

An Adolescent Sexual Health Community Needs Index for New York State

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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



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



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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.)



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- 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>)



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



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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).

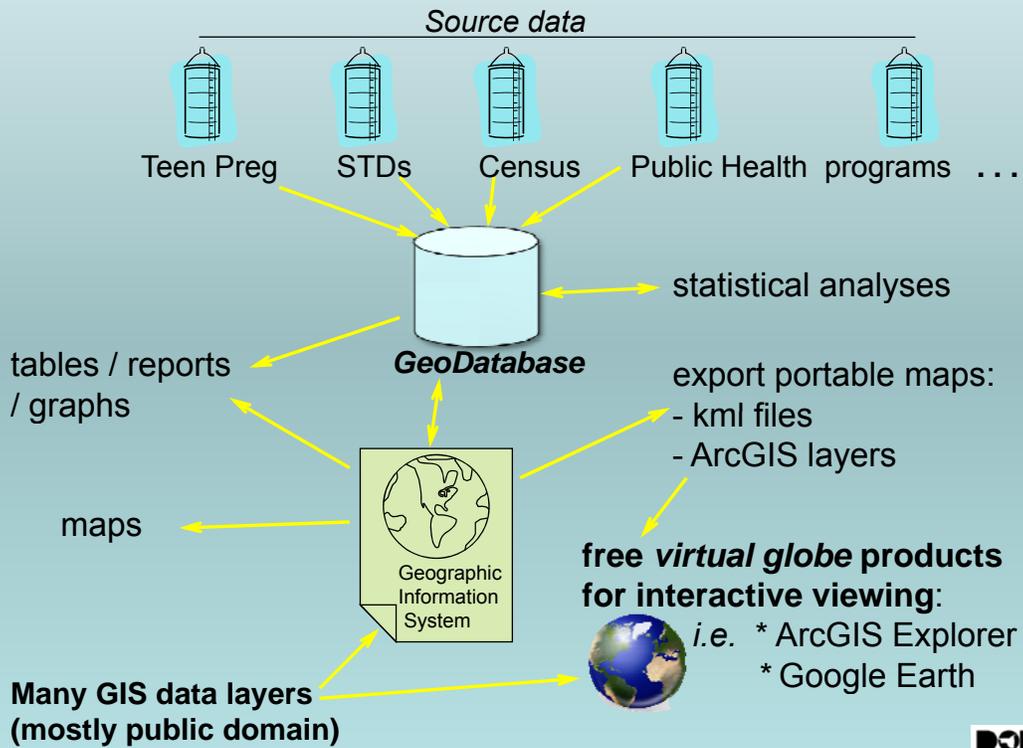


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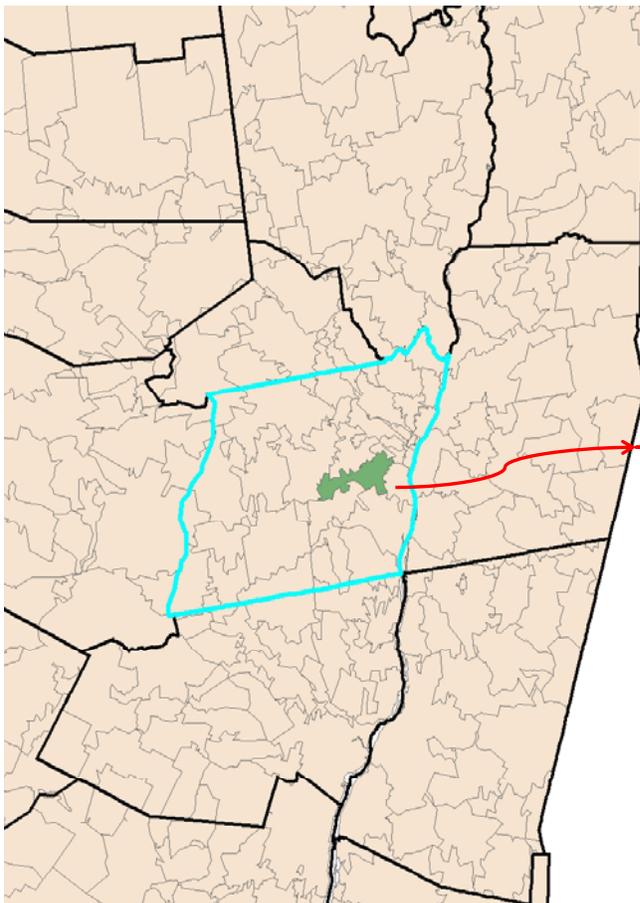
This needs index is essentially a ...

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



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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



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Results for

Teen Pregnancy and STDs (Chlamydia plus Gonorrhea)

