

# **An Adolescent Sexual Health Community Needs Index for New York State**

**Glen D. Johnson, PhD**  
Office of the Medical Director  
Division of Family Health  
New York State Dept. of Health

## **Objectives:**

- Assess community needs with respect to Adolescent Sexual Health
- Driven by Teen Pregnancy and STDs (Chlamydia and Gonorrhea)
- Incorporates community-level factors that characterize socioeconomic, racial/ethnic and family structure composition
- Needs to estimate overall burden (expected number of cases) and not just rates



Division of Family Health  
Office of the Medical Director

## *Many factors (see Kirby, 2007):*

Example of some that can be derived from census data = ...

- Percent adults with *higher education* (protective)
- Percent *foreign born* (protective)
- Percent *single-parent households* (risk)
- Percent *black* (risk)
- Percent *Hispanic* (risk)

Also from Kirby 07:

- Substance abuse
- Crime



Division of Family Health  
Office of the Medical Director

## From other studies of community needs and community deprivation

- Education (consistently a strong protective factor)
- Unemployment
- Poverty
- Migration / Stability
- Single-parent households
- Racial composition
- Housing (owner/renter/rooms per person etc.)



Division of Family Health  
Office of the Medical Director

- Other approaches to community needs indices / community deprivation, etc. typically take a “multivariate statistics” approach like cluster analysis, principal components analysis, etc.
- For example, the NYSDOH AIDS Institute:
  - reduces a set of 9 equally weighted “outcome” indicators for each ZIP code to an index of need, which can be rated low, medium, high(see <http://www.health.state.ny.us/diseases/aids/reports/cni/index.htm>)



Division of Family Health  
Office of the Medical Director

Our objective is to incorporate different aspects of communities, but have the index “driven” by Teen Pregnancy and STDs



Division of Family Health  
Office of the Medical Director

## ***Solution:***

Model teen pregnancy and, separately, STD incident cases as a function of select community-level covariables and *geographic location*, using ZIP codes as observational units

The sum of model-predicted teen pregnancy and STD cases provides an index of need based on caseload (burden).

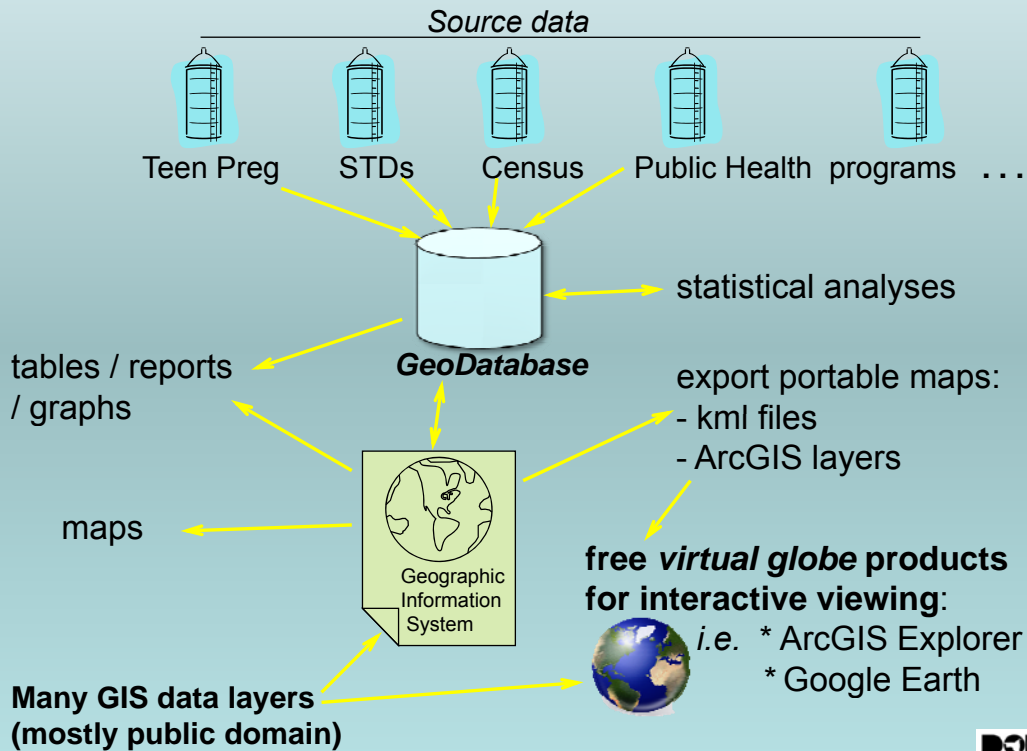


Division of Family Health  
Office of the Medical Director

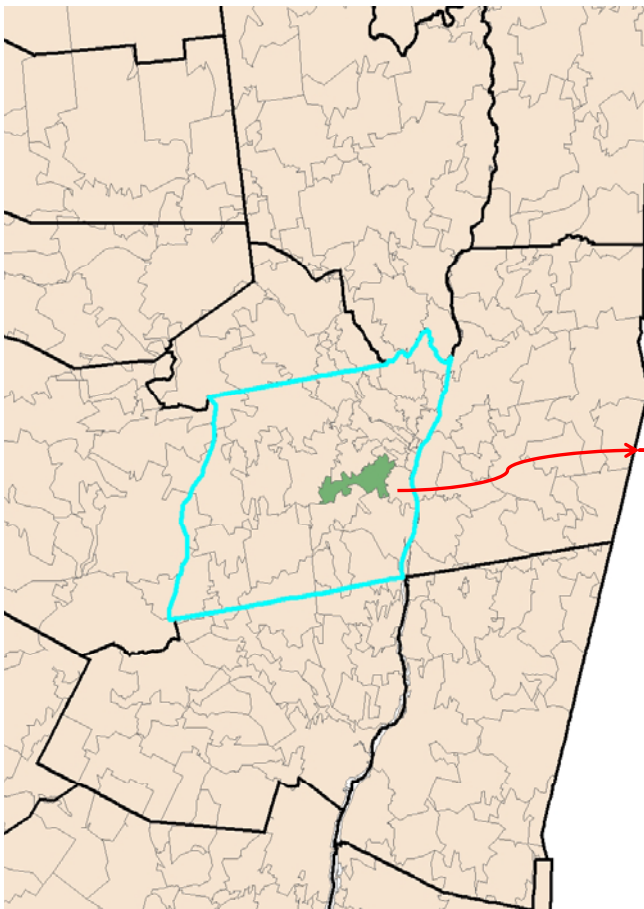
This needs index is essentially a ...

**Community-level risk-adjusted estimate** of the caseload for each ZIP code area, based on a larger reference population (*i.e.* statewide)

## Data Integration, Analysis and Visualization Framework



Division of Family Health  
Office of the Medical Director



For each ZIP code:

➤ *Response* (i.e. Teen Pregnancy cases)

➤ *Predictors*:

- % pop. > age 24 w/ 4-year or greater college degree
- % single-parent households out of households w/ at least one child < 18 years old
- % of tot. pop. that is Black Alone
- % of tot. pop. that is Hispanic, regardless of race
- % of tot. pop. that is a foreign-born naturalized citizen
- % of tot. pop. with income below poverty

➤ *Population at Risk*

➤ *County*

(crude indicator of neighborhood effect)

## The Model ...

For  $i = 1, \dots, n$  ZIP codes, let

$y_i$  = observed caseload

$n_i$  = population at risk

$\{x_1, \dots, x_p\}_i$  = community predictors

$\{\beta_1, \dots, \beta_p\}$  = coefficients

$L_i$  = location effect, arising from a random process such that  $L_i \sim N(0, \sigma_L^2)$

