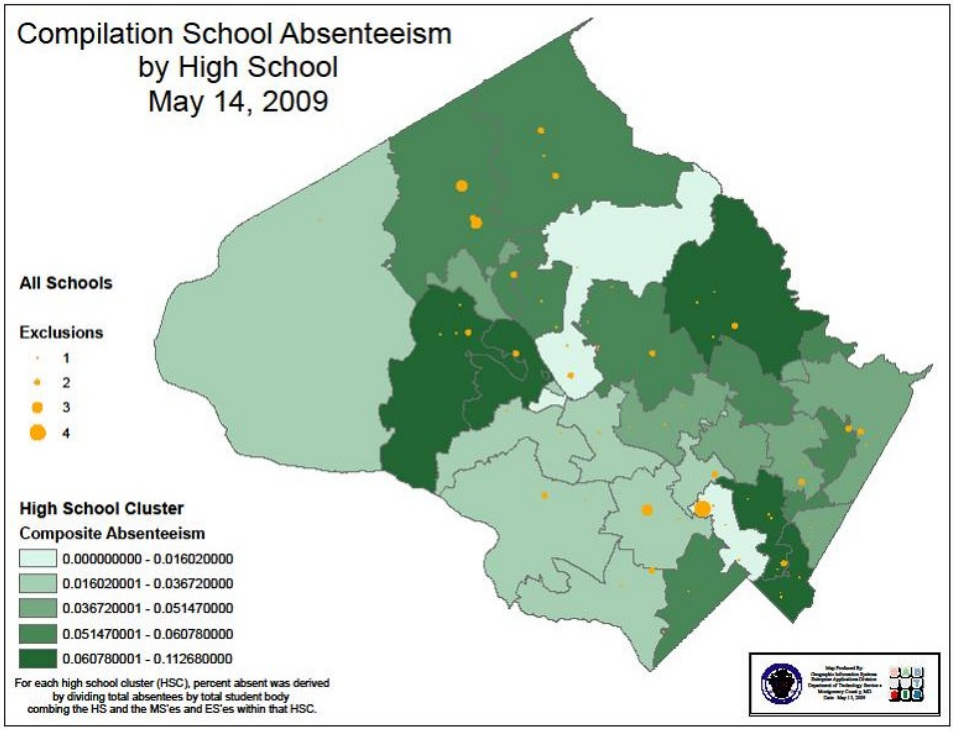
DTS-GIS is the clearing house for all the needed geographic and information data to operate the MSAA. Geographic data is provided by DTS-GIS in ArcInfo coverages and shapefiles. The attribute data items include, but are not limited to, Elementary School Service Areas, Middle School Service Areas, High School Service Areas, Elementary School locations, Middle School locations, High School locations and High School Clusters. These data items are updated and downloaded at the start of a school year and then go through quality control checks. The many data sources in the application are then updated. CHAN absenteeism and exclusion data are provided by DHHS/PHS. Detailed MSAA operating instructions and pictures were documented for easy reference. Tutorial classes will also be provided to DHHS/PHS staff by a DTS-GIS staff member.

Step 3: Programming and Creating the Mapping School Absenteeism Application

The application was programmed with Model Builder using ESRI's ArcGIS 9.2 software development environment. The geocoding capability was provided by ESRI's ArcGIS 9.2 software. ESRI's ArcGIS 9.2 software was used to produce the final four map products to be used in daily H1N1 Influenza Surveillance Report. The application was initially tested on a Dell Precision 690 (Intel Zeon processor) with Microsoft Windows XP.

The application interface is generated by functional dialog boxes to enable DHHS/PHS staff to quickly and easily review the results of their input. The MSAA was designed to enable users to quickly load Public Health Service data into attributes and then display their changes. The application includes displaying current overlays of the school enrollment area maps with the numbers of students excluded from school for at least 7 days due to potential flu symptoms related to the H1N1 pandemic, using weighted circles where each school lies in the enrollment area with size of the circle being larger as more students are under exclusion there. In addition, these MSAA maps provide delineations by school enrollment area, updated percent absent for each reporting school and the schools grayed out with no submitted absenteeism rates are generated. (Figures 1, 2, 3 & 4).