whole state analysis

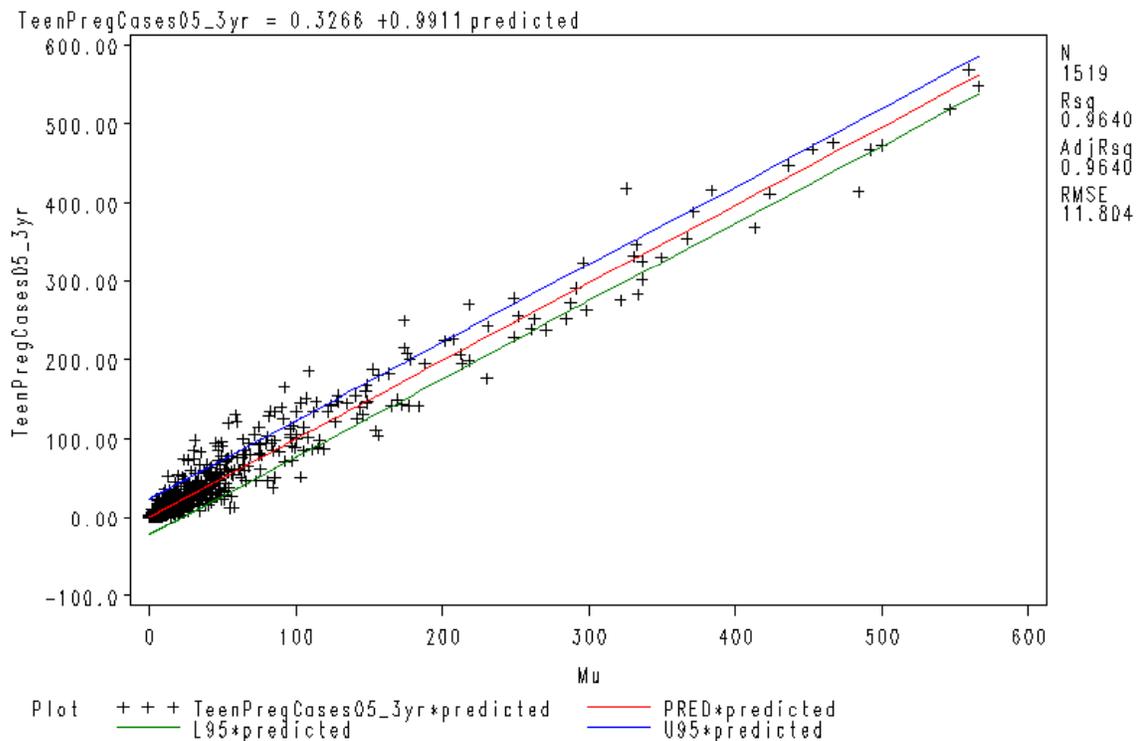


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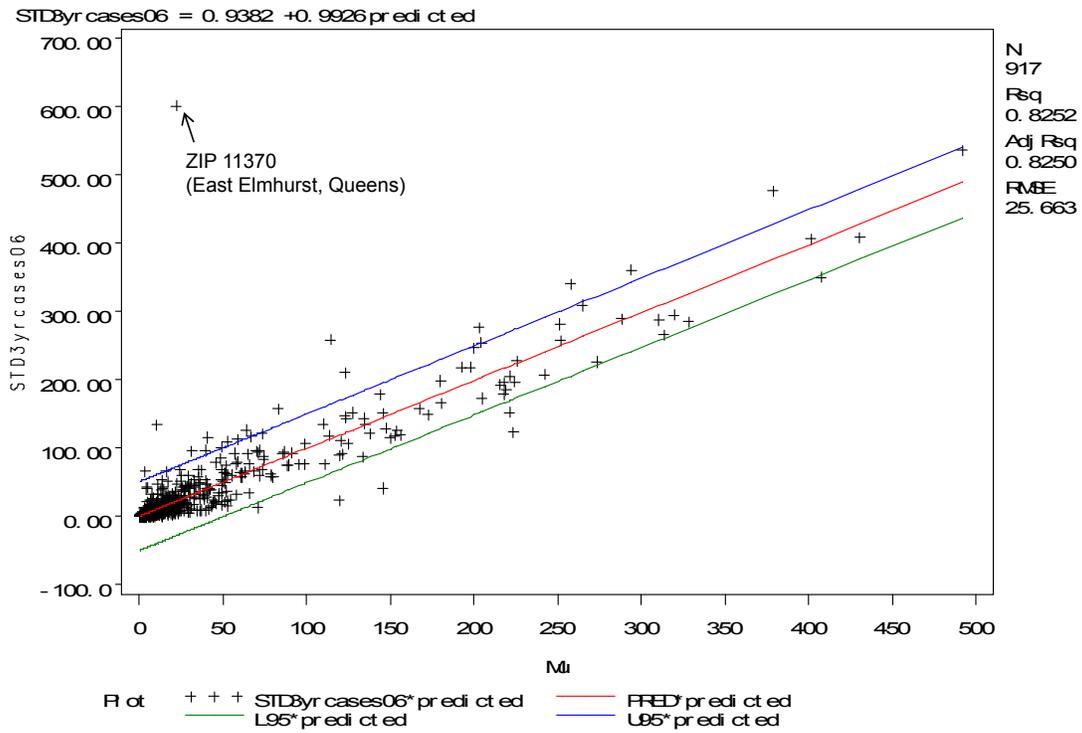
Community-level Covariables associated
With *both* Pregnancy and STD Rates
(after adjusting for all other covariables in the list)

% 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

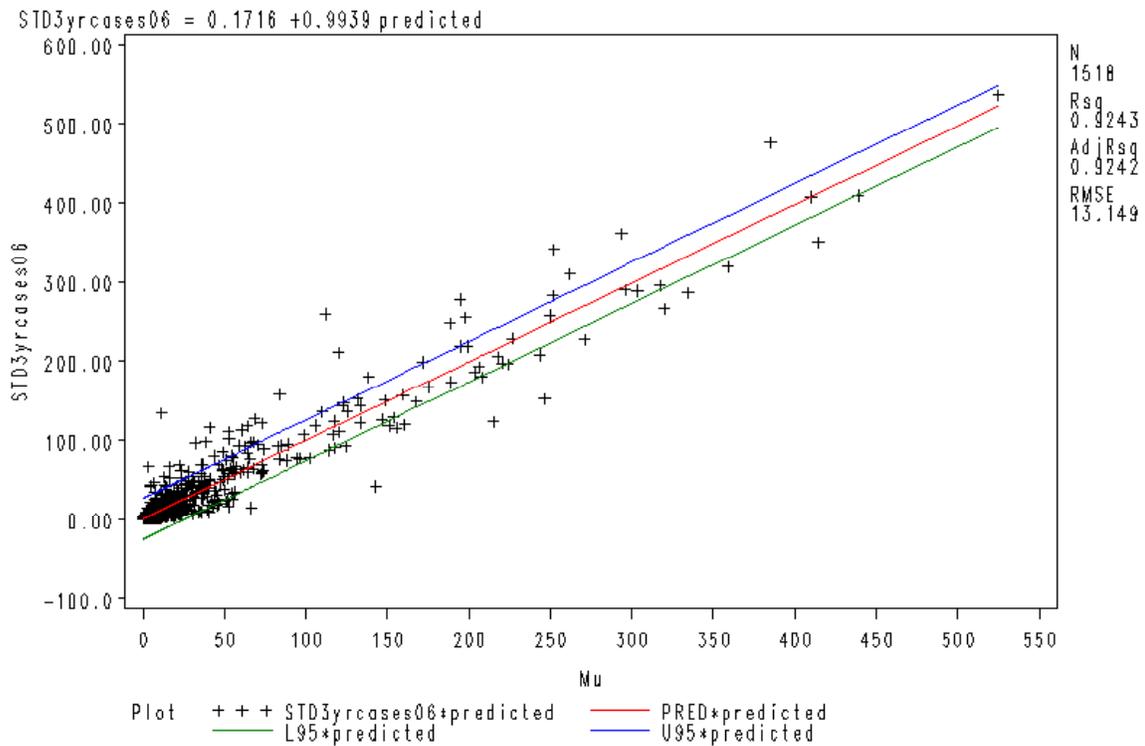
Teen Pregnancy, Whole State, Observed vs Predicted



