

# Linking The Utah Birth Defect Network Registry to the Environment

Environmental Epidemiology  
Program

Utah Department of Health

[www.health.utah.gov/els/epidemiology/envepi/Default.htm](http://www.health.utah.gov/els/epidemiology/envepi/Default.htm)

The Utah Birth Defect  
Network

Utah Department of Health

[hlunix.hl.state.ut.us/birthdefect/index.html](http://hlunix.hl.state.ut.us/birthdefect/index.html)

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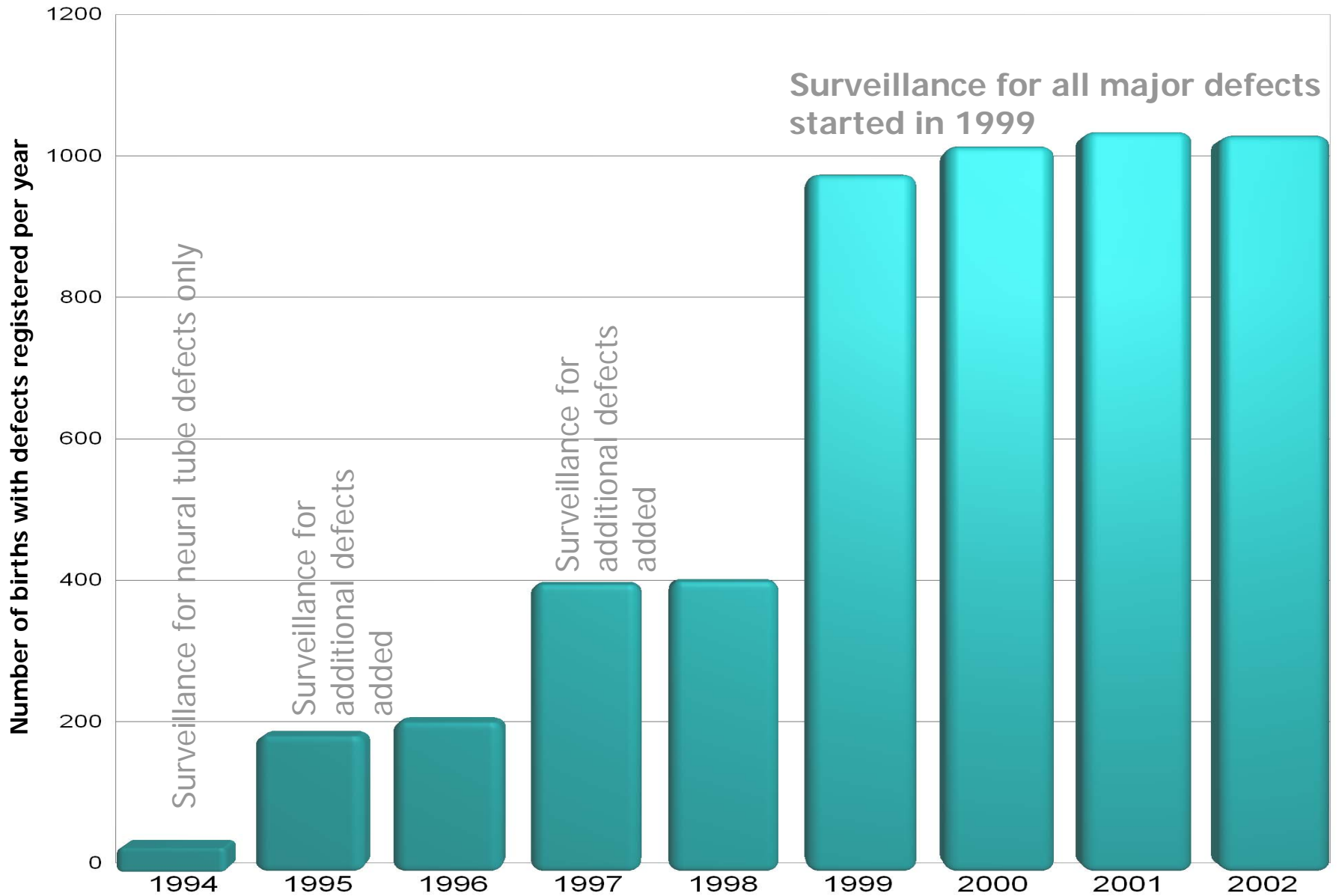
# Why

- ▶ Birth defects are the leading cause of infant mortality
- ▶ The annual health cost of treating and caring for surviving children with birth defects is over \$8 billion
- ▶ Among the many risks associated with birth defect prevalence, environmental concerns are yet to be fully explored

