



## Project Abstract

### Hazard proximity and the perception of cancer risk: A multi-level spatial analysis.

SES-0433410

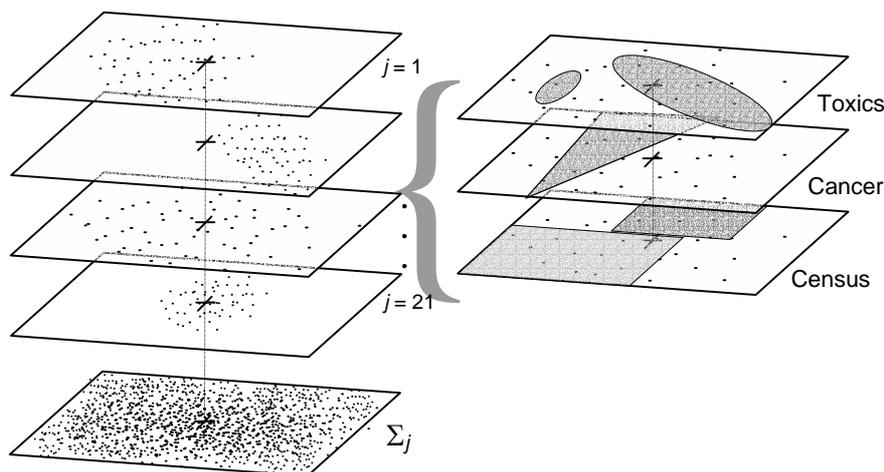
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### Overall Mission/Objective

This exploratory project examines the cancer risks people associate with environmental hazards through the application of geographic information systems (GIS). The goal is to advance fundamental understanding of the spatial dimensions of risk perception.

The relationship between hazard proximity and risk perception is under-examined but not ignored. For some time researchers have looked at the social and psychological problems associated with living near environmental pollution. For example, it has been shown that fear of cancer is more prevalent in communities located near toxic exposure sites. Recent work has brought the tools of spatial analysis to the task of understanding hazard proximity, which has been found to be a strong and independent determinant of risk perception. This literature also illustrates that the effect of proximity is not simple. Elements that need to be considered include economics, associated factors of education and race, and the characteristics of the hazard itself. Through the application of GIS tools, this project will afford an opportunity to look at the role played by a number of associated elements that together may influence how proximity affects risk perception.

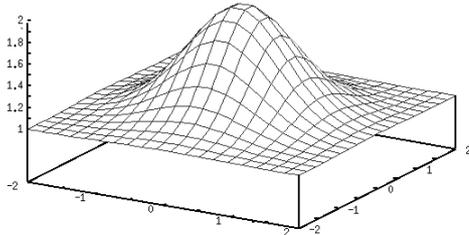


**Figure 1. Concatenation.** Existing survey data will be geocoded and joined in GIS with adjunct data from the Toxic Release Inventory, State cancer registries, and the US Census on each of the 21 site-specific levels. The 21 cases will be centered on their respective hazards and collapsed to a single spatially referenced data set for analysis.

The project involves adjunct analyses of existing data from surveys of some 20 communities that have requested investigations of local cancer rates due to concern over local environmental hazards. The analysis involves geocoding the survey data, combining the 20+ locations into one ‘virtual hazard site’ and expanding the data through linkage to a number of other data sets. The



resulting enriched data set will then be examined through several spatial analysis techniques and visualized through the use of GIS software. The primary relationship to be explored is that of hazard proximity and health risk perception.



**Figure 2.**  
**Hypothetical Spatial Surface.**  
 $L_i$  (Lee, 2001) models a spatially dependent bivariate relationship, for example between risk perception and cancer anxiety. The hypothesized surface (Diggle's function) is theoretically centered on the set of hazards and visualized by a 3D Isopleth map of the values of  $L_i$  for each  $x,y$  location.

## Progress

Work during the first nine months of this two-year project (through September 1, 2005) has emphasized the preparation of the survey data and the acquisition of GIS skills by the Principal Investigator. The PI has completed GIS instruction at ESRI and through online courses offered by Penn State University. One of the goals of the project is to provide the PI with some training and entry to the interdisciplinary field of GIS—this goal is being rapidly met. Progress has also been made in preparing the data for analysis. A preliminary study to finalize a measure of cancer anxiety has been completed and address fields have been prepared for geocoding. Analysis is expected to be underway near the end of the first year of the project with preliminary results available in January 2006.

## Broader Impacts

A significant amount of investigator education is embedded within this project. It is anticipated that completion of this research project will propel the investigator into further research in the spatial dynamics of risk. Further, it is clear that merging data bases such as the Toxics Release Inventory and Cancer Registries using the Web and GIS will be an important force in the future definition of concern over hazards and the manner in which individuals and society views risk. It is imperative that we continue to develop our scientific understanding of how laypersons view hazards and learn to communicate information to them effectively and responsibly. Such an understanding can certainly be generalized to contemporary circumstances involving terrorism.

This project will also satisfy additional criteria. With respect to intellectual merit within and across fields, this project applies a variety of social scientific theories to understand the perception and communication of risk. Like the broader area of risk research, this proposal is strongly interdisciplinary. It draws from perspectives in both the psychological and social traditions, as well as their confluence in the field of communication. These perspectives are further united through the application of GIS tools and spatial analysis. The outcome of this work will be a quantitatively demonstrated model of spatial risk with sufficient rigor to serve as a foundation for ongoing attention to this problem by this investigator well as others in the research community across a range of disciplines.