

Background

- Harris County has a population of over 4.3 million people, and 2.1 million are under the jurisdiction of HCPHES
- Unvaccinated children are at increased risk of contracting pertussis, and respiratory illness can spread quickly within the classroom environment.
- Texas state law grants parents the right to exempt their children from school vaccination requirements for medical reasons or reasons of conscience.¹
- Despite high levels of vaccine acceptance, pertussis has likely resurged in the school-age population due to waning vaccine immunity over time.²
- Assessing school-age pertussis cases for vaccination history and illness source with a comprehensive look at exemption rates and incidence rates in school districts is important for public health to identify and target districts needing vaccination and disease prevention education.

Objectives

- Describe which school-age age groups are most affected by pertussis
- Assess known sources of pertussis in students
- Examine vaccine status and the length of time from vaccination to active disease onset
- Analyze socioeconomic indicators that may contribute to acquiring pertussis
- Determine how district exemption rates might be related to incidence of pertussis

Methods

- Harris County pertussis cases age 5-19 with onsets between August 2007 and June 2015 were extracted from the surveillance database.
- Cases were considered up to date (UTD) if all recommended doses were received by onset and not up to date (nUTD) if the recommended vaccine period was exceeded by one month without a dose.
- Vaccine exemption rates were recorded from 19 school district annual reports.
- Pearson correlations were calculated using Stata 13 to determine the association between school district exemption rates and disease incidence for the 2012-13, 2013-14, and 2014-15 school years.
- Incidence rates for children age 5 to 19 years were calculated using the Public Health Disparities Geocoding Project (PHDGP) methodology. 2010 decennial census population data was used for all denominators.
- The area-based socioeconomic measure used was “% of persons living below the poverty level”. The following poverty level cut points were used: 0-4.9%, 5.0-9.9%, 10.0-19.9%, and ≥20. The majority educational attainment groups were determined based on the majority educational attainment for adults in that census tract

Results

Descriptives

The majority of cases appear in younger age groups and non-Hispanic whites. Analysis revealed 123 isolated cases and 72 clusters of which 3 were associated with schools.

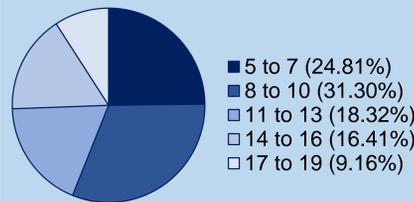


Figure 1. Age distribution of pertussis cases

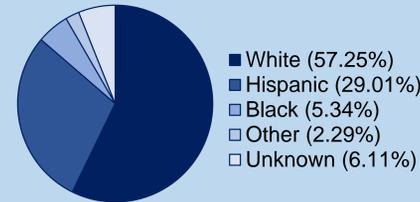


Figure 2. Race distribution of pertussis cases

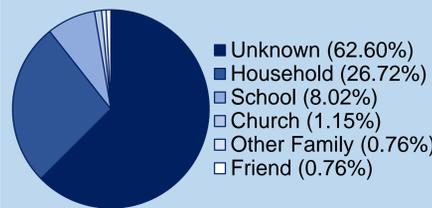


Figure 3. Pertussis case sources

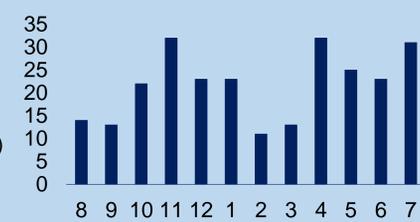


Figure 4. Case onsets by month

Vaccination Status

Vaccination status was known for 75.19% of cases with 80.71% considered up to date. Amount of time between last pertussis containing vaccine and illness onset ranged from < 6 months to over 15 years with most cases falling between 2 years and 6 years. This may demonstrate that immunity does wane during this time period, and there may be a need for an additional booster.

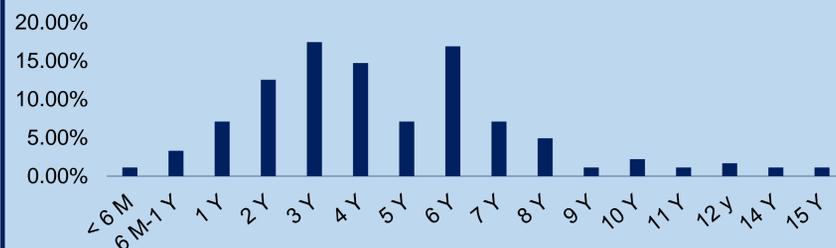


Figure 5. Amount of time since last pertussis vaccine

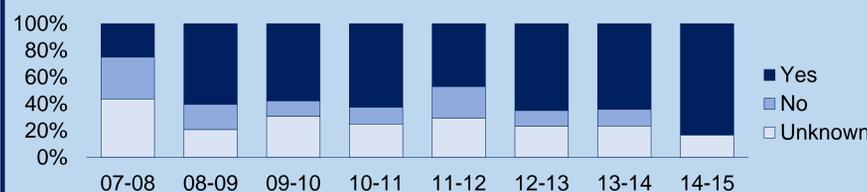


Figure 6. Case vaccination status by school year

Socioeconomic Indicators

Census tract analysis shows that cases are more likely to be found in census tracts with higher household income levels and with higher education levels