# The Utah Birth Defect Network

- ▶ *Established in 1994 to*
  - *assess the impact of congenital malformations upon infants, families, and health care in Utah;*
  - *to determine factors involved in their etiologies, developing insights into primary prevention strategies;*
  - *and assist families and their providers in preventing of secondary disabilities.*

# Surveillance History of the Utah Birth Defect Network



# Objective

- ▶ **Support the Utah Center for Birth Defects Research and Prevention *and* the National Birth Defects Prevention Study**
- ▶ **Geographically link the Utah Birth Defect Network's registry to environmental pollution sources**
- ▶ **Analyze the spatial distribution of birth defects in Utah and association with environmental pollution sources**
- ▶ **Develop tools for the Utah Birth Defect Network**

# Project Plan



Children with Birth Defects



Children Born in Utah



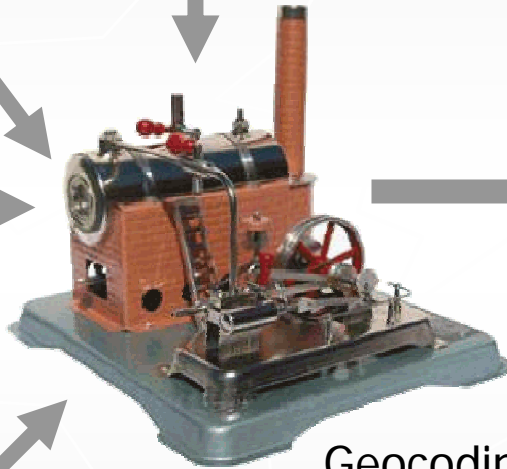
Environmental Pollution Sources



Street Address Data



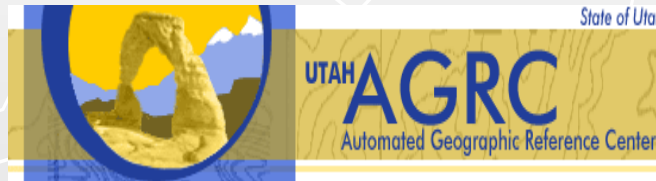
Tool Development



Geocoding & Linking



Spatial Analysis



Spatial Reference Data

# Geocoding

## ▶ Automatic Address Match

- Directly with no editing
- After editing
  - ▶ Street alias
  - ▶ House number alias
  - ▶ Reference data errors

## ▶ Manual Address Match

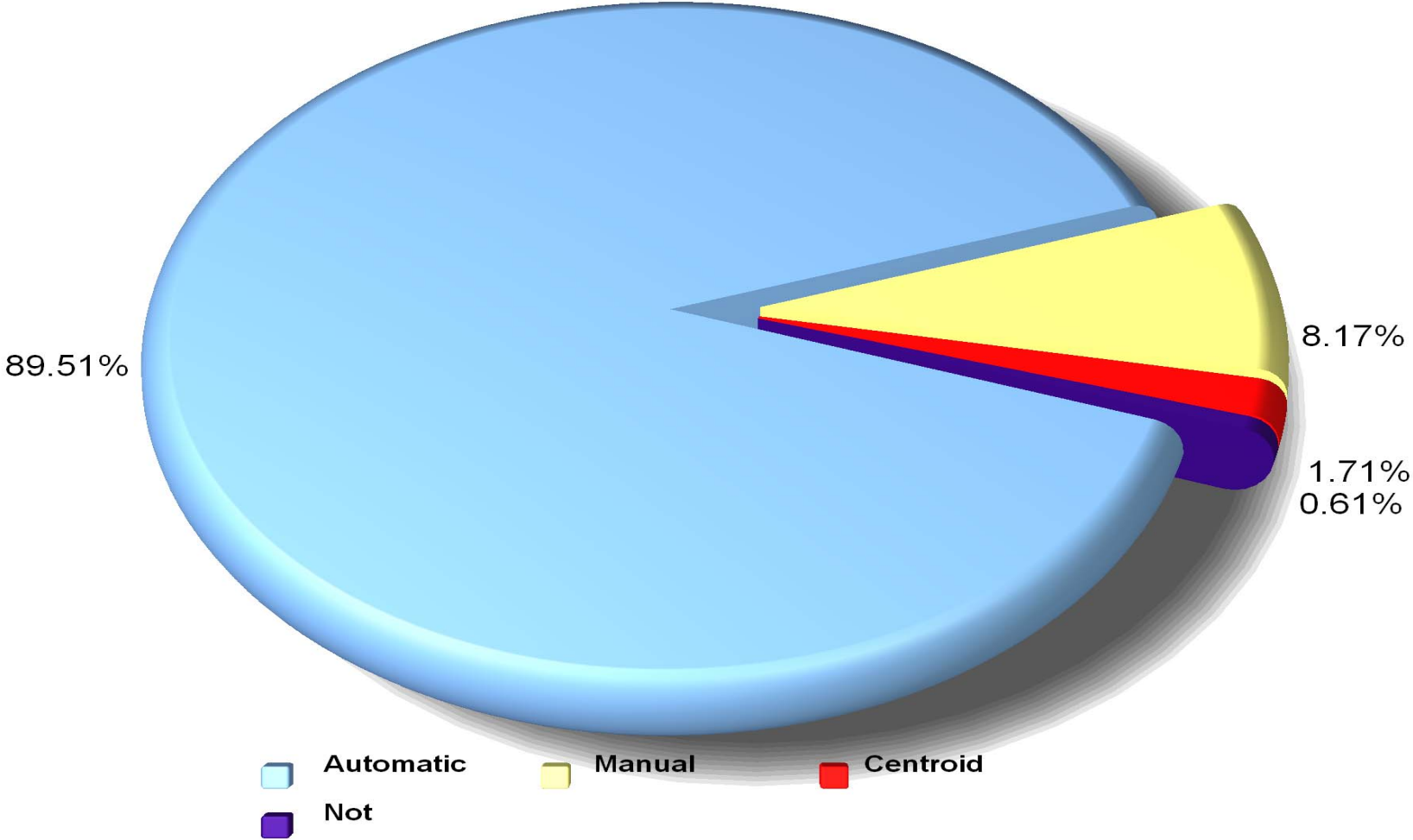
- Old address no longer valid
- New address not in reference data
- Distance and direction

