



*Geographic Information Systems and Environmental Epidemiology*

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**Special points of interest:**

- One of the objectives of the EPHT is to acquire useful tools and make those tools available through the network.
- EPHT program is moving into Phase II and beginning the network implementation plan.

Since the days when Dr. John Snow, used a map to discover the relationship between cholera deaths and the location of the Broadway water pump, maps have been an important part of epidemiology and public health. The development of computerized geographic information systems (GIS) has increased the utility and importance of maps in the practice of epidemiology. These tools, with careful data preparation and responsible use can help epidemiologists discover information and knowledge from data.



*Map of London during the time of Dr. John Snow.*

One important epidemiologic use of GIS is to discover and understand the relationships or associations that cases of disease have among other cases and within a geographic area. For example, clustering of cases of a disease may demonstrate a relationship between those cases of disease. Those cases are related to each other in that they belong to the same cluster event and may share the same risk factors of etiologies. Cases of disease are related to each other in that they belong to a particular population. The population can be further defined by certain population characteristics such as location, socio-economic status, or proximity to some other geographic entity. A disease cluster in close proximity to an

environmental hazard (such as a hazardous waste site) may have an association with an exposure at a hazardous waste site.

Another important epidemiologic use of GIS is to help discover information about a case not normally collected as part of the case's record. For example, certain behavior factors (such as smoking) and socio-economic factors (low income levels) may be important risk factors for a particular disease (such as asthma or cancer). The behavior factors may contribute to the association between cases of disease and the location of an environmental hazard, but information about behavior factors are not part of the case's health record (i.e. their hospital discharge record or Utah Cancer Registry record). We can assume that cases that belong to a particular population most likely share

## *Geographic Information Systems and Environmental Epidemiology cont'd*

**Geographic information systems help us see important patterns and trends in the incidence or prevalence of disease.**

the traits of that population. To work around this problem we can use information about the population that comes from other sources to make some assumptions about the cases. For example, we can use census data to assign income levels to cases within a census area or Utah's behavioral risk factors surveillance (BRFSS) data to assign smoking probability for cases. (Note that these assignments are likely and not known for sure.)

Finally, GIS helps us see important patterns and trends in the incidence or prevalence of diseases. Most people are able to make valid conclusions from graphs and maps faster than from long columns of numbers. Particularly if the trend or pattern fluctuates instead of being steady. Using modern GIS and

computers it is possible to evaluate those trends in both space and time. This is particularly useful for conducting periodic surveillance about environmentally related diseases.

By understanding how epidemiologists routinely use maps and GIS, some of the data preparation and analytical processes can be automated to increase the efficiency of using data in epidemiologic research and public health surveillance. With that in mind, one of the objectives of the EPHT program is to acquire useful tools to help automate data processing and to make those tools available through the network.

*Thank you for supporting the EPHT program.  
Sam LeFevre, Program Manager*

## **The Hill Air Force Base report can be found at**

**[www.health.utah.gov/epi/enviroepi/activities/hha/hha.htm](http://www.health.utah.gov/epi/enviroepi/activities/hha/hha.htm)**

## *Update- Program Management*



Utah's EPHT program was originally funded to conduct "Phase I" planning and capacity development activities. We are finally ready now to start movement into the next phase: network implementation. To prepare for that phase, the program staff are busy consolidating all of the planning work that the program and consortium have produced into a EPHT Network Implementation Plan.

The implementation plan details how the program and consortium will work

together to design, develop, implement, test and accept the network.

On January 5<sup>th</sup>, 2006, the EPHT program hosted a review of the draft network implementation plan for the planning consortium.

A copy of the network implementation plan can be found on the EPHT web board [www.ehttp.webexone.com](http://www.ehttp.webexone.com) or contact Sam LeFevre [slefevre@utah.gov](mailto:slefevre@utah.gov) or Brittney Carver [blcarver@utah.gov](mailto:blcarver@utah.gov).