STDs, Whole State, Observed vs Predicted

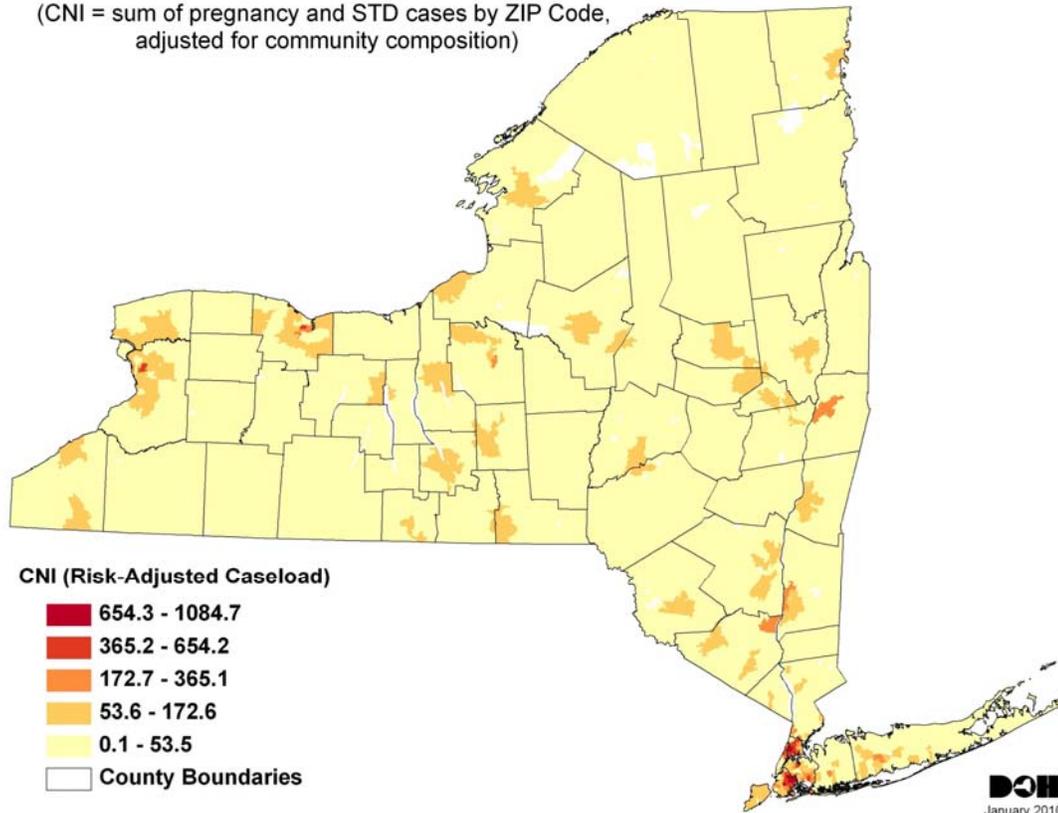


STDs, Whole State, Observed vs Predicted, excluding outlier ZIP



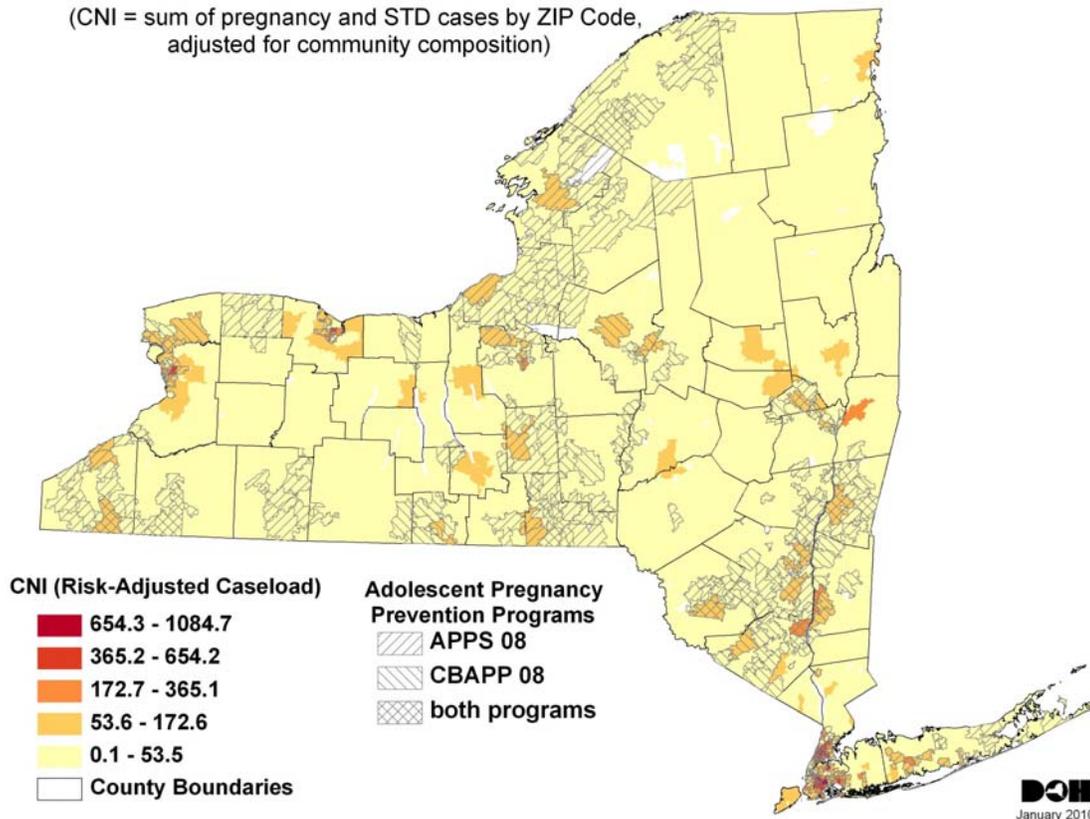
Adolescent Sexual Health Community Needs Index, Year 2005-2006

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



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**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