Then, the expected value of  $y_i$ , given  $\{x_1, \dots, x_p, L\}_i =$

$$E[y_i | \{x_1, \dots, x_p, L\}_i] = n_i \exp(\beta_1 x_{1i} + \dots + \beta_p x_{pi} + L_i)$$

Relative Risk of ZIP  $i$

- Values for the unknown coefficients  $\{\beta_1, \dots, \beta_p, \sigma_L^2\}$  are estimated with SAS PROC GLIMMIX, assuming  $y_i$  arose from a *Poisson* (or negative binomial) random process, conditional on location.
- ... thus allowing risk adjusted estimates of caseload for each ZIP code.
- Incorporating the “location effect”
  - adjusts for unidentified covariables that co-vary spatially with the response, thus reducing residual spatial autocorrelation and potential confounding
  - also provides a “smoothing” effect, in that the predicted caseload is adjusted towards a common local value

- Actual observed caseload can be compared to what is expected, given a statewide reference model, to identify communities that are either:
  - performing worse than expected
  - performing close to expected
  - performing better than expected



Division of Family Health  
Office of the Medical Director

# Results for

## Teen Pregnancy and STDs (Chlamydia plus Gonorrhea)

### whole state analysis

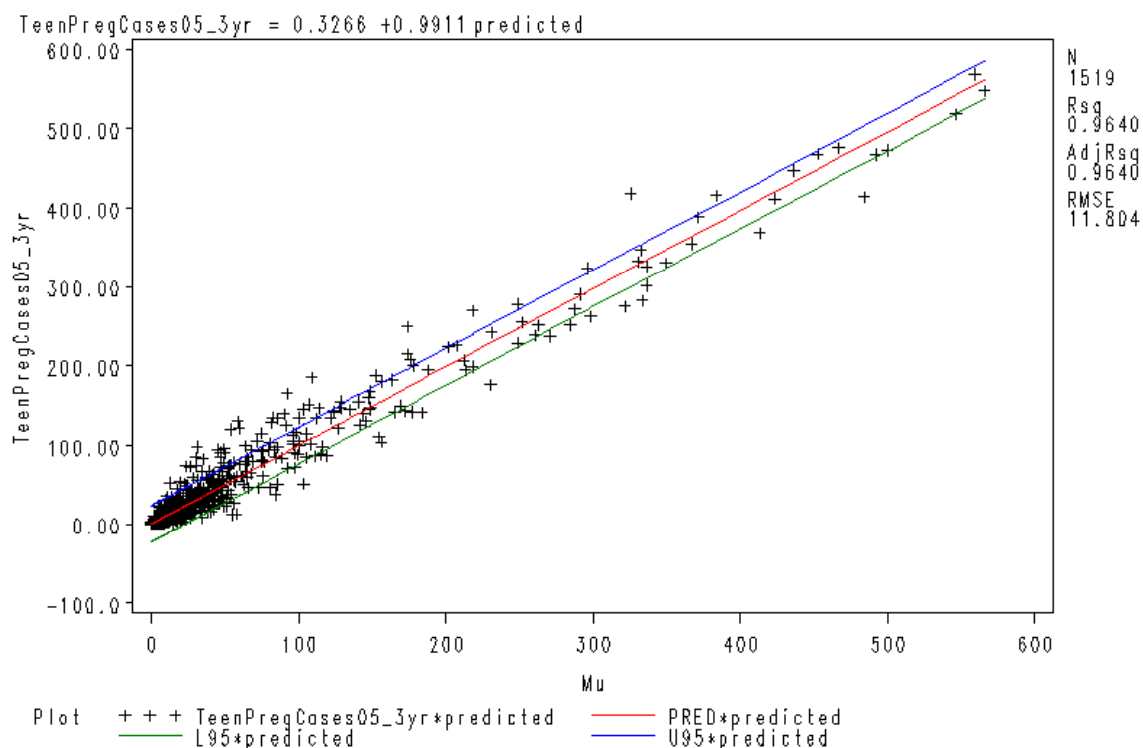


Division of Family Health  
Office of the Medical Director

Community-level Covariables associated  
With *both* Pregnancy and STD Rates  
(after adjusting for all other covariables in the list)

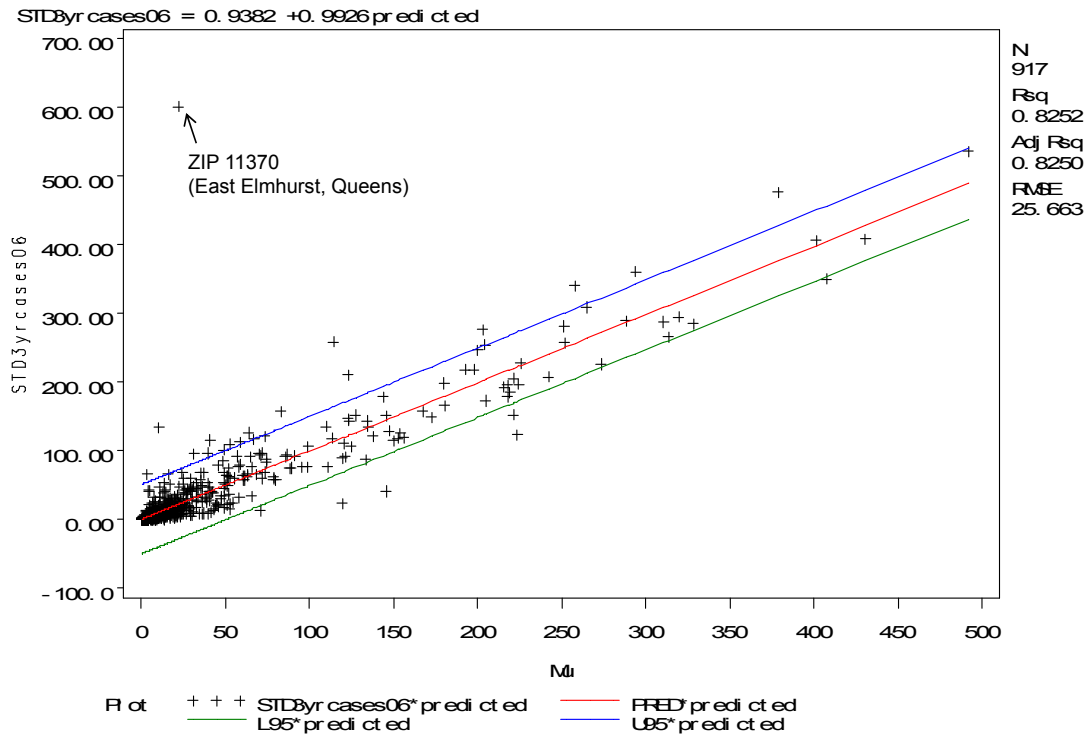
% pop. > age 24 w/ 4-year or greater college degree	protective
% single-parent households out of households w/ at least one child < 18 years old	risk
% of tot. pop. that is Black Alone	risk
% of tot. pop. that is Hispanic, regardless of race	risk
% of tot. pop. that is a foreign-born naturalized citizen	risk
% of tot. pop. with income below poverty	risk