## Update— System Development

Currently, the Utah EPHT program is closely working with Department of Environmental Quality (DEQ) in order to develop a method to transfer environmental data such as ambient air, ambient water, and drinking water. The Utah EPHT can download pertinent records from the Medicaid data warehouse. In the future, cancer, asthma and birth defects data will be added to the EPHT network, all held on the EPHT's server.

Future plans entail Web enabling the EPHT network . Allowing the Utah EPHT program the ability to share data with the national EPHT network by using DEQ's network node, which

allows for standardization of data in an XML (Extensible Markup Language) format. This will require the writing of codes (largely in-house) to allow DEQ to access EPHT server data.

An essential goal for the EPHT network is the creation of a data warehouse on the EPHT server. This will be essential in allowing researchers to probe data in a manner suitable to their health disciplines.

For more information on EPHT systems development contact Lew Jeppson [ljeppson@utah.gov](mailto:ljeppson@utah.gov).

**"An essential goal of the EPHT network is the creation of a data warehouse..."**

## Update— Program Marketing

A EPHT marketing packet has been developed and is being distributed to consortium members. The packet includes such items as EPHT program goals both State and nationally, newsletter, information on pilot projects (IBIS, BDN, HAFB), services that are provided such as geocoding, EPHT data security, and future projects and

activities. The marketing packet enables current or new members to be up-to-date on the EPHT goals, progress, and future projects.

For more information on Utah EPHT marketing efforts contact Kori Gunn [kgunn@utah.gov](mailto:kgunn@utah.gov).



***Check out the EPHT program Web Board for updates, documents, news, and training at***

***[www.ephtp.webexone.com](http://www.ephtp.webexone.com)***

***If you need a username and password contact Kori Gunn at [kgunn@utah.gov](mailto:kgunn@utah.gov)***

## Rapid Inquiry Facility (RIF)

The Rapid Inquiry Facility is a disease and exposure-mapping tool developed by the Imperial College of London for use in the European Union (EU). The Imperial College Small Area Health Statistics unit has been working on this system as mandated by legislation in 1986 to address environmental issues.

The aims of the RIF project are to improve health information and analysis in order to understand the links between environmental exposures and health outcomes. The RIF will also allow rapid response to health threats and improve knowledge and understanding of health risk management.

The RIF is intended to be a simple system with GIS linked directly to the database that could be easily accessed by partner countries using different spatially referenced datasets. The system was also designed with the intent that those unfamiliar with computers could easily and rapidly run investigations to assist epidemiologists in routine disease mapping. The RIF also includes a Bayesian hierarchical modeling approach for statistical analysis of disease and hazard analysis studies and point source investigations. These methods allow raw disease rates to be 'smoothed' to overcome problems of sparse data and provide a natural framework for incorporating common features of the data such as over-dispersion, spatial correlation, missing data, exposure measurement error and ecological bias. (source: EUROHEIS home page (n.d.), Retrieved February 1, 2006, from <http://www.euroheis.org>)

The RIF system allows the user to upload geocodable environmental data

and chronic disease data, and specify the time, area, and parameters to be examined. The system can then represent the data on contextual maps with relevant rates and ratios, providing a rapid assessment to specific queries.

In the EU partner countries, the RIF is presently being used for health impact assessments using exposure and disease mapping modules. The 'hazard analysis' module is used to define populations that are exposed to different pollution levels, to evaluate existing exposure response data and to examine health impacts of defined environmental exposures. The 'disease mapping' module is used to monitor health outcomes that may potentially be related to sources of environmental exposure.

The Utah EPHT program worked with the Centers for Disease Control and Prevention (CDC) and the RIF team to evaluate the use of RIF as a possible tool in the tracking network. In October 2005 Utah EPHT program received the RIF system. In November 2005 CDC, Imperial College of London, UDOH, Florida and Washington formed a RIF development working consortium.

The RIF incorporates analytical framework consisting of two types of spatial epidemiology inquiry. The first type is disease mapping which, consists of rates and risk and is based on boundary areas. The second type of spatial epidemiology the RIF offers is risk mapping which consists of rates and risk and is based on proximity to hazards.

