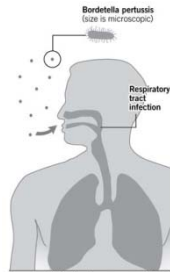


Hospitalization Risk for Infants with Pertussis, Texas, 2009

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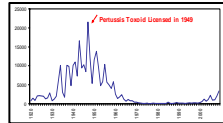
Causative Agent and Incidence of Pertussis

Bordetella pertussis, the causative agent of pertussis (whooping cough), colonizes the upper respiratory tract of humans. The bacteria reproduce on ciliated epithelial cells and release toxins that kill the ciliated cells and macrophages, producing the clinical symptoms.



Source: California Department of Health Services, MedicinePlus, Los Angeles Times

Reported Cases of Pertussis in Texas, 1920-2009



During the early 20th century, pertussis was a significant source of childhood morbidity and mortality. Between 1947 and 1980, however, vaccination against pertussis was effective in lowering Texas pertussis cases by 99%. Despite continued vaccination, pertussis cases have steadily increased since the 1980s. In 2009, there were 3,358 reported pertussis cases in Texas, the most since 1959. Of those cases, 290 were hospitalized, 252 of whom were under 12 months old. Of the 657 infant cases, 38% were hospitalized.

Purpose and Methods

The purpose of this analysis was to identify risk factors for hospitalization from pertussis using Texas surveillance data from 2009. Medical providers, schools, laboratories, and the public report suspected pertussis cases to health departments. Health department staff then investigate and collect data on the clinical symptoms, demographic characteristics, potential contacts, and vaccination status for each case. Excel and Epi Info were used to analyze these data. Cases were considered vaccinated if they had received one or more doses of a pertussis vaccine. Cases were considered "behind" if they did not meet the Advisory Committee on Immunization Practices' (ACIP) recommendations (see chart below) for their age. Eligible cases were defined as those eligible for the next dose in the series (ie, a 4 month old with 1 dose). Cases were considered "up-to-date" if the cases met the ACIP recommendations for their age.

Recommended Immunization Schedule for Persons Aged 0 Through 6 Years—United States • 2010
For those who fall behind or start late, see the catch-up schedule

Vaccine	Age	Birth	1 month	2 months	4 months	6 months	12 months	15 months	18 months	19-23 months	2-3 years	4-6 years
Hepatitis B ¹		HepB		HepB						HepB		
Hepatitis A ²			1st	2nd								
Diphtheria, Tetanus, Pertussis ³			DTaP	DTaP	DTaP	DTaP				DTaP		DTaP
Haemophilus influenzae type b ⁴			HiB	HiB	HiB	HiB						
Pneumococcal ⁵			PCV	PCV	PCV	PCV						PPSV
Inactivated Poliovirus ⁶			IPV	IPV	IPV	IPV						IPV
Influenza ⁷												
Meningococcal ⁸			Men	Men								Men
Varicella ⁹												Var
Hepatitis A ¹⁰												
Meningococcal ¹¹												MCV

Taken from: <http://www.cdc.gov/vaccines/recs/schedules/child-schedule.htm>

Risk Factors for Hospitalization

Hispanics under 12 months old with pertussis were 34% more likely to be hospitalized than their non-Hispanic White counterparts (see table at right). This result is consistent with previously published studies that found Hispanic infants had a greater risk of mortality from pertussis compared to their non-Hispanic counterparts (1,2). Non-Hispanic Black infants in Texas in 2009 with pertussis, however, did not have an increased risk for hospitalization compared to their non-Hispanic White counterparts.

The increased risk for hospitalization and mortality for Hispanic infants may be due to racial and ethnic differences in health-care seeking behaviors. For example, insured Spanish-speaking Hispanic patients have been shown to be less likely than insured non-Hispanic White patients to visit a physician (3). These behaviors may affect hospitalization rates.

The risk of hospitalization for unvaccinated 2-11 month olds with pertussis was significantly greater than that for their vaccinated counterparts. Eligible cases were also at greater risk for hospitalization compared to up-to-date cases. It is unclear why eligible infants had an increased risk for hospitalization, but behind infants did not. Sample size may have contributed to this finding.

Stratification of Significant Risk Factors for Hospitalization by Race/Ethnicity

When the relative risk of hospitalization was stratified by race/ethnicity, unvaccinated cases of all races/ethnicities were at increased risk for hospitalization compared to vaccinated cases. The relative risk of hospitalization for unvaccinated non-Hispanic Black cases may be skewed due to small sample size. Stratified analysis of eligible cases by race/ethnicity could not be performed due to small cell size (n<5).

Summary

In 2009, the vast majority of hospitalizations from pertussis occurred in the under 12 month old age group. Within this age group, even one dose of pertussis vaccine appeared to reduce the risk of hospitalization from pertussis. Although neither gender had an increased association with hospitalization, race and ethnicity may be associated with hospitalization. Importantly, race and ethnicity did not affect a patient's association with vaccination. This suggests that the increased risk for hospitalization of Hispanic infants was independent of vaccination status.

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Hospitalization Risk by Selected Variables

	Relative Risk for Hospitalization (95% CI)
Hispanic (n=327)	1.34 (1.06<RR<1.68)
Black, non-Hispanic (n=43)	1.06 (0.67<RR<1.66)
White, non-Hispanic (n=206)	1.0 (Reference Group)
Female (n=305)	1.15 (0.96<RR<1.38)
Male (n=352)	1.0 (Reference Group)
*Unvaccinated (n=86)	2.16 (1.55<RR<3.02)
*Vaccinated (n=253)	1.0 (Reference Group)
*Behind (n=72)	1.43 (0.93<RR<2.21)
*Eligible (n=54)	2.16 (1.47<RR<3.18)
*Up-to-date (n=181)	1.0 (Reference Group)

* Restricted to those eligible for vaccination (2-11 month olds)

Hospitalization Risk by Vaccination Status for Racial/Ethnic Groups

Race/Ethnicity	Relative Risk for Hospitalization of Unvaccinated Cases Compared to Vaccinated Cases (95% CI)
Hispanic (n= 166)	2.08 (1.56<RR<2.79)
Black, non-Hispanic (n=54)	5.70 (1.44<RR<22.53)
White, non-Hispanic (n=101)	2.68 (1.72<RR<4.18)