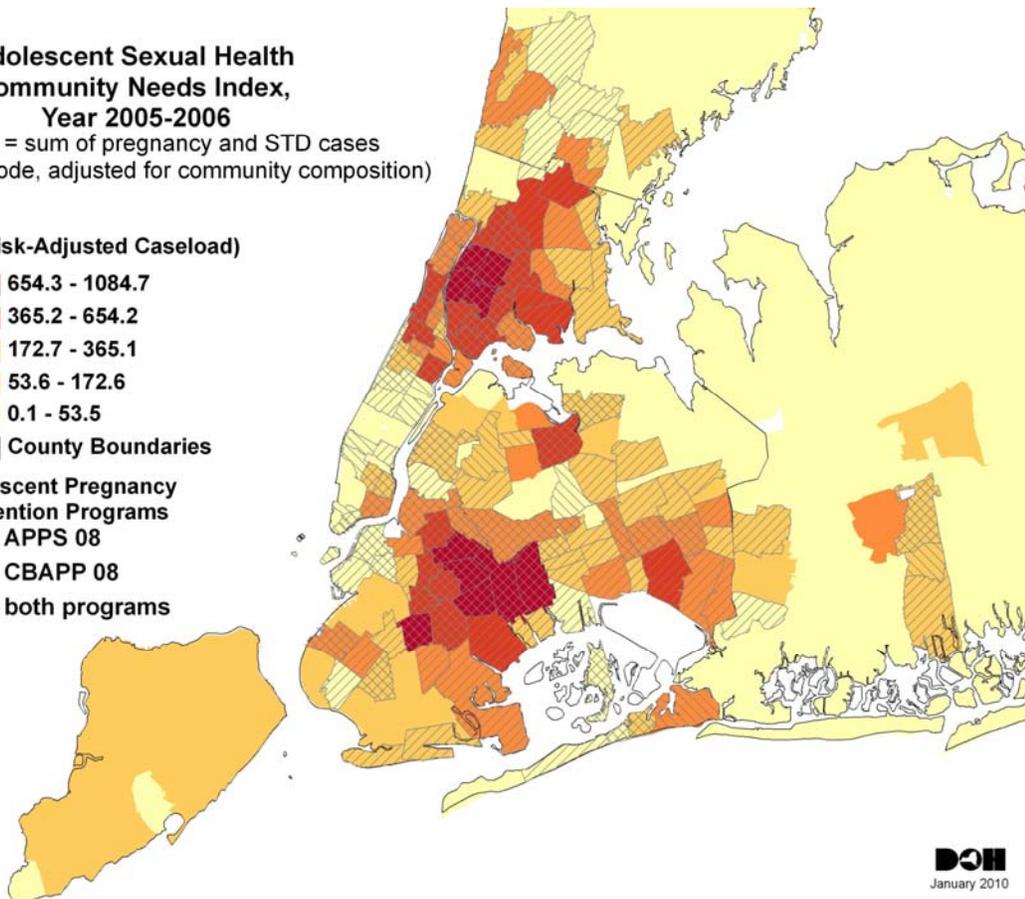
County Boundaries

**Adolescent Pregnancy
Prevention Programs**

APPS 08

CBAPP 08

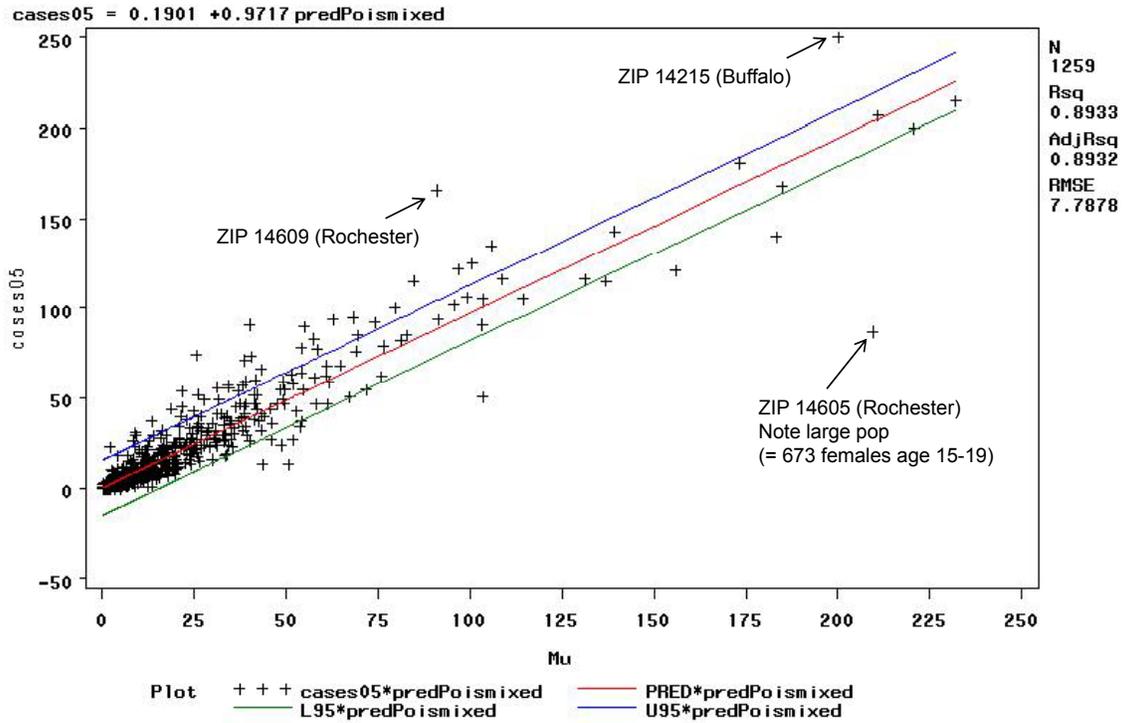
both programs



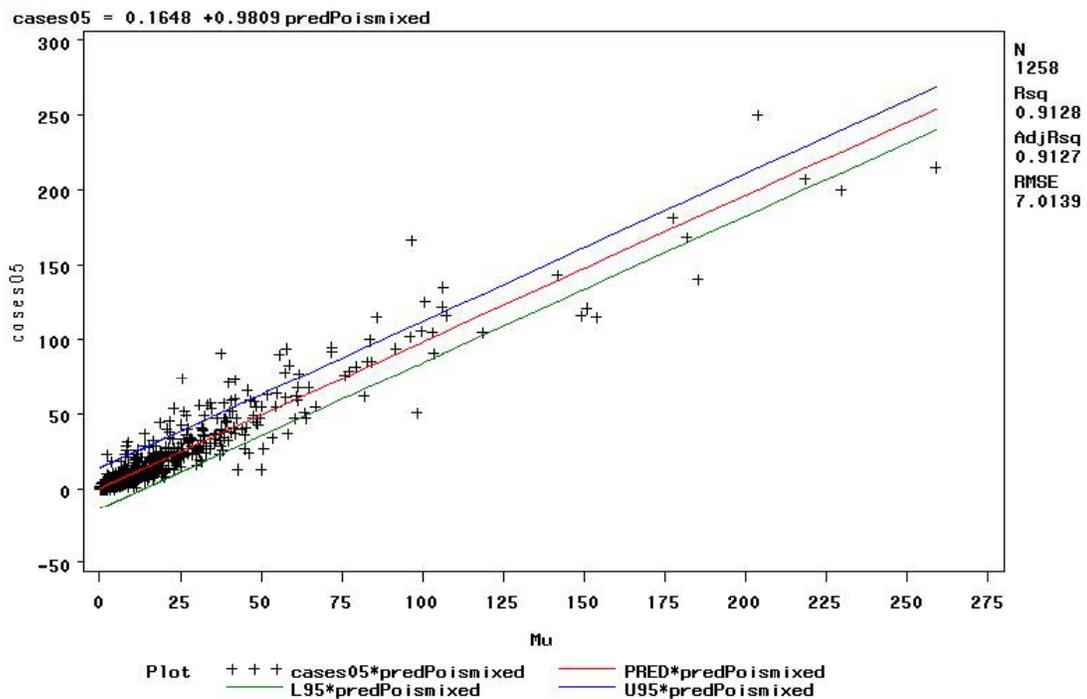
