Abstract

We use generalized linear models to study the effect of availability of family planning services, socioeconomic and demographic factors on the teenage birth rates in the state of Texas. In addition to these factors, we compare the recent downward trend among the white, black and Hispanic teen birth rates. Fitting the generalized linear mixed models using the WinBUGS software incorporates over-dispersion, temporal correlation and spatial variation. Birth counts data for the 15-17 years old girls from the 254 counties in Texas over the years 1990-1999 are used.

Methodology

For analyzing birth counts, we consider a Poisson model. Let $Y_i$ denote the observed count of live births given by 15 to 17 years old girls in county $i$ ($15 \leq i \leq 254$) during the year $j$ (1990 $\leq j \leq 1999$). We assume that $Y_i$ is a Poisson random variable with mean $N_i \lambda_i$. Here $N_i$ and $\lambda_i$ are respectively the population size of 15-17 years old girls and the expected birth rate for this age group in county $i$ during year $j$. The Poisson distribution serves as an approximation to a binomial distribution, say $Y_i = B(N_i, \lambda_i)$.

We relate the birth rate $\lambda_i$ to various covariates using a log-linear model

$$\log(\lambda_i) = X_i \beta + \gamma_1 + \gamma_2 + \epsilon_i$$

Bayesian Formulation

$\beta$: parameters for county-specific covariates $X_i$.

Prior distribution: $\beta \sim N(0, \sigma_\beta^2)$

Large-scale Spatial Variation

$\gamma_1$: spatial-effects with quadratic temporal trend over each of the 11 public health regions (PHRs)

$\gamma_2$: spatio-temporal effects with quadratic temporal trend

The objectives of this report are

1. To study the socioeconomic and demographic factors influencing the variation in teenage birth rates among the white, black and Hispanic Texan girls.
2. To study the temporal and spatial trends in teen birth rates in Texas from 1990 to 1999.

Data

To model the birth rate, counties in Texas are used as the unit of aggregation. The data pertain to the 15-17 years old girls during the years 1990 to 1999. County level birth counts and population estimates data were gathered from the Texas department of health (www.tdh.state.tx.us) and the Expert Health Data Programming Inc. of Houston (www.etdip.com) web pages. County level data on socioeconomic, demographic and health services variables were gathered from various sources.

County level explanatory variables:

1. Urbanity: An index measuring the degree of urbanization in the county
2. Child Poverty: Percent of county residents under age 18 living in poverty in 1995
3. Not In School: Percent of 16-19 years old not going to school and not high school graduates in 1990
4. Fem Labor: Labor force female participation rate (percent) in 1990
5. FamClinics: The number of family planning clinics in the county in 1999

The birth rates per 1000 girls from the three race groups and over the years 1990-1999 are shown in Figure 1. The racial differences in the rate decline are evident. The decline of birth rates for black teen girls is in line with the national trend.

![Graph showing birth rates per 1000 girls 15-17 years old](image)

**Fig 1. Observed Birth Rates per 1000 Girls 15-17 Years Old**