Linking Documents to the World

USACHPPM's Preventive Medicine Data Archival System

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Abstract:
Expanding on traditional methods of storing reports and assessments, the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) has developed a web-based application designed to display, archive, and disseminate occupational and environmental health surveillance (OEHS) data, which is vital to assigning potential health risk to deployed soldiers. Adding spatial context to this data allows users to graphically search for available documentation on specific sites of interest, as well as offering a graphic overview of the extent of work being done throughout a country, region, or Combatant Command (COCOM). This application was developed using ArcIMS, Standard Query Language (SQL) Server, and ASP .NET, and represents a significant shift in USACHPPM's use of information. As more data is incorporated into the system, spatial relationships and historical patterns begin to emerge making this tool useful for Preventive Medicine personnel in the field or stateside by planners and decision makers.

The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) provides worldwide technical support for implementing preventive medicine, public health, and health promotion/wellness services into all aspects of America's Army and the Army Community anticipating and rapidly responding to operational needs and adaptable to a changing world environment.

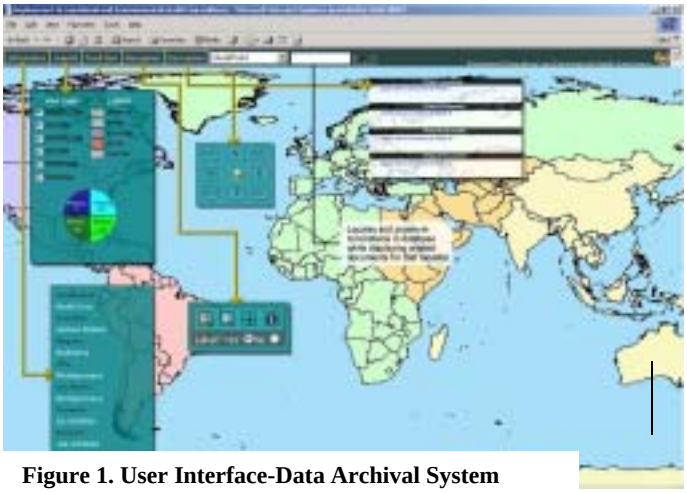

Figure 1. User Interface-Data Archival System

USACHPPM has developed a web-based application using ESRI ArcIMS. The application is written in Visual Basic.Net and uses the Active X connector. This system is designed to display, archive, and disseminate occupational and environmental health surveillance (OEHS) data. OEHS data is comprised of items such as environmental site surveys and operational risk assessments for areas that may pose a health risk to deployed soldiers. All of the OEHS data and documents are stored in a Standard Query Language (SQL) database.

Geographic Information Systems (GIS) has become an integral part of the preventive medicine mission over the years as technology and expertise has improved. USACHPPM's Global Threat Assessment Team (GTAT), the GIS Branch and Applications Programming Branch, collaborated to find a way to organize and archive all

of their data files by geographic location. Since the majority of work produced at the center is spatial in nature and refers to a specific place in the world, an ArcIMS-based data display and archival system was developed to aid in working with this data.

Adding spatial context to previously nongeospatial data represents a significant shift in USACHPPM's use of information. It allows users to graphically search for available documentation on specific sites of interest and gives a graphic overview of the extent of the work being done throughout a country, region, or Combatant Command (COCOM). As more data is incorporated into the system, spatial relationships and historical patterns begin to emerge making this tool useful for preventive medicine personnel in the field or stateside by planners and decision makers. This system allows USACHPPM to link documents and data files to real world coordinates on an interactive world map.

Phases of Completion

The application's primary function is to associate OEHS documents with a location in the theater of operation. Each point is represented by a different custom icon, which is based on the stage of completion for each location (See Figure 2). These icons are automatically created based on the entry of the phase number in the database. Each location that USACHPPM assesses can be categorized into a phase which is based on the extent of work that has been done for that site. The four phases of completion developed by USACHPPM are as follows:

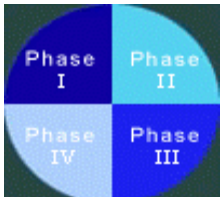

Figure 2. Phase Icon

- Phase I occurs during the Intelligence Preparation for the Battlefield (IPB) and relies on intelligence products, imagery analysis, and historical information. It supports the medical threat assessment and helps build the Force Health Protection structure.
- Phase II occurs during mobilization/deployment and involves completion of the occupational environmental hazards (OEH) baseline assessments at any known location in the operational plan. It involves a visual site inspection and OEH sampling.
- Phase III occurs during the operation and involves completion of the routine OEH surveillance and sampling. This phase is primarily conducted by organic preventive medicine assets. It includes reach back for analytical support and technical consultation. Sometimes this phase requires onsite augmentation by Echelon V units like the USACHPPM for specialized problems.
- Phase IV occurs post conflict and involves assigning exposure profiles to the veterans of the operation and assessing their health risks and health experience. Ideally, this would be epidemiologically focused (evaluating actual health experience data) vs. risk assessment focused (predicting health outcomes).

If all four (4) phases are completed for a specific site, it is considered fully assessed; however, health surveillance may still be ongoing.