DOH
January 2010

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

Teen Pregnancy, excluding NYC, Observed vs Predicted

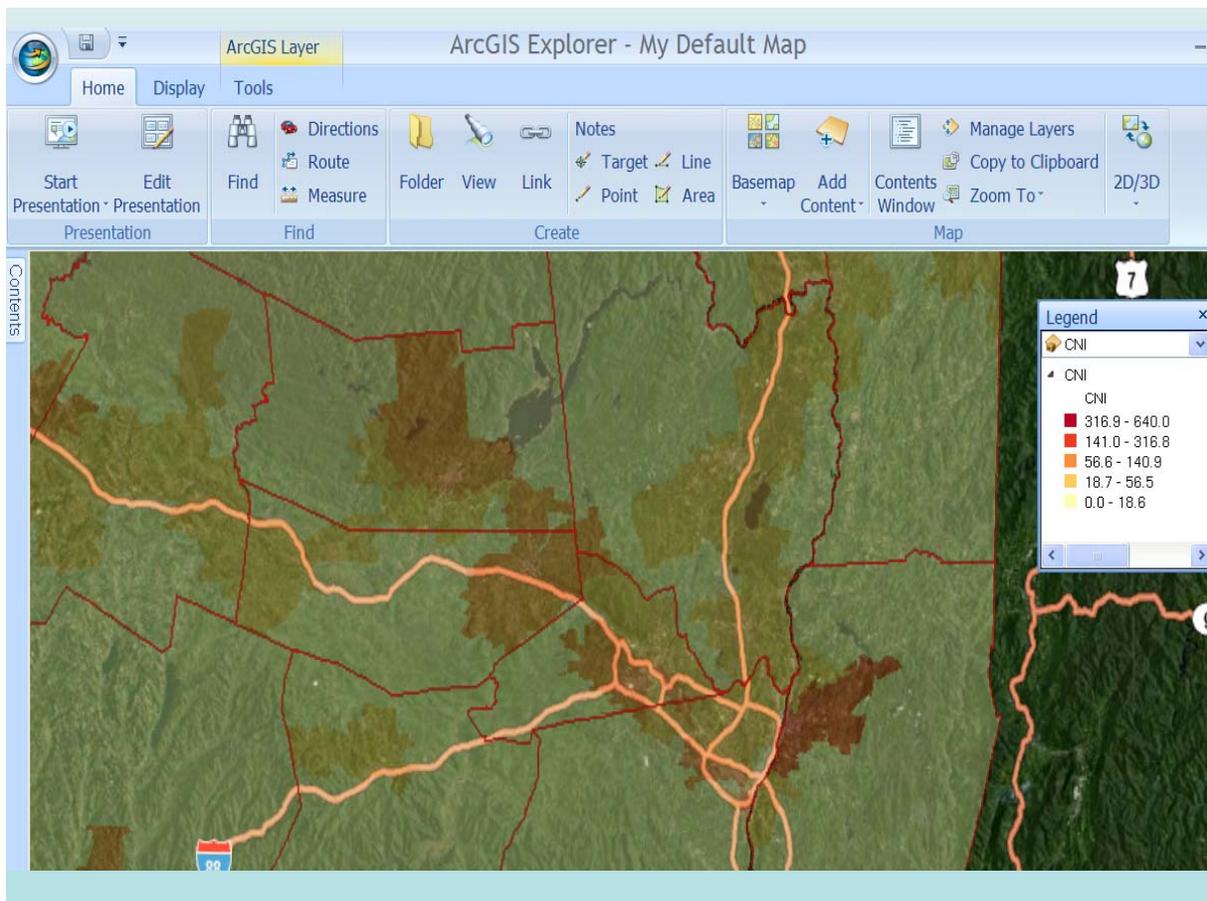
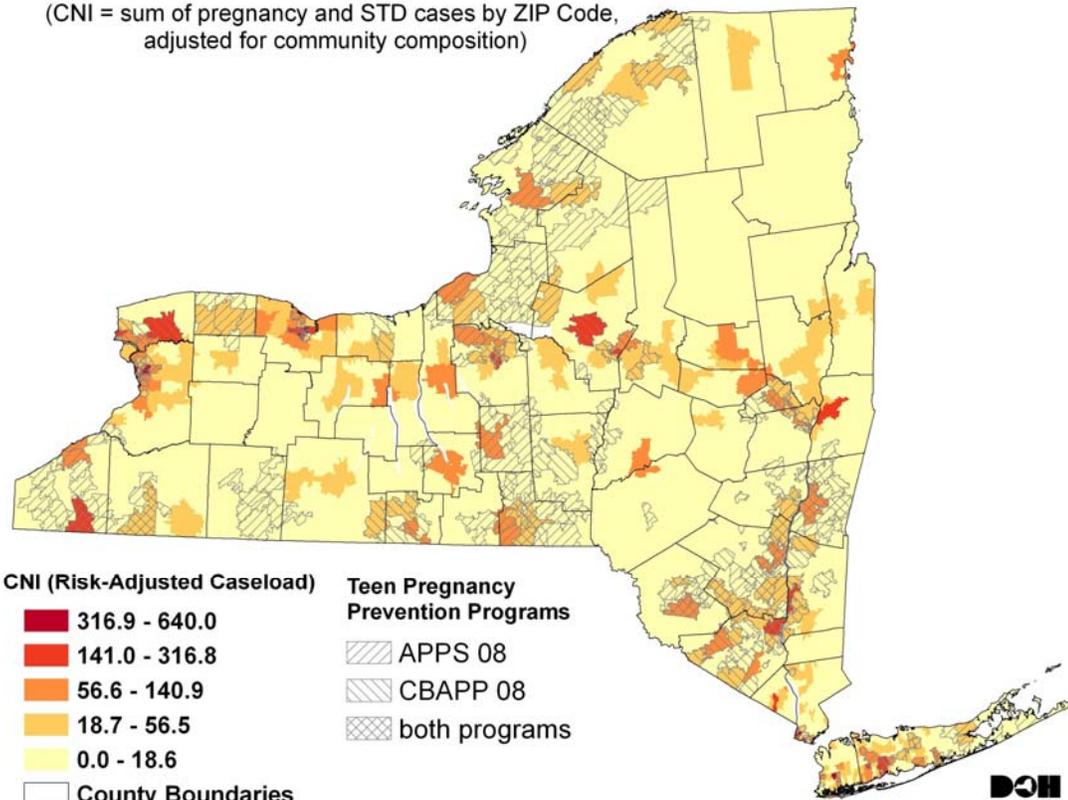