Teen Pregnancy, Whole State, Observed vs Predicted

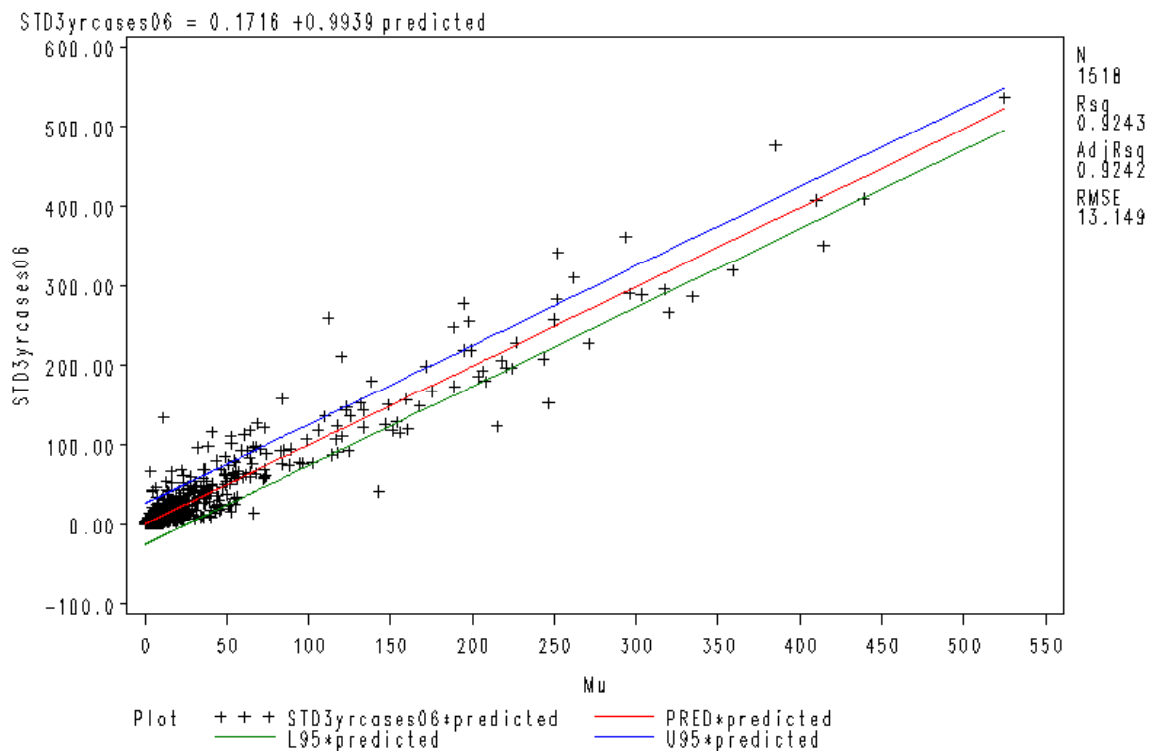




## STDs, Whole State, Observed vs Predicted

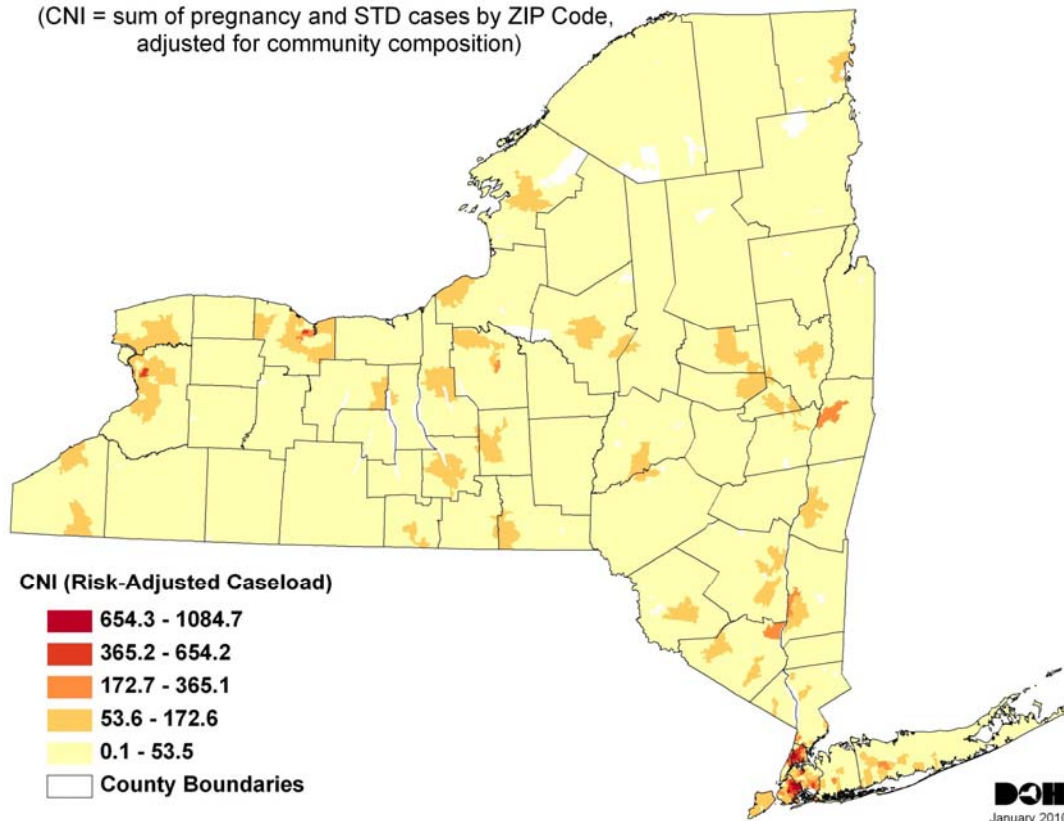


## STDs, Whole State, Observed vs Predicted, excluding outlier ZIP



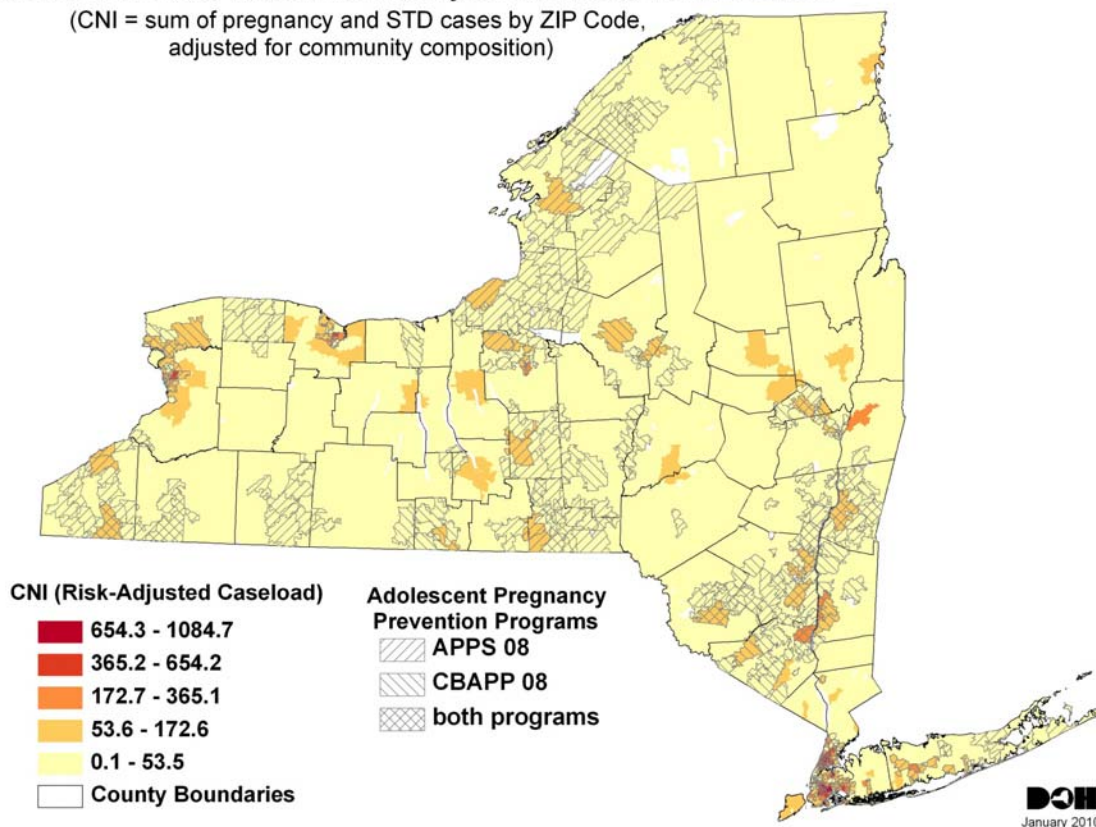
## Adolescent Sexual Health Community Needs Index, Year 2005-2006