## ▶ Centroids

- Postal box with zip code
- Rural route with known or unknown street leg
- Only zip code or city given

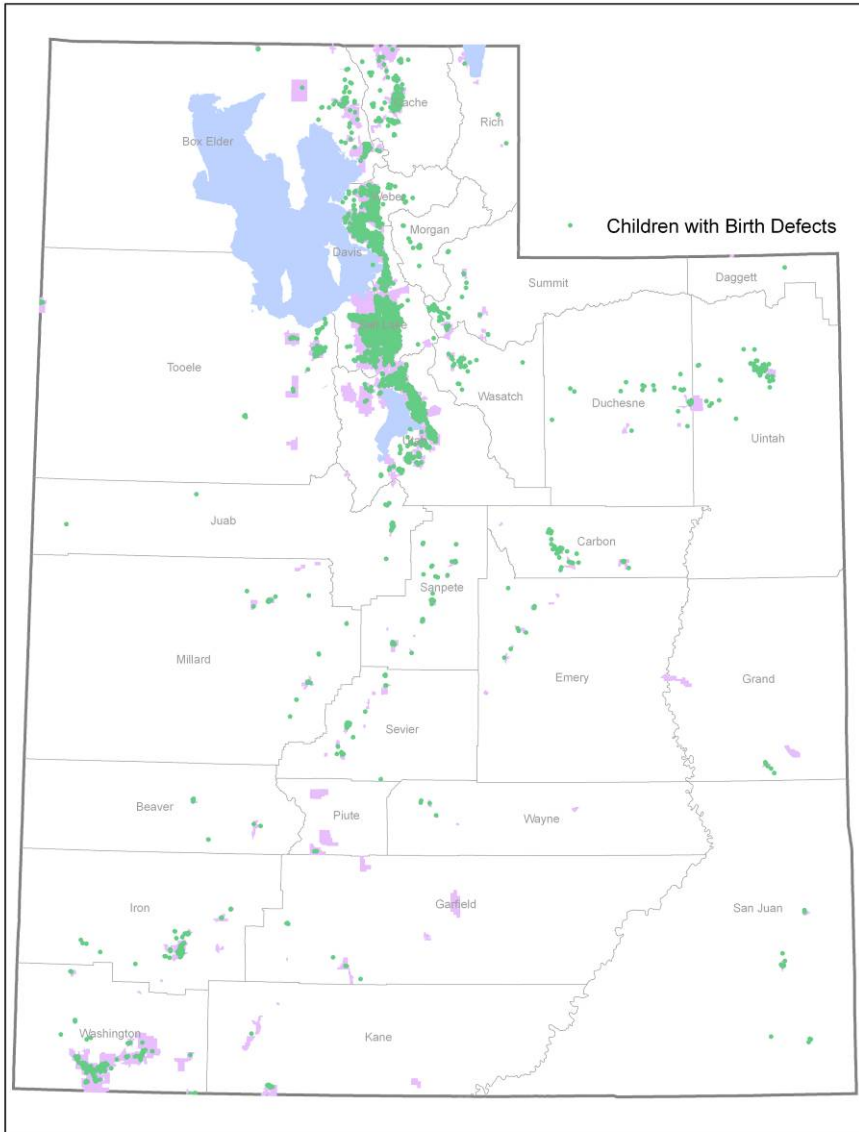
# Methods Used for Geocoding the Utah Birth Defect Registry Data