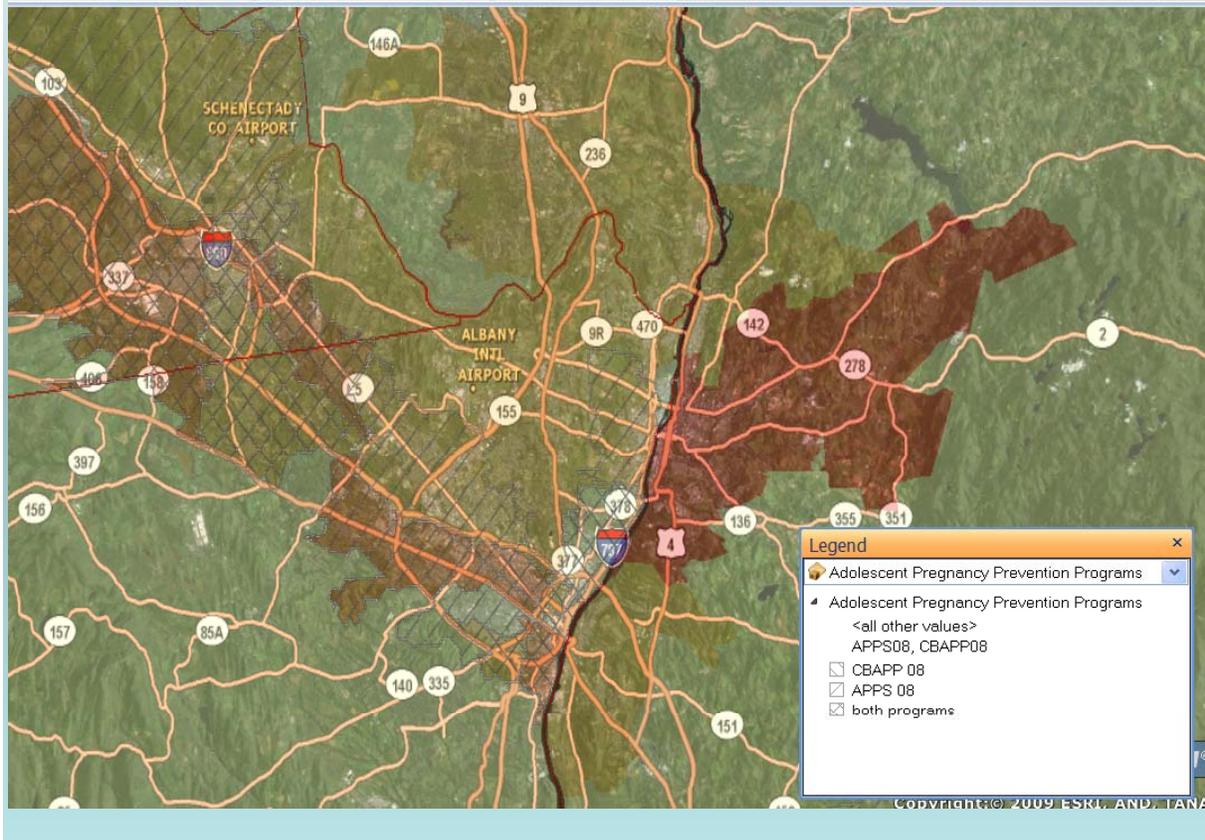
Teen Pregnancy Observed vs Predicted, excluding NYC and ZIP 14605



Adolescent Sexual Health Community Needs Index, Year 2005-2006

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





Troy

ZIP code in 2007	12180
NAME	Troy
primary county FIPS	083
secondary county FIPS	
tertiary county FIPS	
primary county name	Rensselaer
pop in 2006, age 15-19	4250
female pop in 2005, age 15-19	1844
% over age 25 with 4-yr college	25.57
% single-parent households	12.62
% naturalized citizens	2.37
% black	9.71
% hispanic	3.59
% in poverty	15.46
targeted by CBAPP in 2008	
targeted by APPS in 2008	
STD cases in 05-07, annualized ave.	106.33
STD rate in 05-07, annualized ave.	25
teen preg cases in 04-06, annualized ave.	102.33