Figure 1: MSAA Composite Map for High School Clusters



Data include middle and elementary schools within each HS Cluster.

Figure 2: MSAA Map – Elementary Schools

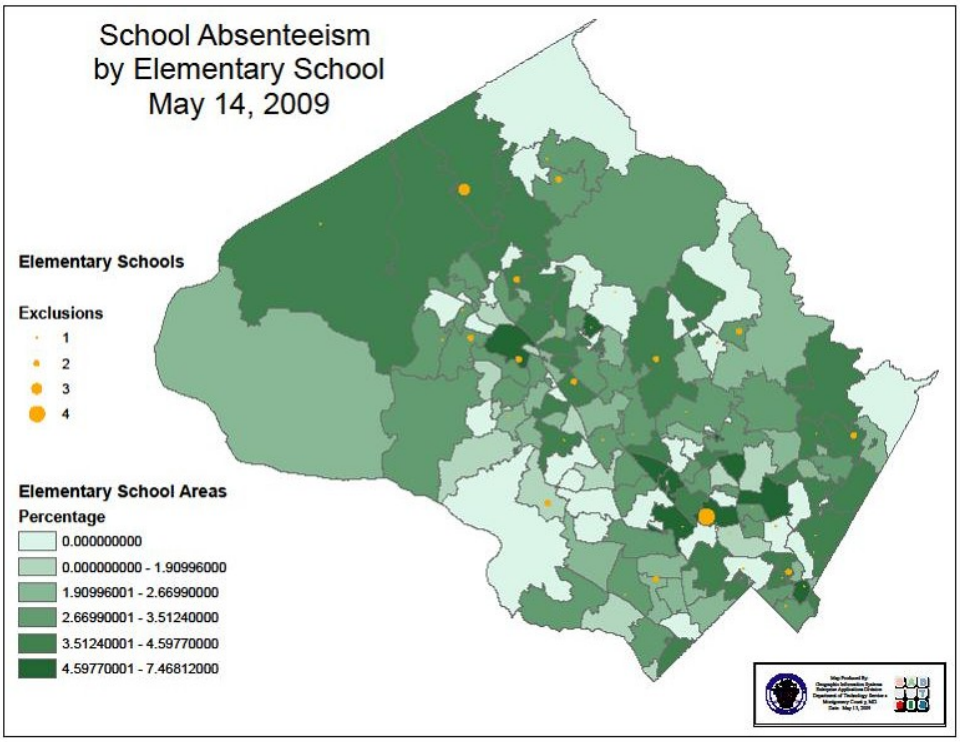


Figure 3: MSAA Map – Middle Schools

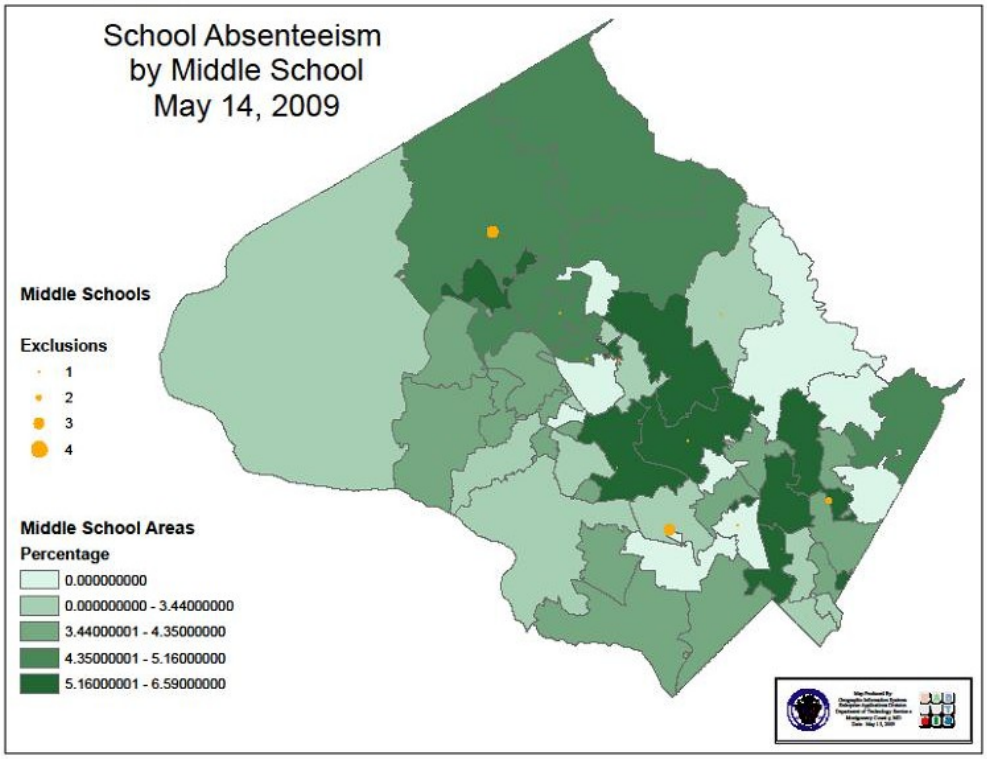