(n=5,253 records from 1994-2002)

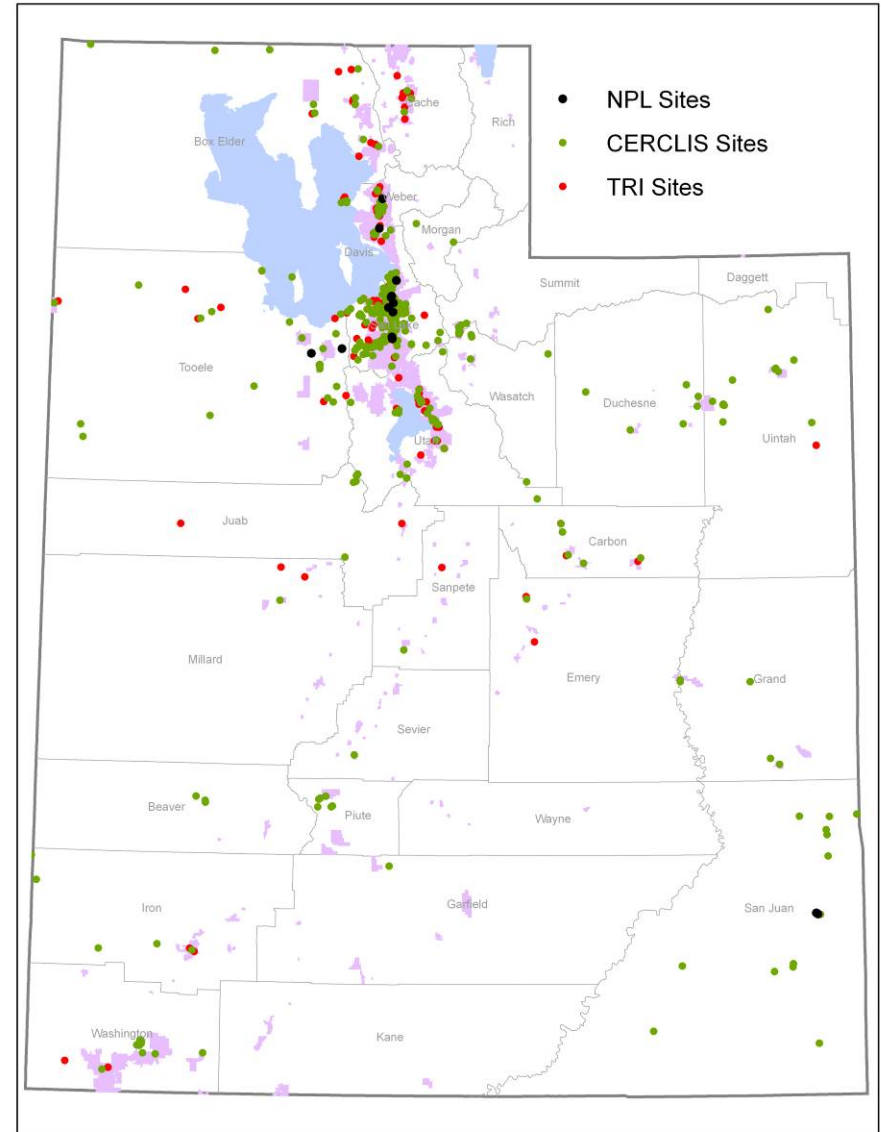




**Map of Utah children with birth defects from The Utah Birth Defect Network (1994-2002)**



**Map of Utah NPL Sites, CERCLIS Sites and TRI Sites from ATSDR (2000)**



# Analysis of Rates

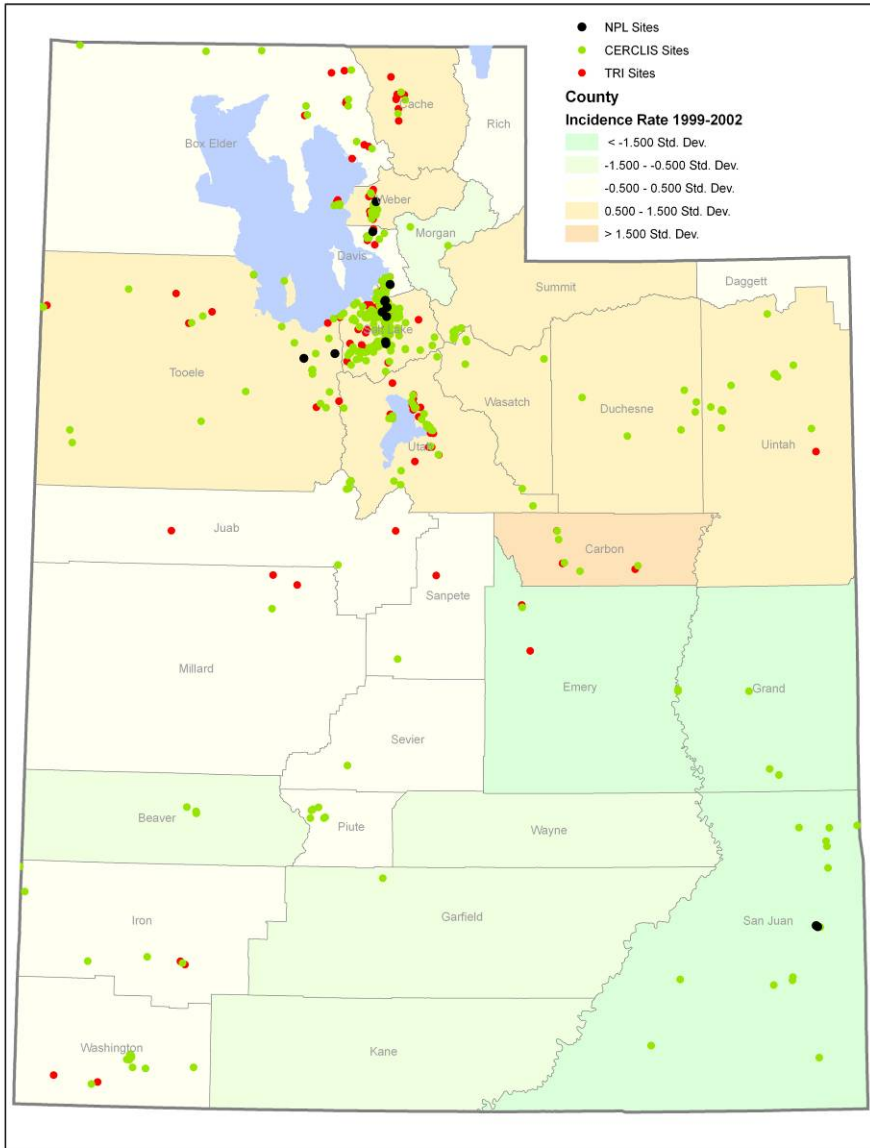