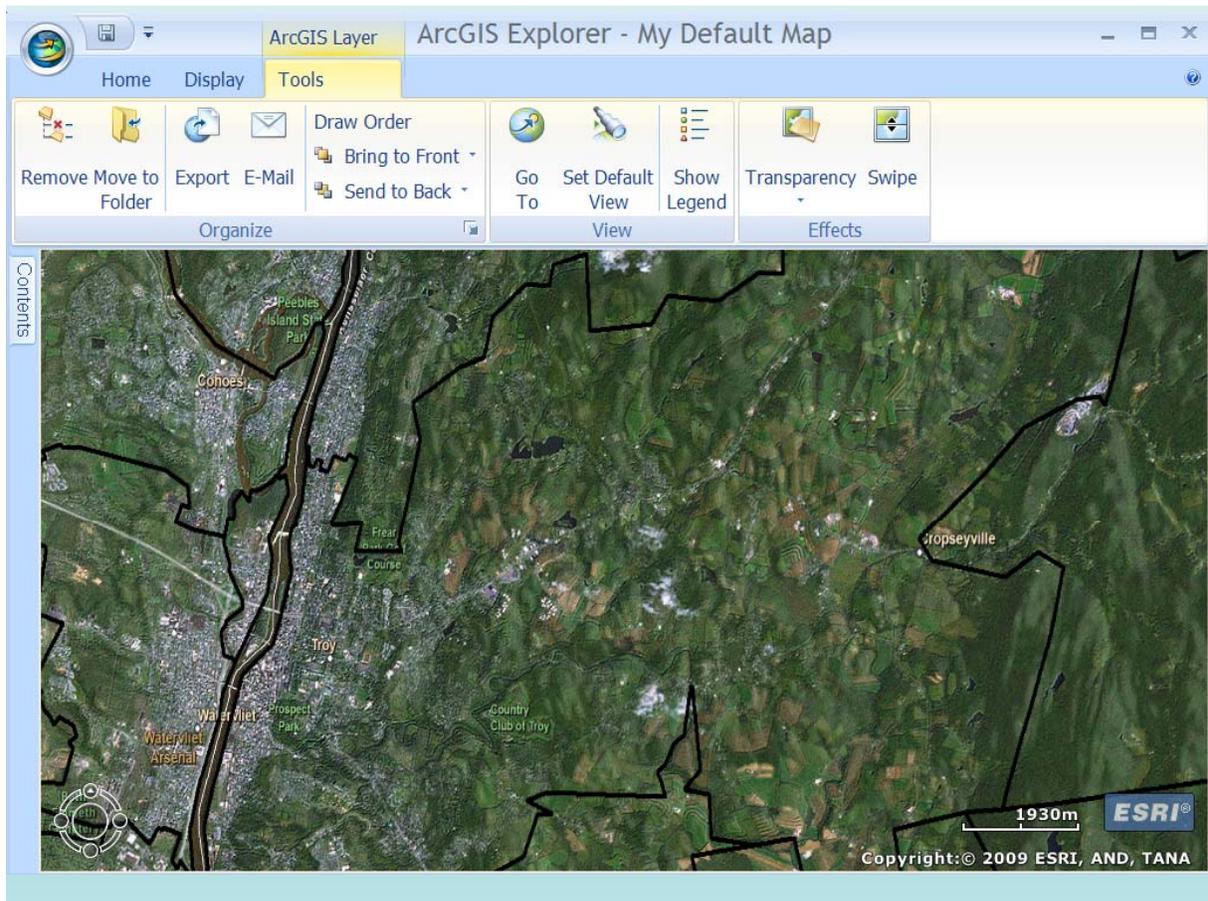
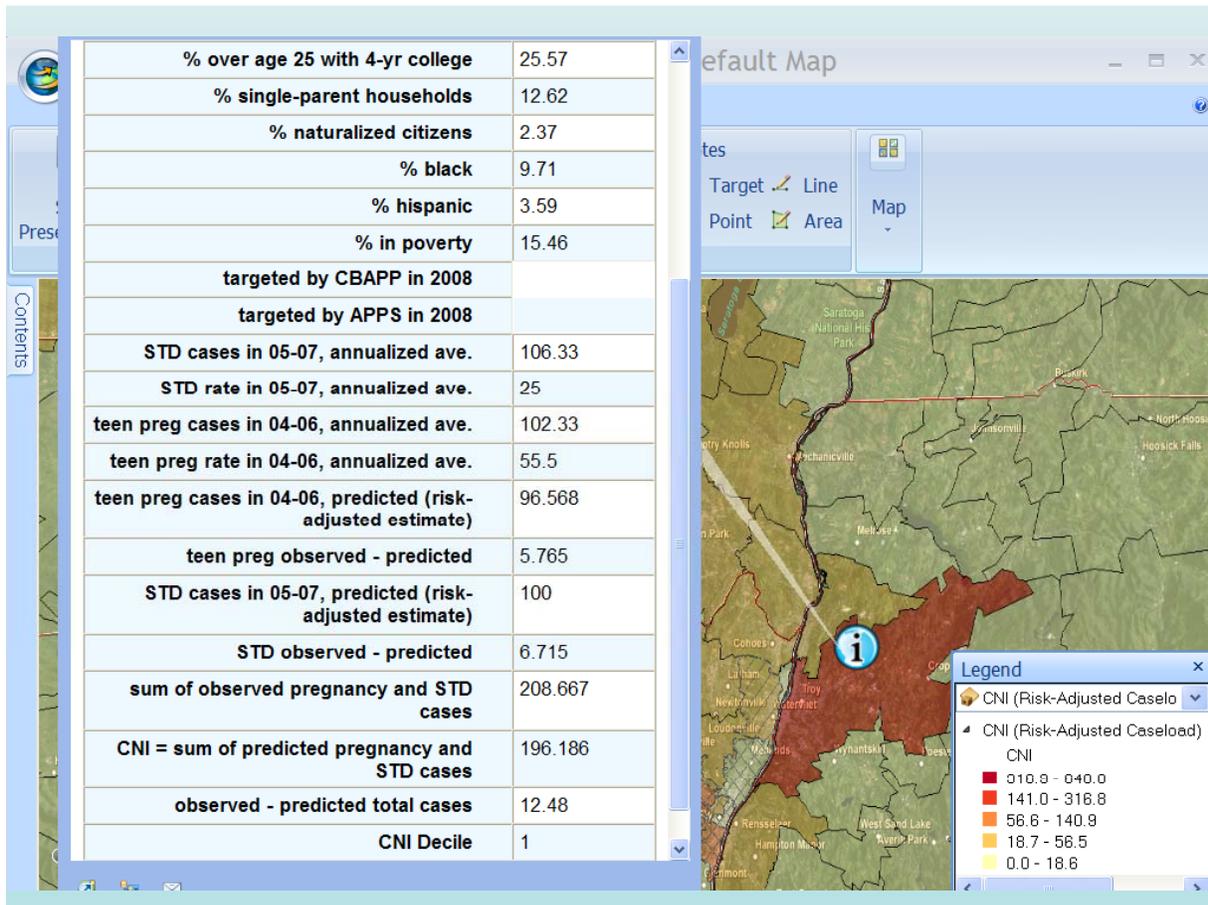
default Map