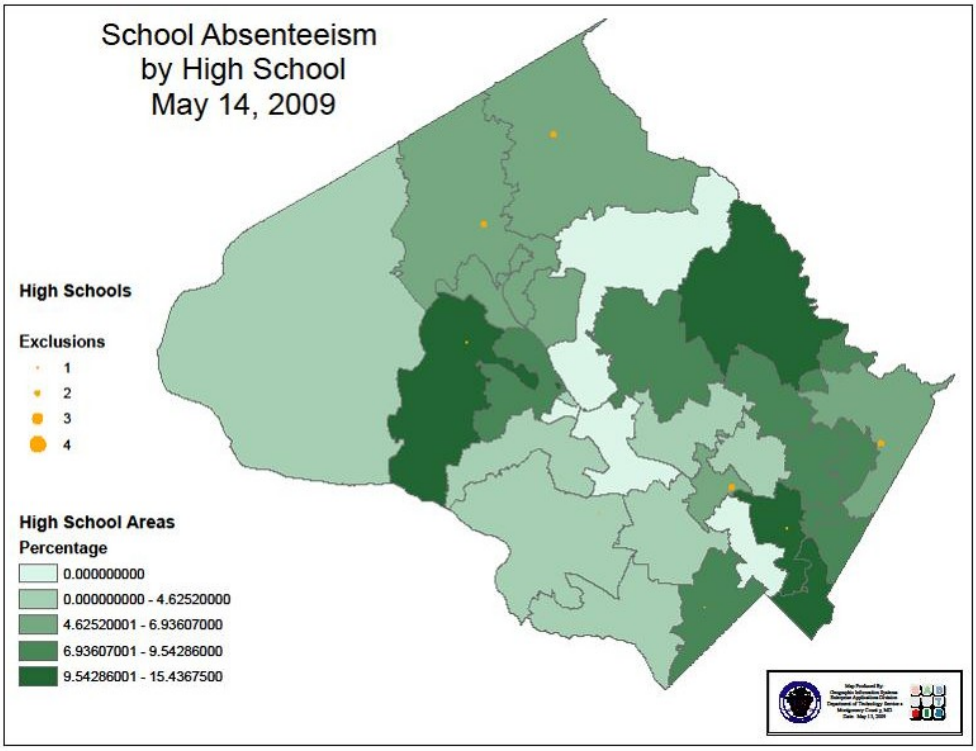


Figure 4: MSAA Map – High Schools



Step 4: Review and revise MSAA

DHHS/PHS reviewed and provided recommendations for the application over the summer of 2009. The recommendations were incorporated into the application by a DTS-GIS staff member.