$$E(X_i) = P_i \frac{\sum X}{\sum P}$$

$$RR_i = \frac{X_i}{E(X_i)}$$

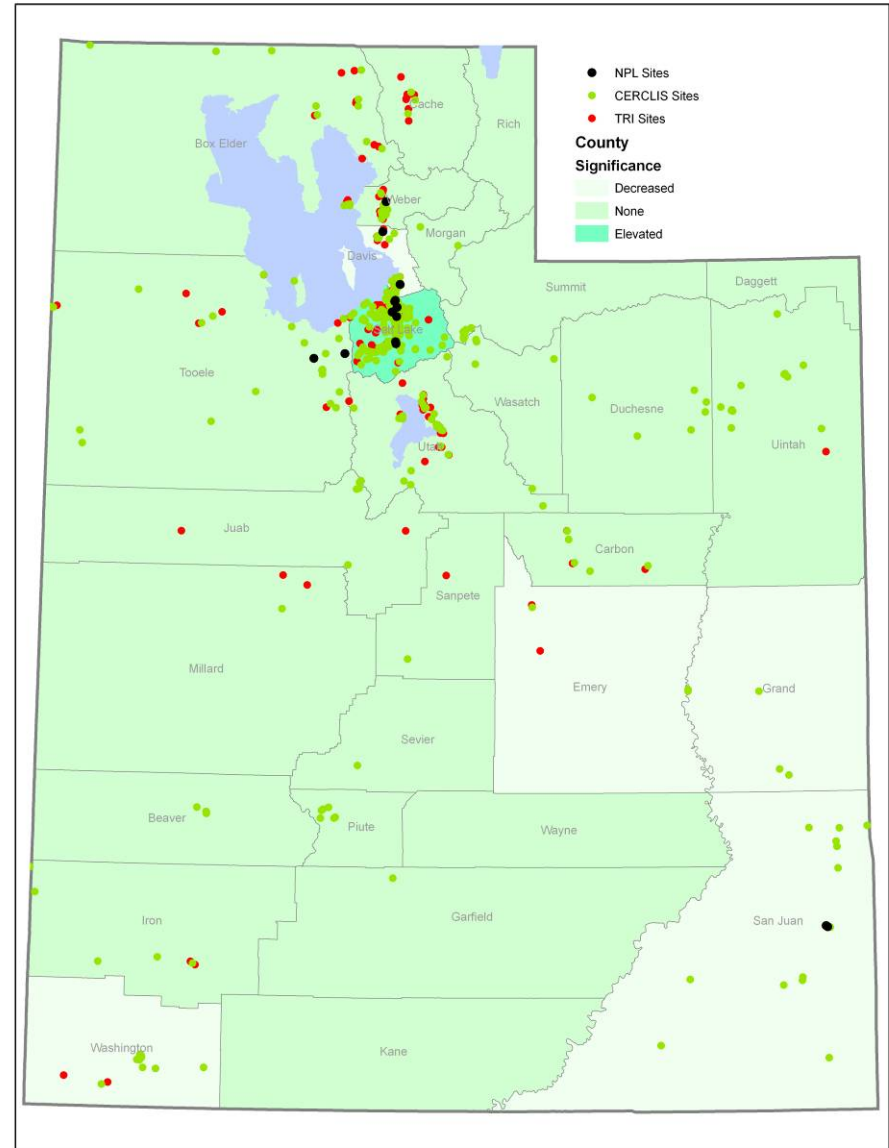
$$\underline{RR} = \frac{X_i}{E(X_i)} \left( 1 - \left( \frac{1}{9X_i} \right) - \left( \frac{Z_\alpha}{3\sqrt{X_i}} \right) \right)^3$$