(CNI = sum of pregnancy and STD cases by ZIP Code, adjusted for community composition)



## Adolescent Sexual Health Community Needs Index, Year 2005-2006

(CNI = sum of pregnancy and STD cases by ZIP Code, adjusted for community composition)



**Adolescent Sexual Health  
Community Needs Index,  
Year 2005-2006**  
(CNI = sum of pregnancy and STD cases  
by ZIP Code, adjusted for community composition)

**CNI (Risk-Adjusted Caseload)**

654.3 - 1084.7

365.2 - 654.2

172.7 - 365.1

53.6 - 172.6

0.1 - 53.5

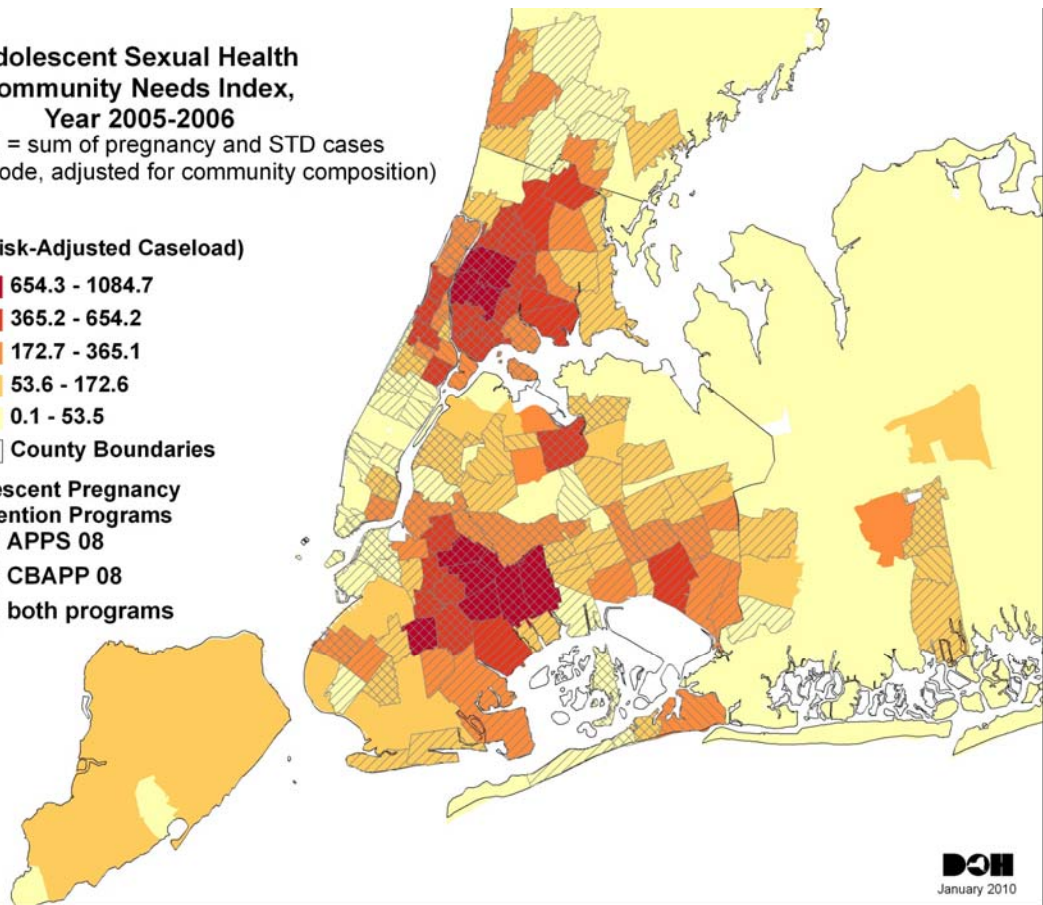
County Boundaries

**Adolescent Pregnancy  
Prevention Programs**

APPS 08

CBAPP 08

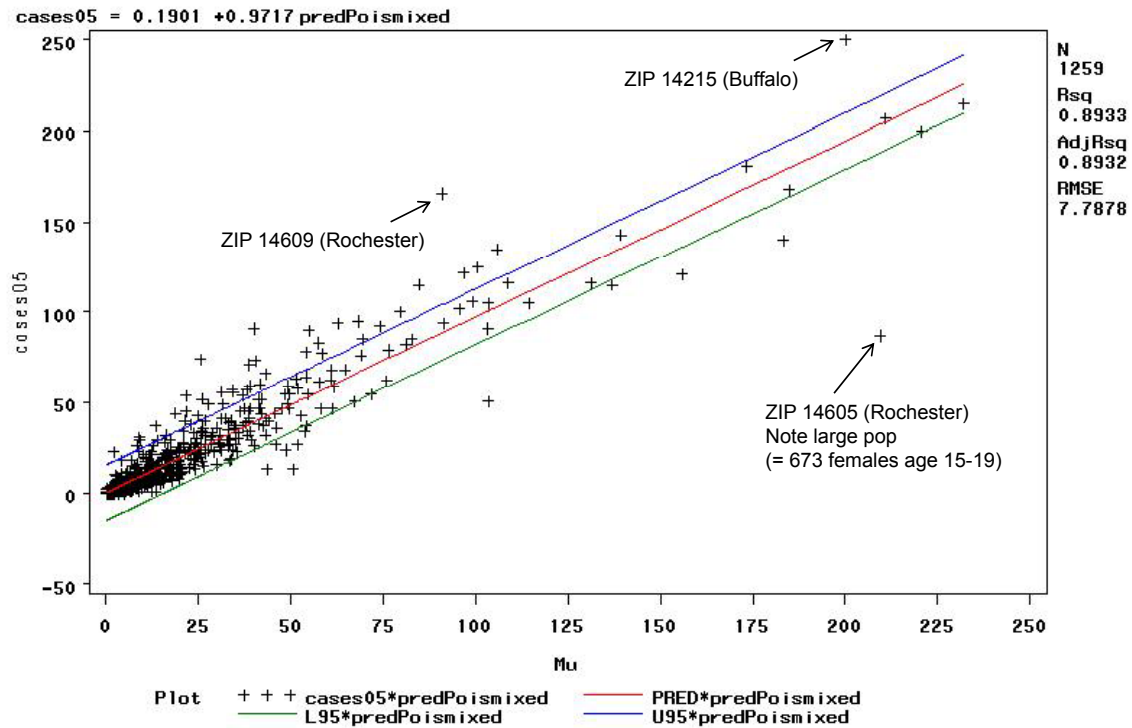
both programs



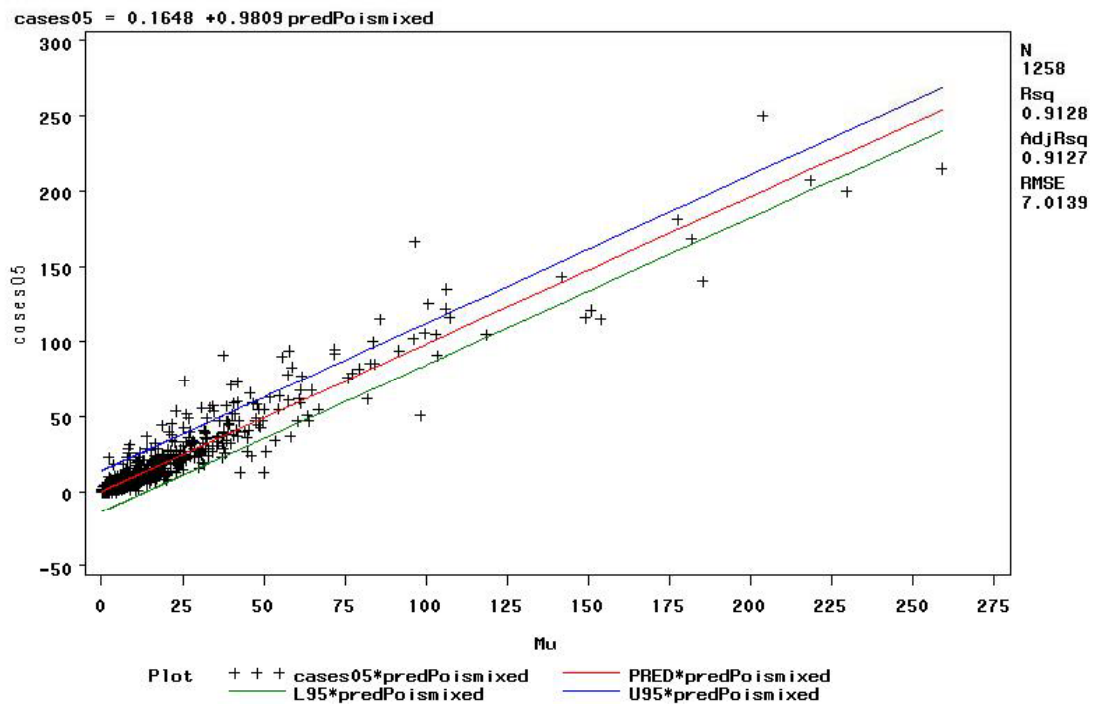
Results for

Teen Pregnancy and  
STDs (Chlamydia plus  
Gonorrhea),  
excluding NYC

## Teen Pregnancy, excluding NYC, Observed vs Predicted



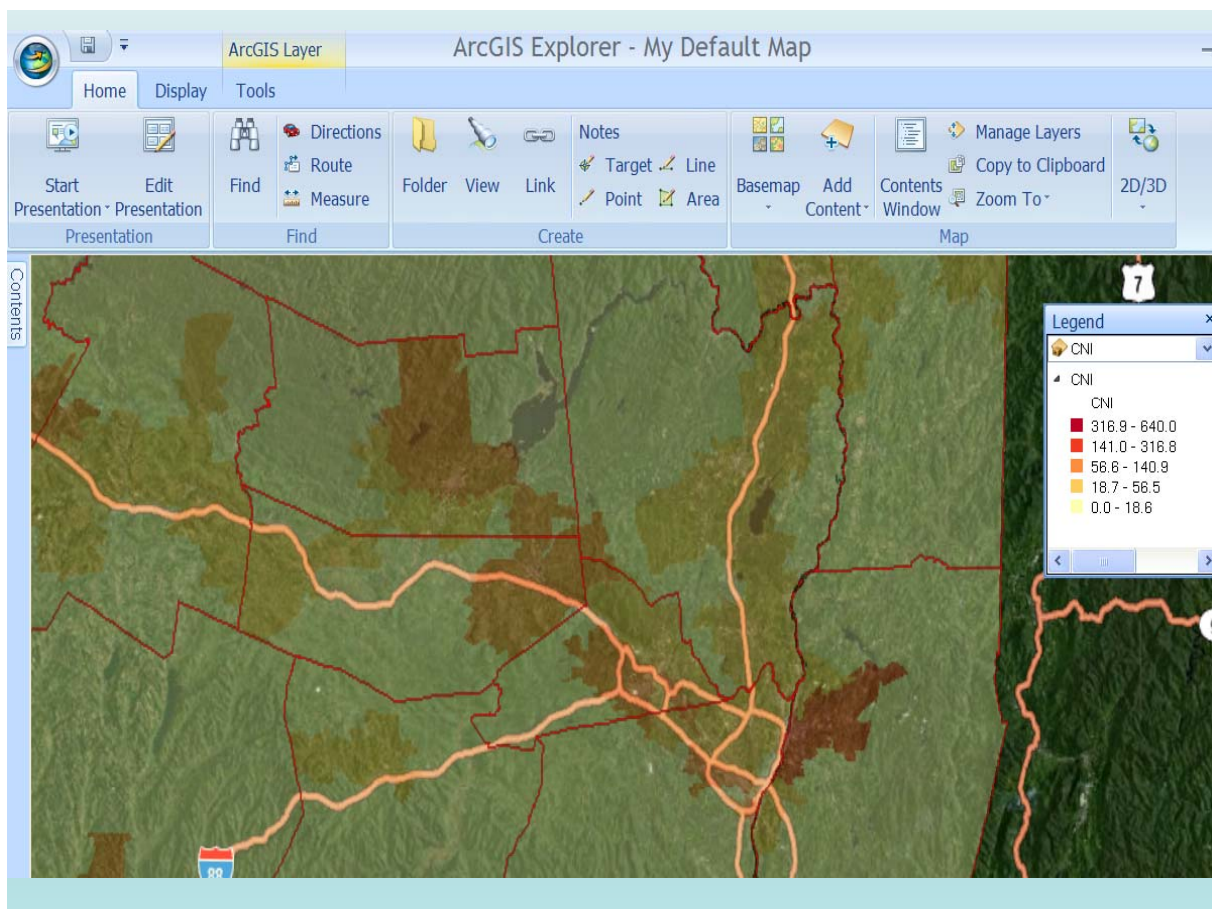
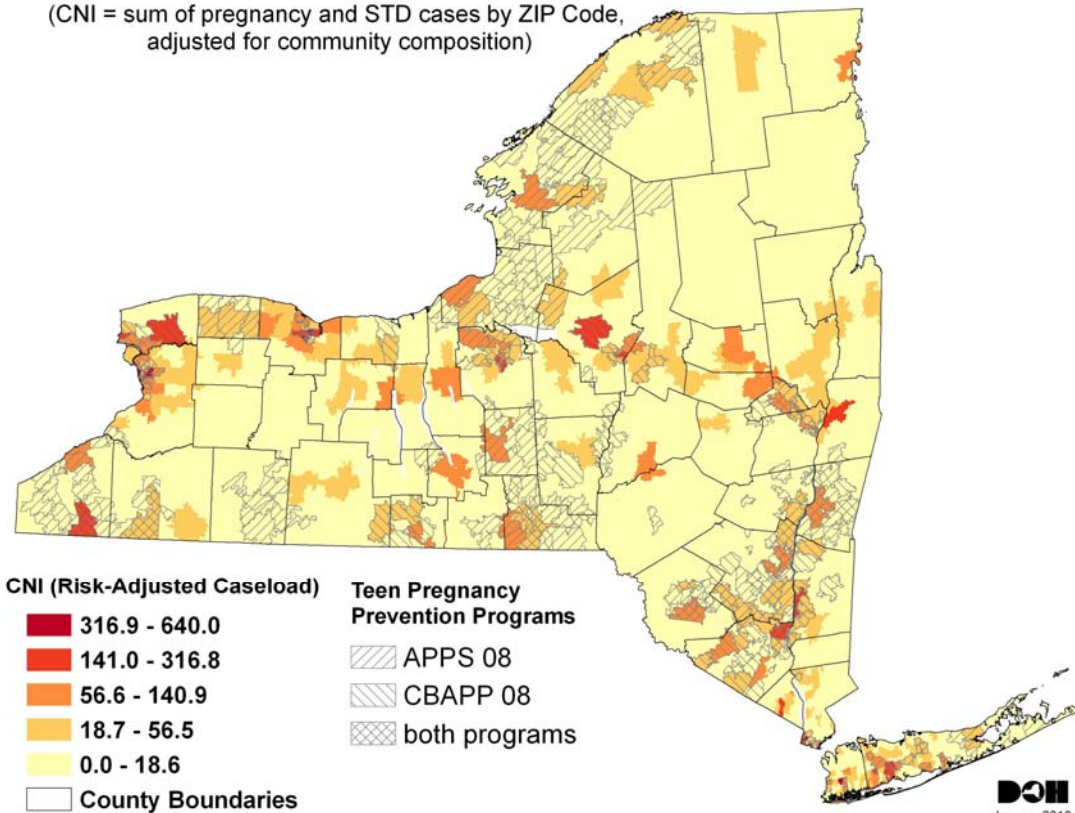
## Teen Pregnancy Observed vs Predicted, excluding NYC and ZIP 14605