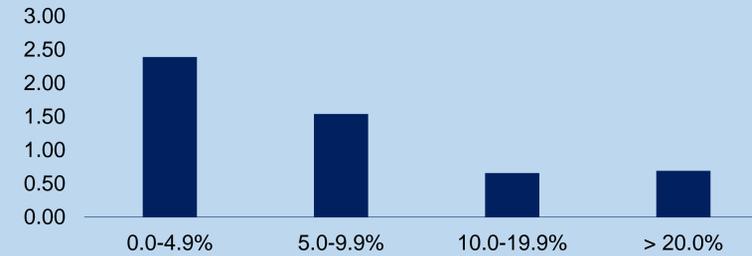


Figure 7. Average annual incidence per 100,000 by poverty level group

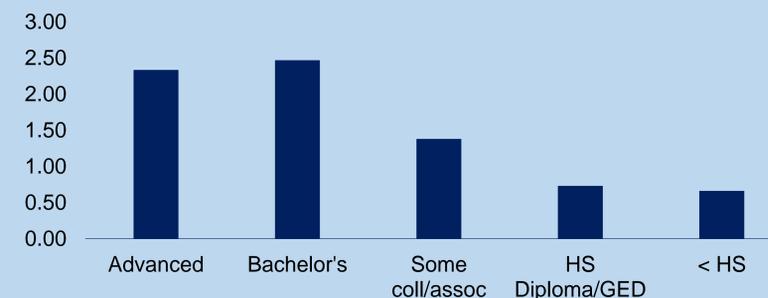


Figure 8. Average annual incidence per 100,000 by parental educational attainment

Vaccine Exemptions

Correlation coefficients between district exemption rates (X) and school-age pertussis incidence (Y) for the 2012-13, 2013-14, and 2014-15 school years were 0.312, 0.403, and 0.512, respectively, showing a moderate to strong positive relationship.

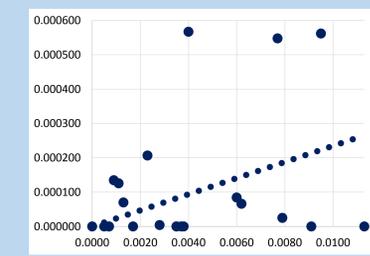


Figure 9. 2012-2013 correlation

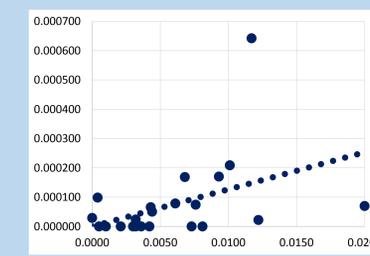


Figure 10. 2013-2014 correlation

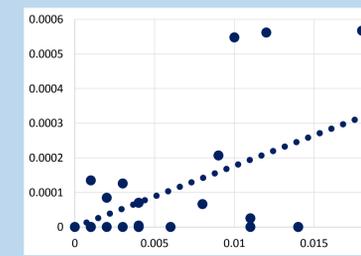


Figure 11. 2014-2015 correlation

Conclusions

- The number of childhood cases between 2007 and 2015 is moderately associated with school district exemptions, although correlation does not explain the relationship, and there may be other factors involved.
- School-age children who become infected with pertussis are more likely to live in wealthier census tracts where the majority parental educational attainment is high.

Recommendations

- Utilize the same methods for the analysis of other vaccine preventable diseases in the school-age population
- This analysis may be useful when evaluating high risk school districts and targeting vaccination and prevention efforts
- Acquire control data to identify demographic, vaccination, and socioeconomic differences between those who get pertussis and those who do not
- Conduct further analysis on waning immunity to determine the best time frame for an additional booster

Limitations

- HCPHES only has access to the cases within its jurisdiction. There may be other cases
- This analysis only considers public schools as there is limited information available for private schools.
- Pertussis is likely underreported

Acknowledgement

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References

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- Mooi, F.R., Van der Maas, N.A.T., & De Melker, H.E. (2014). Pertussis resurgence: Waning immunity and pathogen adaptation-two sides of the same coin. *Epidemiology and Infection*, 142(4), 685-694.

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