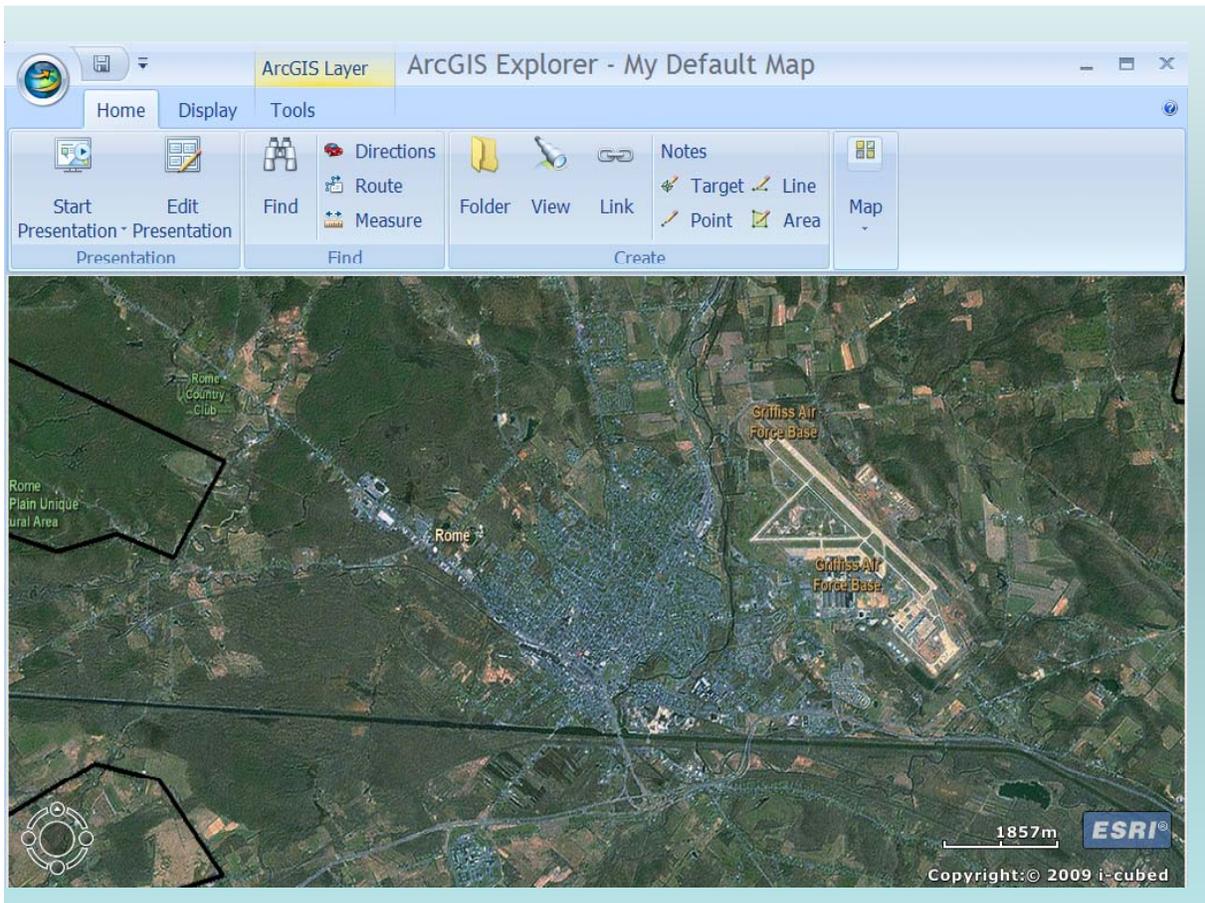
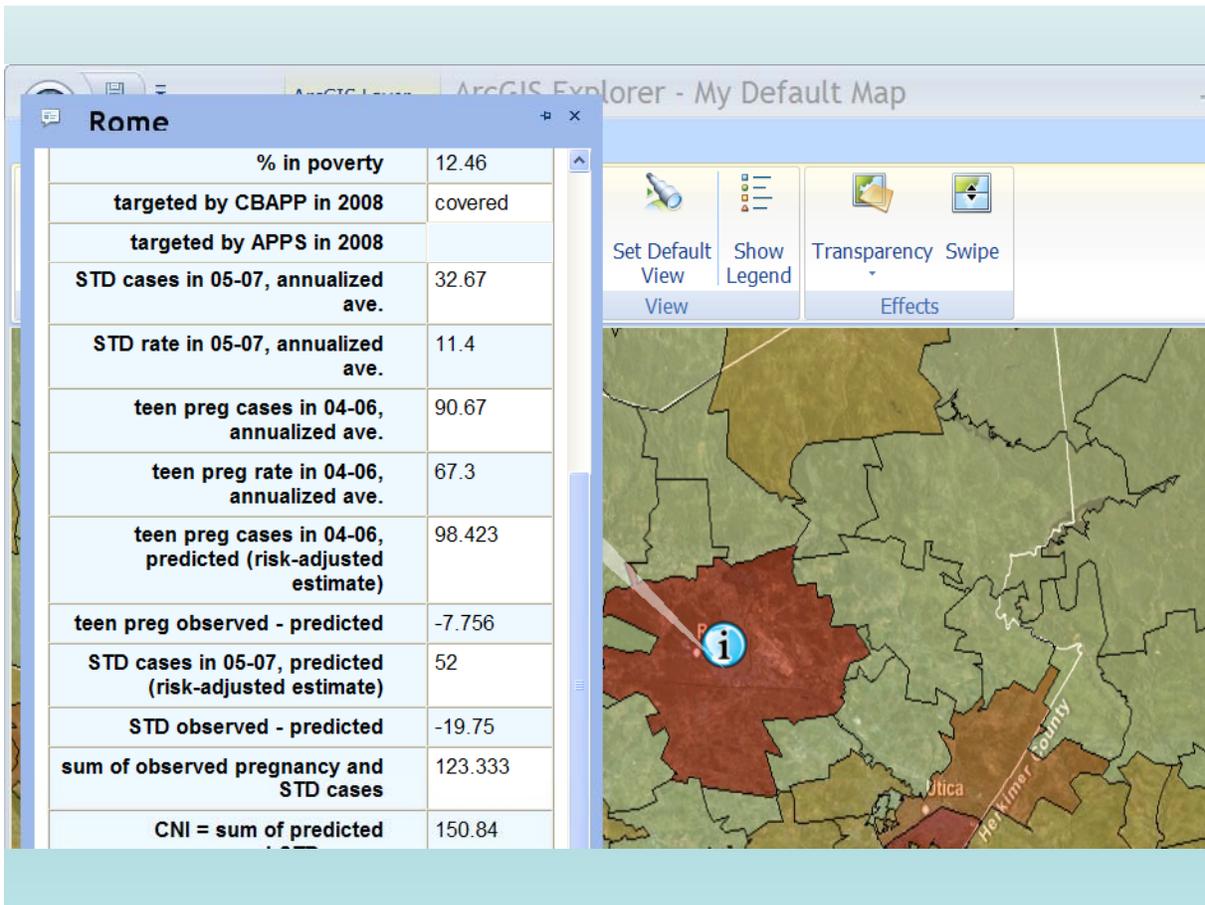
Target Line
Point Area

Legend

CNI (Risk-Adjusted Caseload)

- CNI
- 316.9 - 640.0
- 141.0 - 316.8
- 56.6 - 140.9
- 18.7 - 56.5
- 0.0 - 18.6





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:

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