In 1997, São Paulo, Brazil experienced a measles outbreak with an unusually high average age of infection. It has since been hypothesized that this high age of infection was due to unvaccinated rural adults traveling to urban communities. This project tested this hypothesis through the use of descriptive statistics and nonparametric analyses of variance. Evidence was found for varying adult transmission patterns between urban and rural communities. Forty-nine counties displayed a multimodal distribution of age of infection, and the rest were categorized as moderately multimodal or non-multimodal. The average outbreak size was significantly different between the multimodal, moderately multimodal, and non-multimodal counties: Counties which were not multimodal, displayed a high modal age of infection. Small outbreak sizes typically have a large density of cases from ~20 to ~25 years of age during the middle of the outbreak. Classical studies, such as Anderson and May 1983, have identified children of primary school age (five to ten years old) as spreaders and amplifiers of infection in small outbreaks. The older than average age of infection seen in the São Paulo state outbreak suggests amplifiers of infection in measles outbreaks. São Paulo state, Brazil experienced a large measles outbreak during the months 10 and 11 of 1997. This study examined how the age structure of an outbreak in São Paulo state, Brazil varies, and how this affects the spread of infection between urban and rural communities. Used Kruskal-Wallis test and bootstrapped 95% confidence intervals to examine differences of quartile values between urban and rural counties in Sao Paulo state. Differences in age distribution patterns in urban and rural counties of São Paulo state, Brazil: 1. How does the distribution of age of infection differ between urban and rural counties? 2. Do unimodal counties share a common mode with multimodal counties? 3. Are outbreak size and multimodality related? Methods

- Used the non-parametric Kruskal-Wallis test and bootstrapped 95% confidence intervals to examine differences of quartile values between urban and rural counties in São Paulo state throughout the course of the outbreak.
- Identified counties which display a multimodal distribution of age of infection with Hartigan’s dip test.
- Used Kruskal-Wallis tests to determine if multimodality is related to outbreak size.

Results

- Figure 1. São Paulo’s location in Brazil

- Figure 2. Age distribution of cases throughout the epidemic for São Paulo state.

- Figure 3. 25th percentile, mean, and 75th percentile values for urban and rural counties in São Paulo state. Urban age of infection tended to be higher than rural age of infection for the mean and 75th percentile. These values were found to be significantly different (Kruskal-Wallis one way analysis of variance p = 0.000597 and p = 0.008133) between urban and rural counties. This can be visualized by the white space between bars, which represents the statistically significant difference between the quartile values for each county type.