User Interface

When the user accesses the system they are given the choice of which area of responsibility (AOR) they would like to navigate to. When selected, the map will refresh to the AOR chosen. The user has many navigational tools to utilize in order to further explore the area such as zooming, panning, and identifying features. The search option allows a user to search for locations of interest and query the database for any available documents. Each document or file produced, whether it is a one page list of water samples taken in the Philippines or a seventy-five page health risk assessment for a base camp in Iraq, is associated with a latitude and longitude location and plotted with spatial markers on a world map. For example, if a user wanted to find out if USACHPPM has any data related to Ankara, Turkey, they would type in "Ankara" in the Search Query. If documents are present, the map will zoom to that city and display background GIS data, along with a list of related documents that can be easily viewed and downloaded. The user is also able to zoom to a regional map scale and look at the overall scope of work being done in a particular country or region. The menu/navigation system is based on "fly out" menus in order to give the largest possible viewing area **(See Figure 1).**

Administrator Interface

There is a separate interface for the administrator of the system. This is where point creation, document uploading, metadata creation, and geographic association occurs. The point plotting has several input fields that help to identify the location to include the latitude, longitude, and location name. If a location does not yet exist for a specific site, the user must create this point by entering the latitude and longitude point and a location description. Once the point is created, the document association process begins. The documents that are to be associated with the location are attached under one of the four phase categories (as explained above). The presence of a document and its associated phase determines the icon that is plotted. For example, if there is only one Phase III document associated with location *A*, then the icon for that point will only show a Phase III quadrant filled in. Individual documents are not limited to any one location they can be referenced by other locations as well. Once all the required fields are filled in, the user will send the information to the server which in turn tells ArcIMS to plot a new location or associate a new document with an existing location.

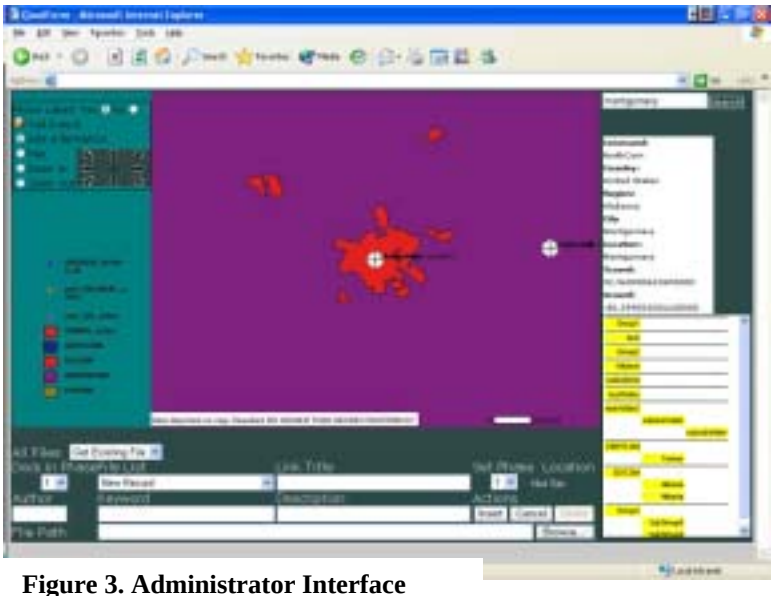

Figure 3. Administrator Interface

Drawbacks

One of the problems with this current system is the amount of time required to refresh the screen and perform spatial queries. This has particularly affected our forward deployed assets who have been unable to fully benefit from using the system. Currently the system is installed on a server that performs other web functions which could be contributing to the performance issues. It has been recommended that this system be installed on a separate server. This issue is presently being explored.

To the Future

Future additions to this system include linking ArcIMS and the USACHPPM Sample Database. This will allow the user to view the field sample locations around particular areas of interest. The samples would potentially be plotted on aerial photos and the user could see exactly what the sampling site looked like along with types of samples taken. These photos would aid in situational awareness. Another improvement might include the capability to track troops in a near real-time manner. This tracking would allow preventive medicine personnel to compare ground contamination with the amount of troops that crossed a certain path within a certain time period. If a potential problem in the field occurred, knowing accurately where the troops were located is essential to understanding any possible health outcomes. Currently, the Army has troops and personnel stationed all around the world and USACHPPM's goal is to keep them healthy and fit.

Since the launch of the system in 2003, it has served a wide variety of Department of Defense personnel including, Combatant and Component Commands, Joint Task Force, Army, Navy, Marines, Air Force Services, and environmental health and preventive medicine intelligence agencies. The server currently holds upwards of 3,000 documents covering every major geographic COCOM. Due to the current ongoing operations much of the focus has been in the CENTCOM AOR. According to Jeff Kirkpatrick, GTAT Mangager, "This system has played a major role as serving as the central archive of deployment occupational and environmental health and preventive medicine information for Operations Enduring Freedom and Iraqi Freedom. Both deployed and rear-area military assets are able to use the system to obtain site-specific and regional information on OEH and preventive medicine data."

References:

"About USACHPPM," http://chppm-www.apgea.army.mil/aboutus.asp

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