$$\overline{RR} = \frac{(X_i + 1)}{E(X_i)} \left( 1 - \left( \frac{1}{9(X_i + 1)} \right) + \left( \frac{Z_\alpha}{3\sqrt{(X_i + 1)}} \right) \right)^3$$

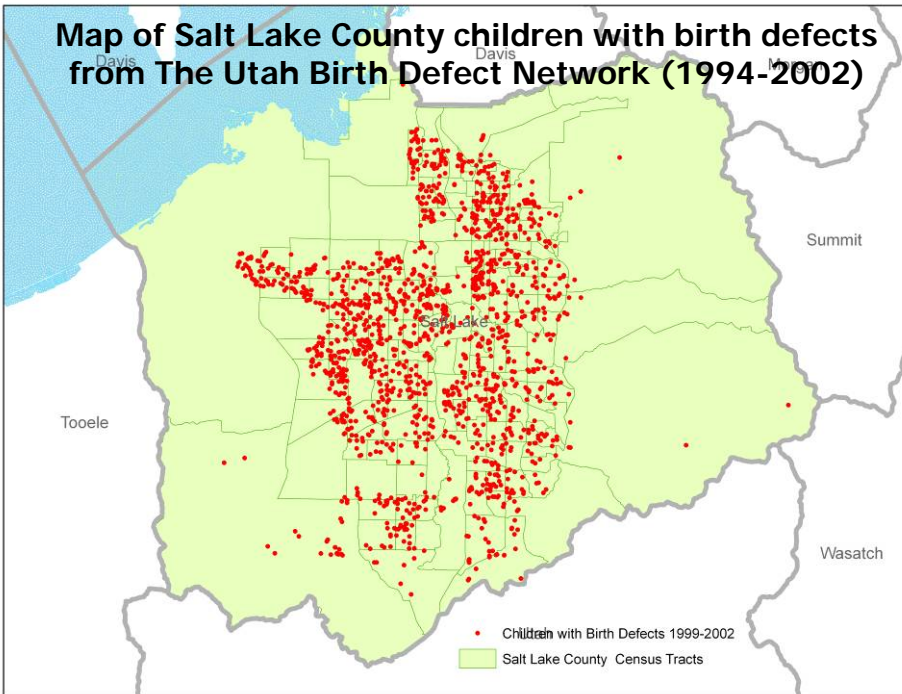
**Map of the standard deviation of the 1999-2002 county birth defect rates for Utah**