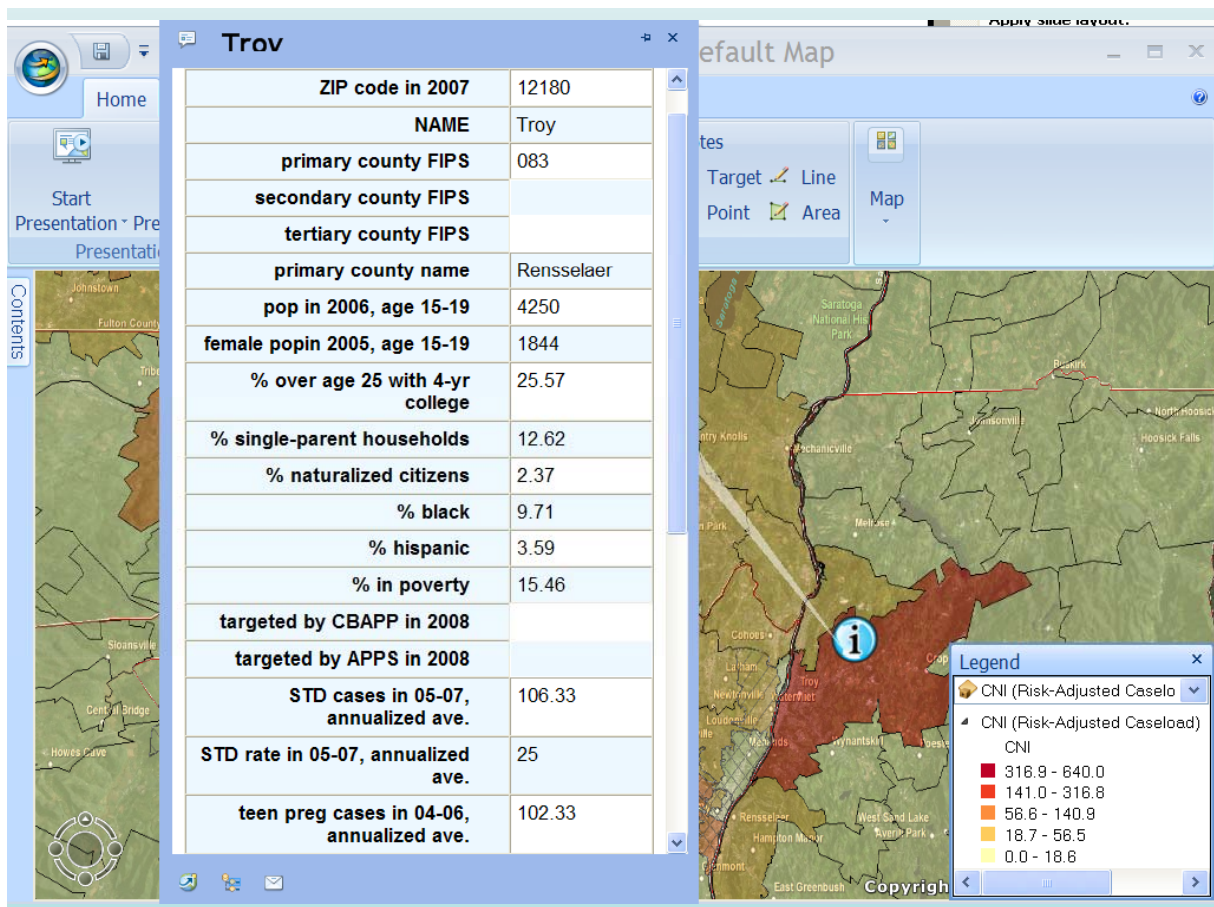
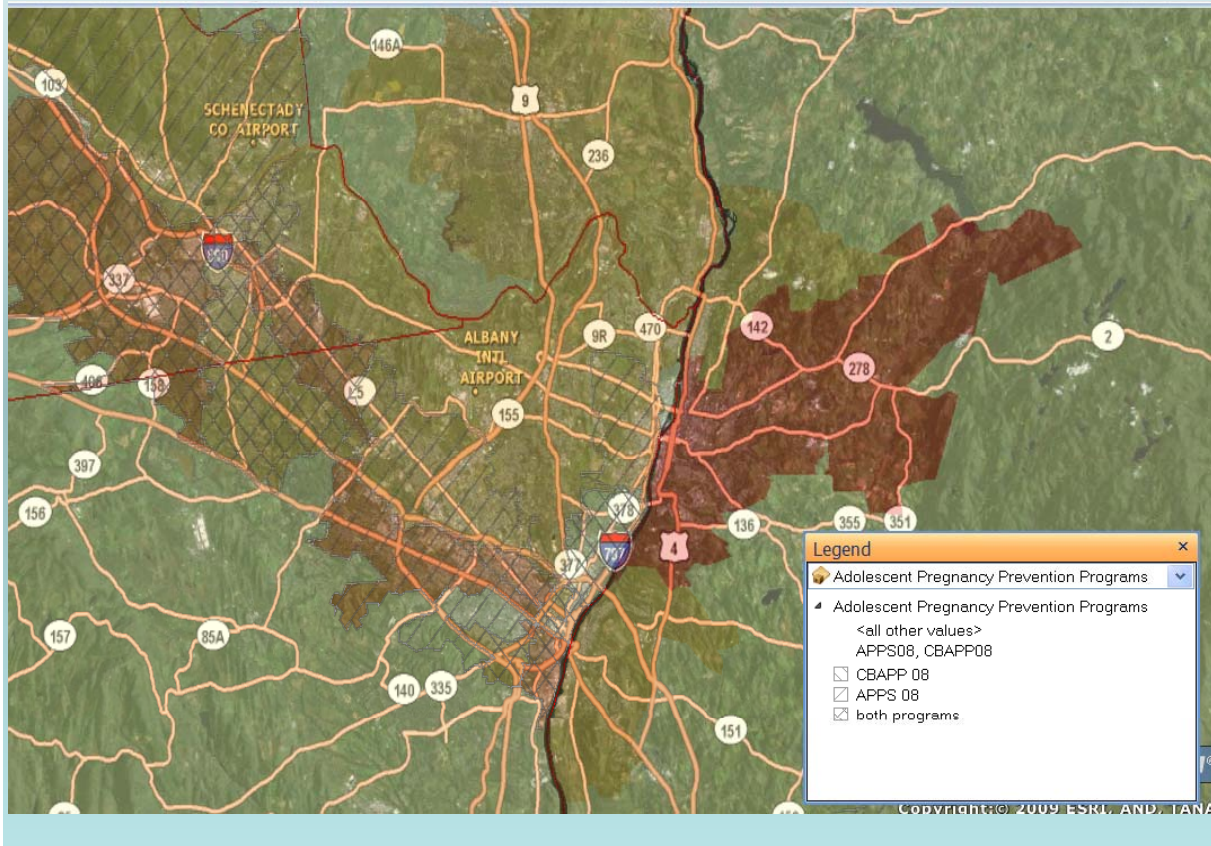