**"The RIF will allow rapid response to health threats, improve knowledge and understanding of health risk management"**



*Technical Architecture*

## *Rapid Inquiry Facility (RIF)- cont.*

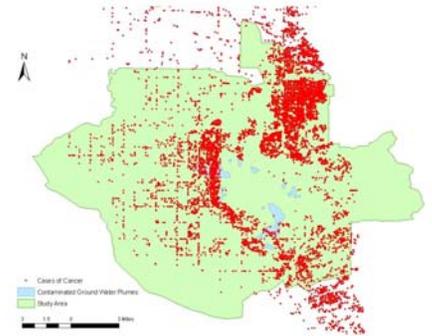
The EPHT program must have the following five data requirements in order to utilize the RIF system:

- geographic references,
- population at risk,
- socio-economic status,
- health event,
- hazards or exposure data.

After obtaining all of the necessary data requirements the RIF system can then

be used to evaluate the links between environmental exposures and health outcomes.

For more information on RIF, contact Sam LeFevre [slefevre@utah.gov](mailto:slefevre@utah.gov) or visit [www.euroheis.org](http://www.euroheis.org).



*Example of RIF*

**Check us out on the web**  
[www.health.utah.gov/ephtp](http://www.health.utah.gov/ephtp)

## *Future Activities and Important Dates*

- **March 2006** CDC Issues RFA for Grant
- **April 2006** Submit Grant Proposal
- **May 17, 2006** Planning Consortium Meeting, Utah Department of Health, 10:00 a.m. –12:00 p.m. Room 114
- **July 31, 2006** CDC Announces Grant Awards
- **July 31, 2006** 10-Month Extension Ends
- **August 7, 2006** National EPHT Conference
- **August 16, 2006** Planning Consortium Meeting, Utah Department of Health, 10:00 a.m. –12:00 p.m. Room 114
- **November 15, 2006** Planning Consortium Meeting, Utah Department of Health, 10:00 a.m. –12:00 p.m. Room 114



# UTAH



BRINGING HEALTH AND THE ENVIRONMENT TOGETHER  
ENVIRONMENTAL PUBLIC HEALTH TRACKING

Office of Epidemiology

P.O. Box 142104

Salt Lake City, Utah 84114-2104

Phone: 801-538-6191

Fax: 801-538-6564

[www.health.utah.gov/ephtp](http://www.health.utah.gov/ephtp)

The mission of the Environmental Public Health Tracking (EPHT) program is to develop a state-wide standards-based, web-enabled tracking network information system in Utah to enable information and knowledge dissemination and improve public health in the realm of chronic diseases related to environmental factors. This project is being conducted in collaboration with the Utah Department of Environmental Quality (UDEQ), the Centers for Disease Control and Prevention (CDC), Local Health Departments in Utah and other programs within the Utah Department of Health (UDOH). The EPHT network will be a secure warehouse comprised of four kinds of data. Those data are surveillance data about chronic diseases that are occurring in Utah, environmental monitoring data from the UDEQ, exposure data collected through biomonitoring and supporting data (such as population data and geographic reference data). The EPHT network data warehouse links together health outcome and environmental hazards data to inform consumers, communities, public health practitioners, researchers, and policymakers on chronic diseases, related environmental hazards and population exposures. This will provide the UDOH and UDEQ with the capacity to better understand, respond to, and prevent chronic disease in Utah. Information generated by this program will enable the UDOH and UDEQ to identify populations at high risk in Utah, to examine health concerns at the local level, to recognize related environmental factors, and to establish and evaluate prevention strategies.



## Contacts

Wayne Ball, Principal Investigator

[wbalk@utah.gov](mailto:wbalk@utah.gov)

Sam LeFevre, Project Manager

[slefevre@utah.gov](mailto:slefevre@utah.gov)

Lew Jeppson, Research Analyst

[ljeppson@utah.gov](mailto:ljeppson@utah.gov)

Kori Gunn, Marketing

[kgunn@utah.gov](mailto:kgunn@utah.gov)

Brittney Carver, Technical Support

[blcarver@utah.gov](mailto:blcarver@utah.gov)