Step 5: Install MSAA

The MSAA has been installed on one PC. The appropriate network drives have been connected to the PC so that live updates and downloads may take place directly from the DTS-GIS databases.

Step 6: Maintain application content

The associated geographic data from the County and other sources, such as Montgomery County Public Schools (MCPS), is downloaded by a DTS-GIS staff member on a school year basis. The DHHS/PHS data is reviewed and prepared for input into the MSAA by a DTS-GIS staff member, daily. The application content including GIS shape files, MCPS shape files and Public Health Services data is maintained daily by a DTS-GIS staff member. The system administration of the application is also provided by DTS-GIS.

The Cost of the Program

The total cost to develop the DHHS MSAA including staff time (programming and data maintenance) and software/hardware equipment is approximately $15,000. Approximately 30 hours of staff time were invested into the development of the application at a cost of $1,275. The GIS software cost approximately $7,500. Maintenance cost will vary according to staff salary.

In order for the application to be run, a Pentium 2 GHz or better Intel-based personal computer running Windows XP with ESRI's ArcGIS 9.2. A standard county T1 connection to the Internet through Microsoft Internet Explorer should satisfy the needs of staff.

Results:

This application grew out of a need to help DHHS identify clusters of illness and determine if school closures were indicated, identify "outside" or "community" cases of H1N1 outbreak, and to make the task of making maps to show the daily updated data simpler and more controllable. These timely maps that can be generated quickly and accurately help to communication with public school administrators, teachers, students, parents and the media. The MSAA also allows County public health officials to objectively and effectively communicate County's (i.e. DHHS and MCPS) H1N1 flu related school illnesses to the state agencies such as Maryland Department of Health and Mental Hygiene and Maryland State Department of Education. Although no school closures occurred in the second wave of the H1N1 pandemic in Montgomery County, there were significant clusters of illness across the county with over 4,000 students being identified with flu-like symptoms and excluded from school. This additional tool available to Public Health reinforced our decision-making about school exclusions. Timely return of the students when flu-like symptoms subsided minimized the negative impact on student education. Thus, the need for auditing the application was evident. The accuracy of the DHHS MSAA will be evaluated by epidemiologists in Public Health Services. If the H1N1 virus

had mutated and become more virulent, there might have been a need to initiate school closures by order of the Health Officer.

The positive results of this application consist of a simple and uncomplicated way for DHHS staff to map school absenteeism data. The application will help reduce the demand on staff time in processing the data and produce maps that highlight patterns in the county where public health service staff need to focus on school service areas with noticeable amounts of student absences.

The MSAA provides DHHS staff with tools to enter school absenteeism data, make maps and search geographic school service area information in seconds rather than hours. Consequently, it is anticipated that the implementation of this application will replace the need to manually calculate data, thereby resulting in a significant savings in staff time and retrieving a larger amount of geographic data within the area of interest. The delivery of geographic data surrounding a public health emergency response activation empowers DHHS staff to find the pertinent geographic data that fits their needs. As a result, DHHS staff time, in this otherwise time consuming task, may be minimized.

Although there are other agencies that maintain this kind of geographic information database, Montgomery County is one of the first few local governments to develop this kind of service for its DHHS. The DHHS MSAA serves as a model for other counties and municipalities who provide geographic data and information to their public health service epidemiologists.

Key Participants:

- Montgomery County, Department of Technology Services
- Montgomery County, Department of Health and Human Services

Contact:

Apollo Teng, GIS Manager, Department of Technology Services
240-777-2883
Apollo.teng@montgomerycountymd.gov