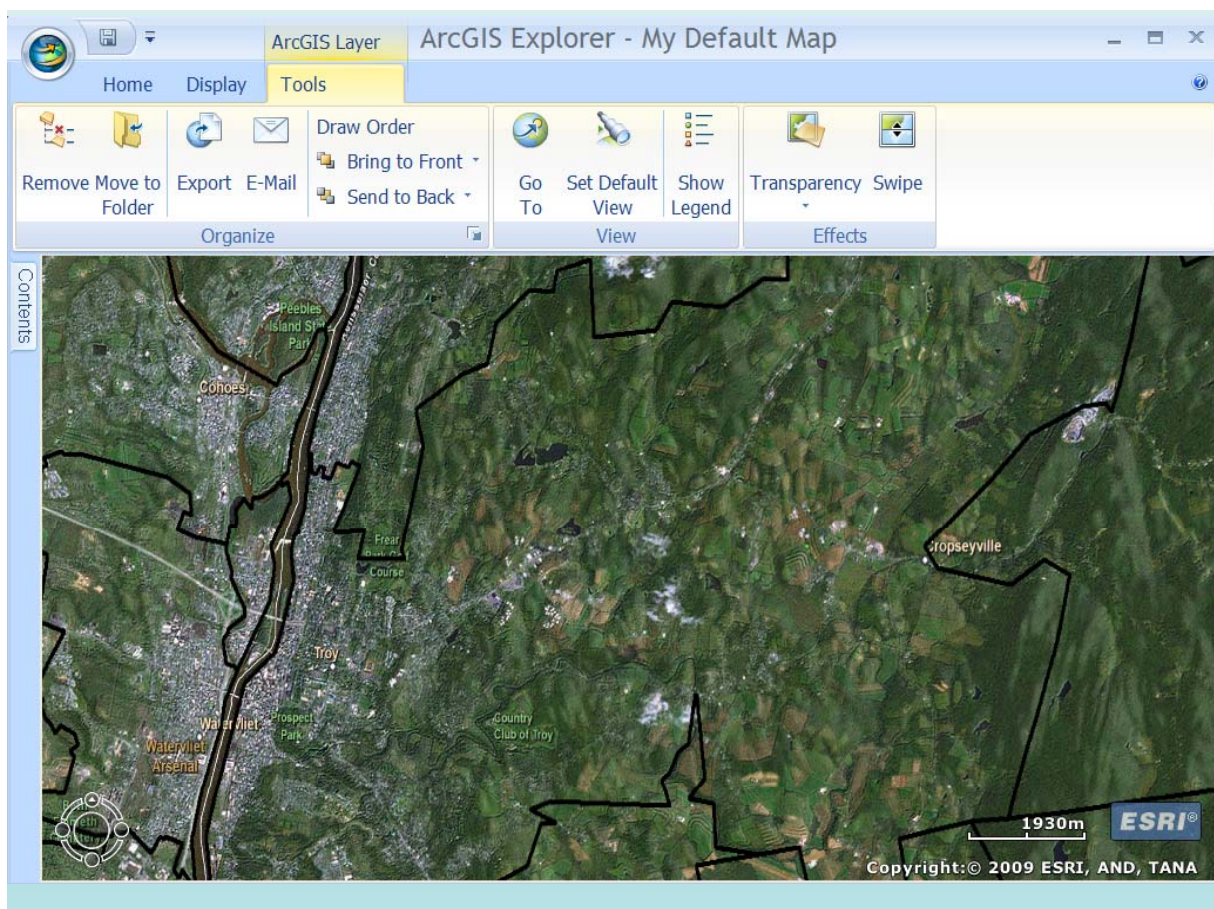
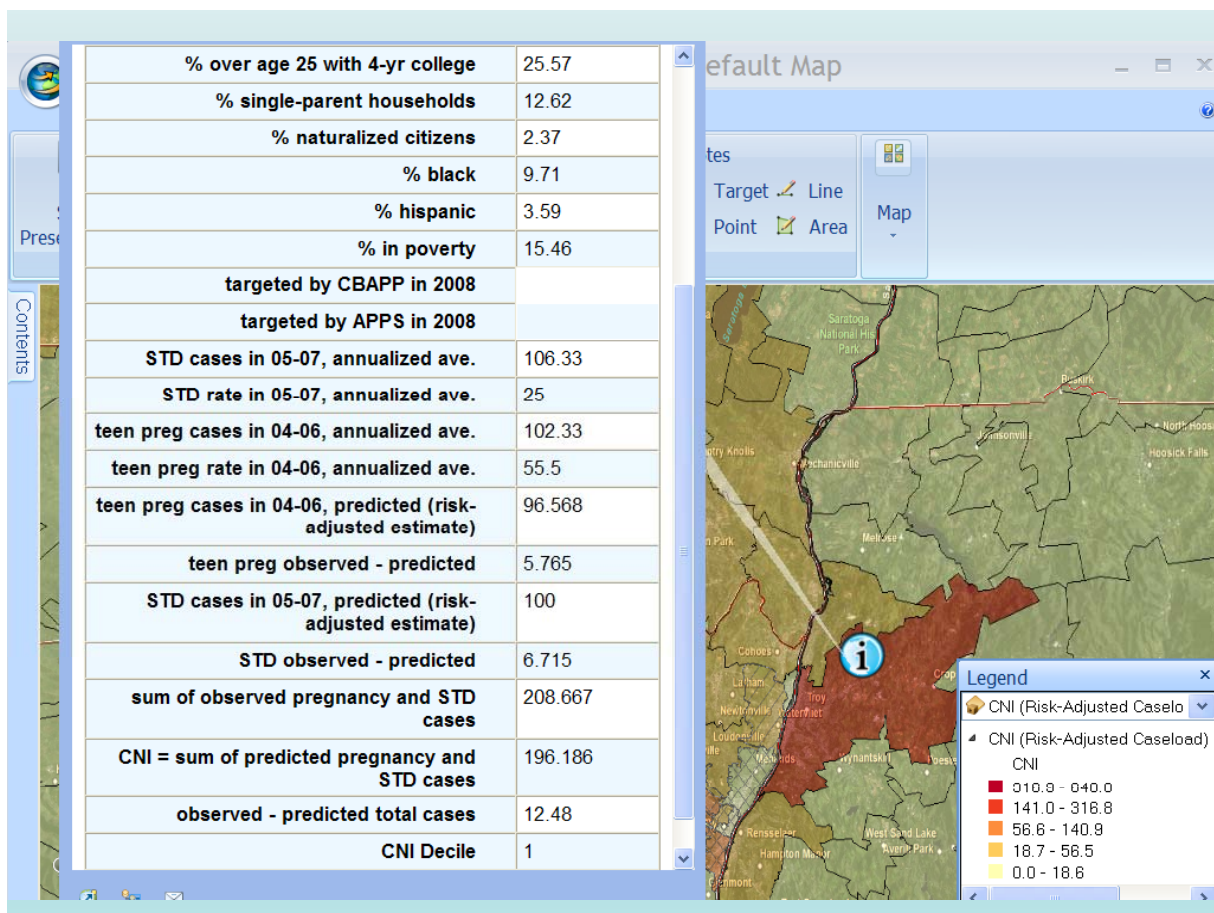
## Adolescent Sexual Health Community Needs Index, Year 2005-2006

(CNI = sum of pregnancy and STD cases by ZIP Code, adjusted for community composition)