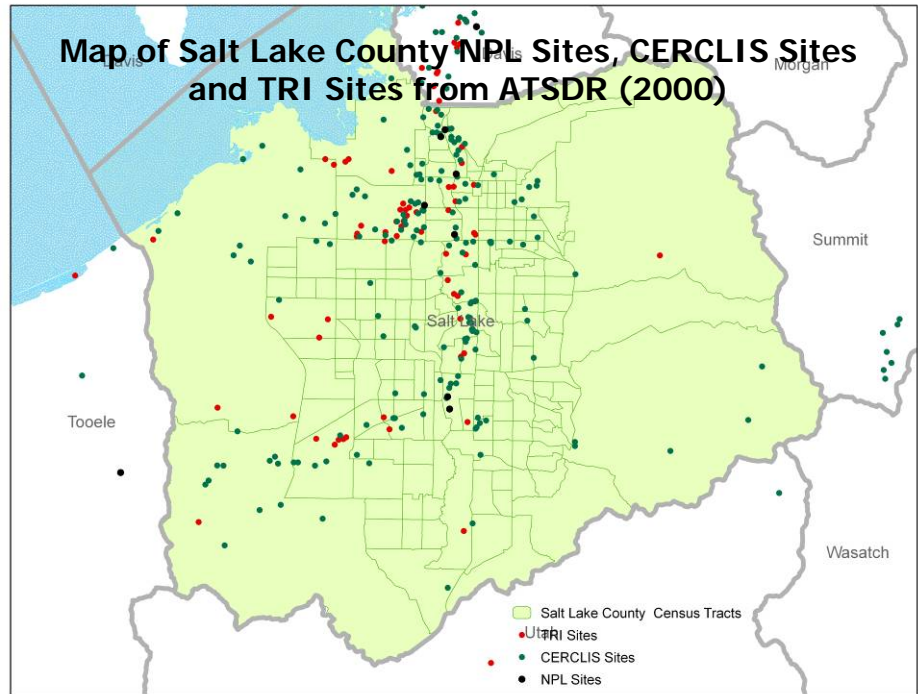
**Map of interpreted significance for the 1999-2002 county birth defect rates for Utah**



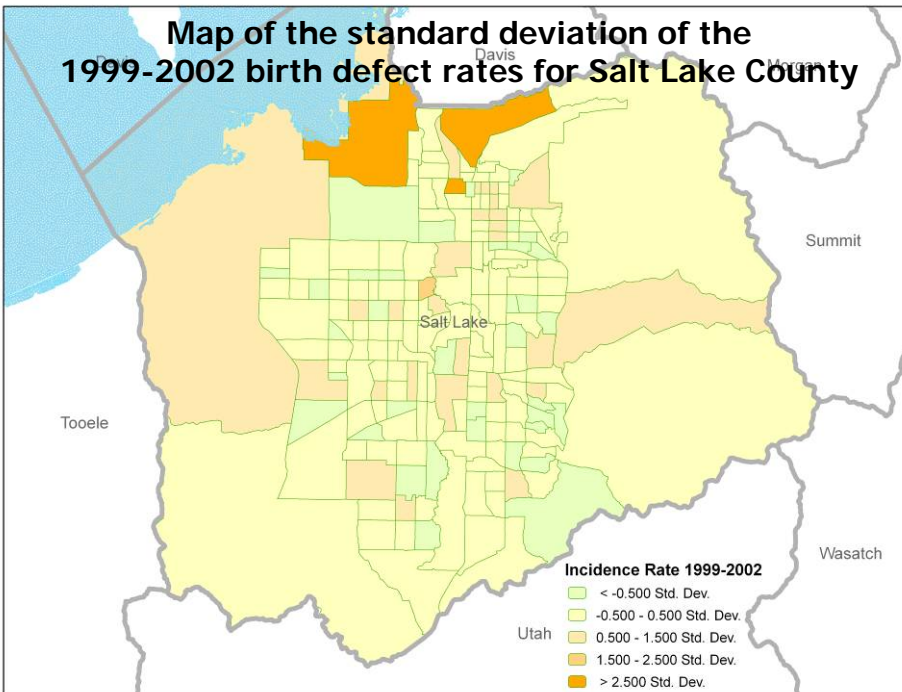
**Map of Salt Lake County children with birth defects from The Utah Birth Defect Network (1994-2002)**



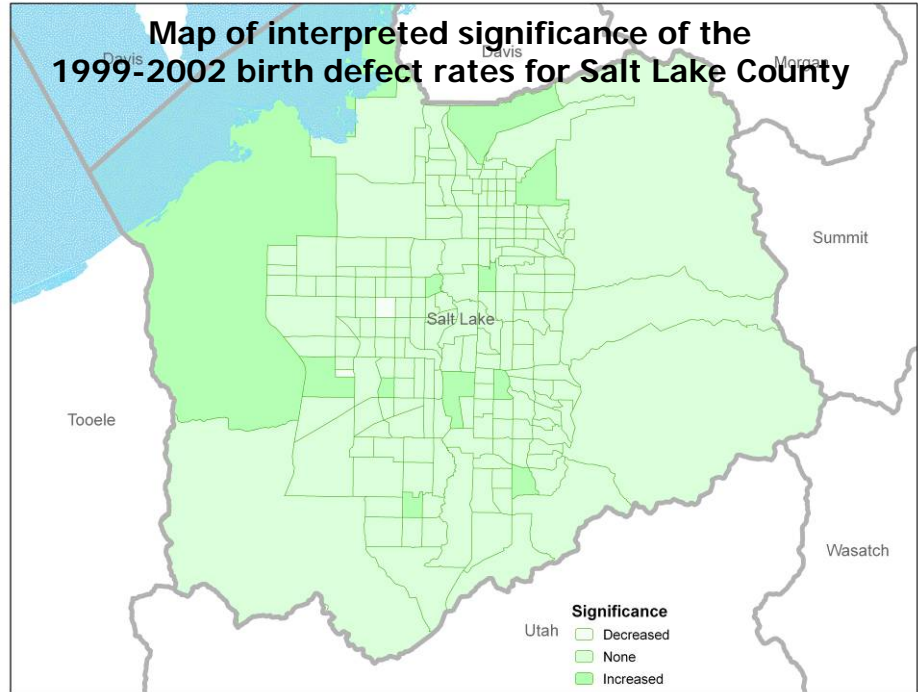
**Map of Salt Lake County NPL Sites, CERCLIS Sites and TRI Sites from ATSDR (2000)**



**Map of the standard deviation of the 1999-2002 birth defect rates for Salt Lake County**



**Map of interpreted significance of the 1999-2002 birth defect rates for Salt Lake County**



# Other Methods

## ▶ Spatial Autocorrelation

### ■ Global Statistics

▶ Moran's I

0.00512 (p=0.68)

▶ Getis-Ord G or G\*

0.00003 (p=0.21)

### ■ Local Statistics

▶ Anselin's Moran I

no significant pattern

▶ Local Getis-Ord G or G\*

no significant pattern

## ▶ Quadrature Sampling

▶ Scan Statistic

## ▶ Bayesian Methods

# Methodological Problems

- ▶ Over dispersed
- ▶ Sensitive to outliers
- ▶ Insensitive to neighbors
- ▶ Unfamiliar interpretation

# Traditional Exposure Analysis

	Present	Not Present	Total
With Birth Defect	527	1,101	<b>1,628</b>
Normal	24,073	54,131	<b>78,204</b>
<b>Total</b>	<b>24,600</b>	<b>55,232</b>	<b>79,832</b>

**Odds Ratio: 1.08 ( 0.97 – 1.20 )**  
**Relative Risk: 1.05 ( 0.98 – 1.13 )**

	<u>Chi-Squares</u>	<u>p</u>
Uncorrected:	1.89	0.17
Mantel-Haenszel:	1.89	0.17
Yates corrected:	1.81	0.18

# Project Accomplishments

- ▶ The Utah Birth Defect Network registry was geocoded through 2002.
- ▶ A collection of tools to support this project were developed
  - ▶ Manual geocoding tool
  - ▶ Point-to-Polygon information transfer tool
  - ▶ Rate Ratio analytical tool
- ▶ Initial analysis of the spatial structure of cases did not result in any remarkable findings.



# Future Steps

- ▶ Analysis of specific conditions
  - Oral facial clefts with no other known etiology
- ▶ Link the tools to ArcView
- ▶ Extend the methodology
  - Bayesian methods
- ▶ Sustain/extend the study
  - Add additional years data
  - Incorporate other environmental risk indicators

# Conclusions

- ▶ Spatially linked data provides a way of associating hazards risks to adverse health outcomes. Spatially linking data requires a good understanding of the spatial domain.
- ▶ Analysis of the rates of all birth defects for the State of Utah and Salt Lake County did not reveal any remarkable association with selected environmental pollution sources.

# Questions?



Take a walk