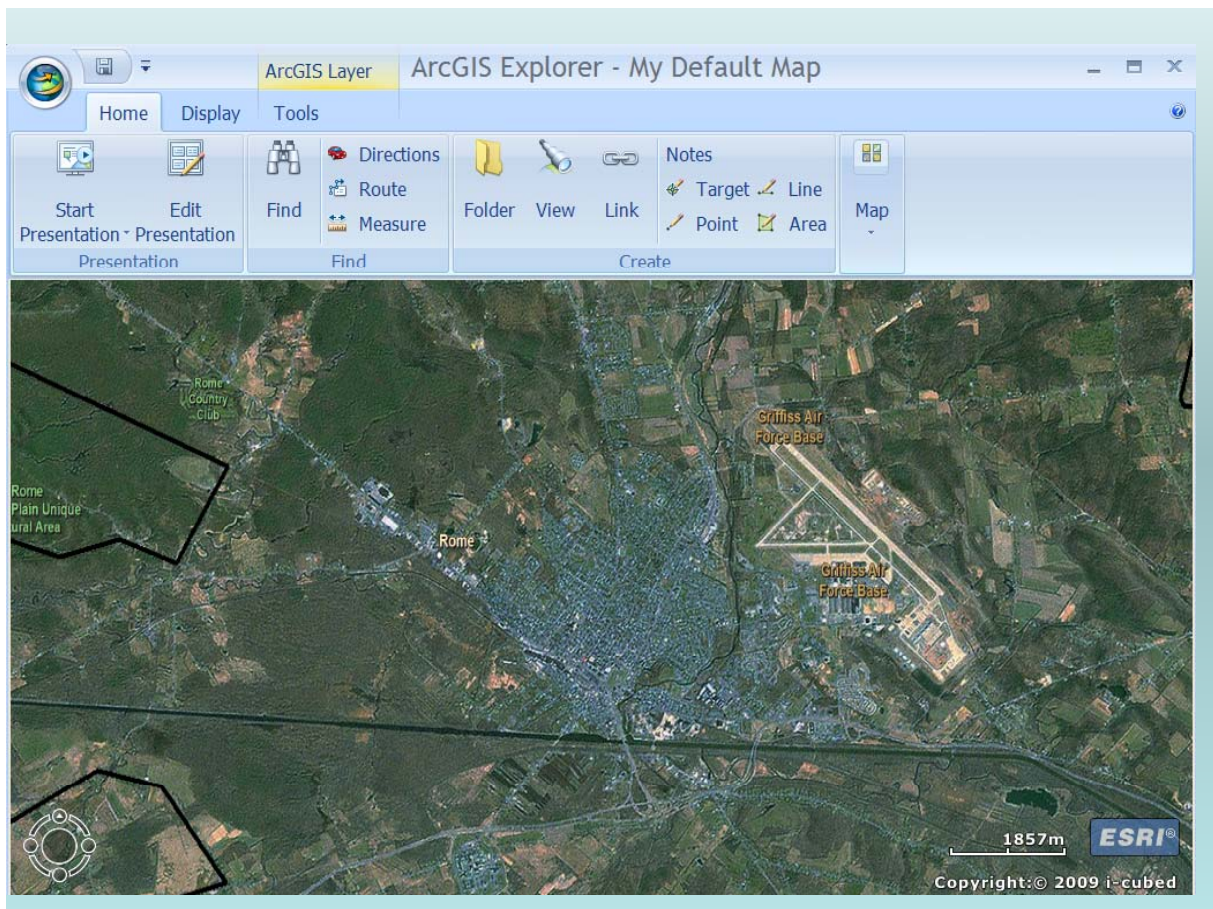
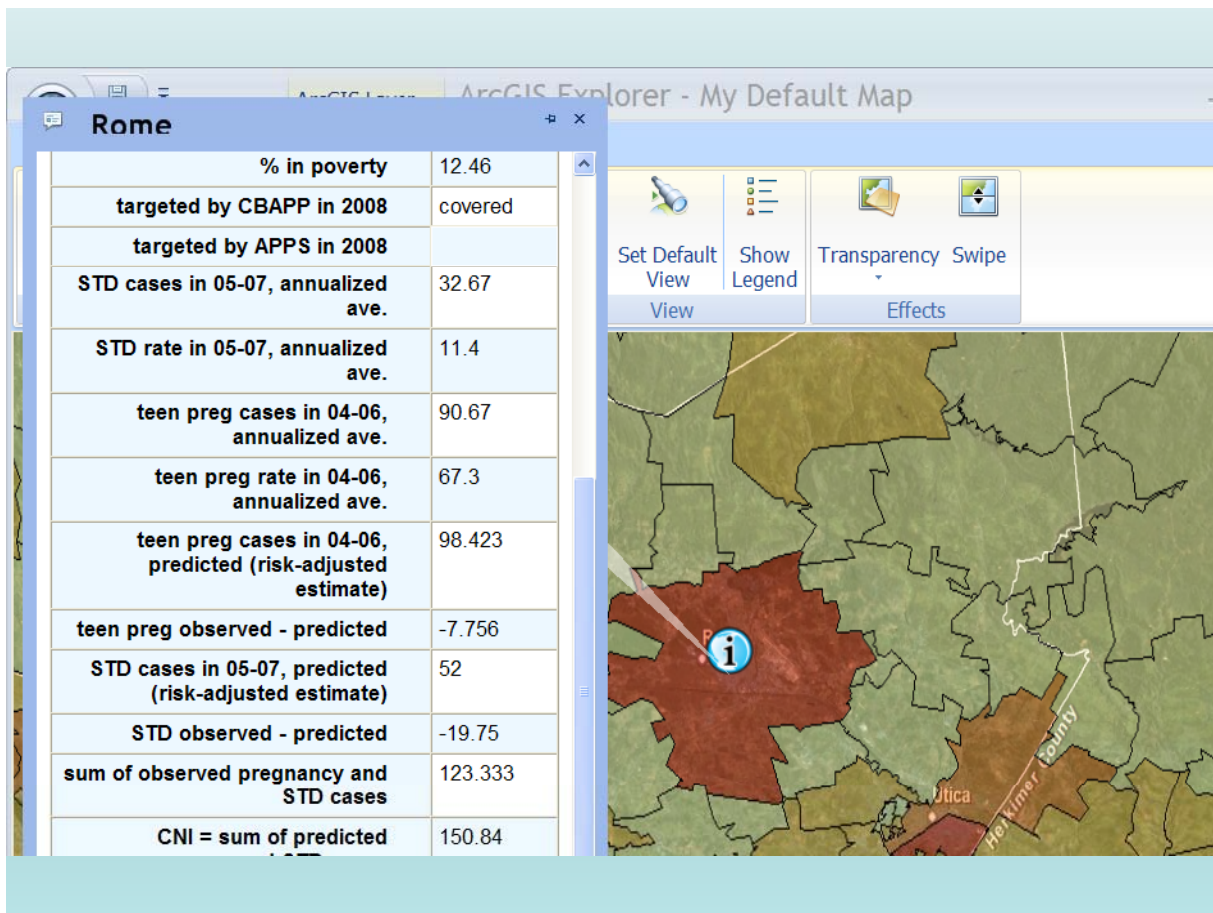














## Notes on map color choices:

- color schemes are *suitable for*  
***Color Blind Readers and Color Printing***

see “Color Brewer” @

<http://www.personal.psu.edu/cab38/ColorBrewer/ColorBrewer.html>

## Acknowledgements:

**Adolescent Sexual Health Surveillance Committee**

**Kristine Mesler:** Bureau of Maternal and Child Health

**Marilyn Kacica:** Medical Director, Division of Family Health

**Alison Muse:** Bureau of STD Prevention and Epidemiology

**Punkin Stephens:** AIDS Institute

**Shu-Yin (John) Leung:** AIDS Institute

and **Larry Schoen**, Bureau of Biometrics and Health  
Statistics, for providing data on Teen Pregnancies