



The California Pertussis Epidemic 2010: 986 Pediatric Cases from San Diego County

Marilynn Chan MD¹; Dean Sidelinger MD, MSEd²; Linda Bethel BSN, MPH²; Jessica Yen MPH²; Lawrence Ma MD¹; Alda Inveiss¹; Mark Sawyer MD^{1,2,3}; John Bradley MD^{1,3}



¹Department of Pediatrics, University of California San Diego School of Medicine, San Diego, CA; ²County of San Diego Health and Human Services Agency, San Diego, CA; ³Rady Children's Hospital San Diego, San Diego, CA

ABSTRACT

Title: The California Pertussis Epidemic 2010: 986 Pediatric Cases from San Diego County
Background: The California Department of Public Health (CDPH) declared pertussis epidemic on June 23, 2010. More cases were reported in 2010 (9146) than in any year since 1947.
Objective: To describe the characteristics of pertussis epidemiology and disease in children in San Diego County (population 3.2 million)
Methods: Descriptive statistics were abstracted from CDPH pertussis case report forms (CRF), which were completed by public health nurses (PHN) investigating reports of positive laboratory results for pertussis and reports of illnesses compatible with pertussis.
Results: Of 1144 reported adult and pediatric cases, 753 (66%) were confirmed, 391 were probable/suspect. Children under 19 years comprised 86% of reported cases; of these, 22% were 11-18 years, 29% 6-10 years, 27% 1-5 years, and 22% under 1 year (with 70% under 6 months). Case rates were highest in infants under 6 months (651/100K population). Of those over one year, the highest attack rates were in preschool aged children 1-5 years (114/100K) and elementary school-aged children 6-10 years (141/100K). By history, exposures occurred primarily in the home (58% of all cases), or at school (31%), with only 6% linked to daycare. Of cases over 6 months, 90-95% had at least one dose of vaccine, with 5% citing personal belief exemption for lack of immunization. Of 51 children hospitalized, 82% were under 6 months; 2 deaths occurred in these young infants. Of those under 6 months, 53% were Hispanic. Apnea was noted in 26% of infants under 6 months. Paroxysmal cough was noted in over 70% of children in all age groups; post-tussive vomiting occurred in 36% (11-18 years) to 57% (under 6 mos) of children.
Conclusions: Reasons for widespread pertussis are unknown. These data primarily represent passive reporting and subsequent CRF completion. Pertussis vaccine efficacy may decrease more rapidly than previously believed, facilitating spread of pertussis in elementary school-aged children. However, the highest case rates and the only mortality occurred in inadequately immunized infants under 6 months.

OBJECTIVES

- Our goal was to identify clinical and epidemiologic characteristics of pertussis cases in San Diego County in 2010. This investigation was designed to provide insight into vaccine efficacy, epidemic control measures, and provide a description of pertussis disease in 2010.

METHODS

- Case Report Data Acquisition and Analysis.** Data from confirmed, probable and suspect cases of pertussis reported to San Diego Human Health and Services Agency between January 1, 2010 and December 31, 2010, were collected for 986 patients, 0-18 years of age. The data were received from a variety of sources including initial reporting from laboratories (per state reporting requirements) as well as from healthcare facilities, practitioners and school nurses in San Diego County. Follow-up telephone interviews with patients, families, and their respective physicians' offices were conducted by San Diego PHN's.
- The California Department of Health clinical case definition was used for this local health department investigation: A cough illness lasting ≥ 2 weeks with at least one of the following: paroxysms of coughing (eg, "uncontrolled coughing episodes" or "fits of coughing") or inspiratory "whoop" or post-tussive vomiting; without other apparent cause (as reported by a health professional). This definition, as well as definitions of confirmed, probable and suspect pertussis, are consistent with Centers for Disease Control and Prevention (CDC) definitions.
- Patients' medical records were provided when nurses conducted follow-up interviews with physicians' offices. Nurses consulted the San Diego Immunization Registry (SDIR) to retrieve vaccination history if not known by patients/parents. The data collected and recorded on the California State Pertussis Case Report forms was then entered into a database, the Visual Confidential Morbidity Report (VCMR) by study authors.
- Study epidemiologists analyzed the data in the VCMR, generating descriptive statistics. The County of San Diego authorized entry of these data into de-identified databases using electronically secure County facilities.

RESULTS

- Reported Cases.** A total of 1144 cases of pertussis were reported to the County of San Diego Health and Human Services Agency in 2010 with 986 cases (86%) occurring in individuals between 0-18 years of age. Of these cases, 66% were classified as confirmed, 11% as probable, and 23% as suspect.
- A first peak was noted in July (n=166) with a second in October (n=165) (Figure 1). Of interest, the epidemic first peaked for school aged children (6 years and older) just after the school year had concluded, in July, while the epidemic in preschool children (5 years and younger), peaked in November (Figure 2)
- Ethnicity.** Whites and Hispanics were noted to have the highest attack rates at 152 per 100,000 and 114 per 100,000 respectively, followed by Blacks and Asians at 70 and 58 per 100,000 respectively. The highest rates for any age/ethnic population occurred in Hispanic infants under 6 months of age, reported at 724 per 100,000 (Fig 3).

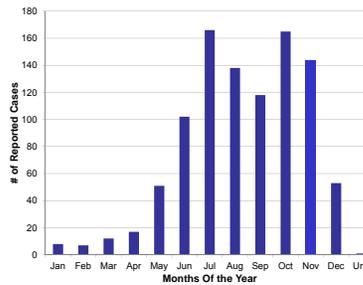


Fig. 1. Reported Pertussis Cases by Month

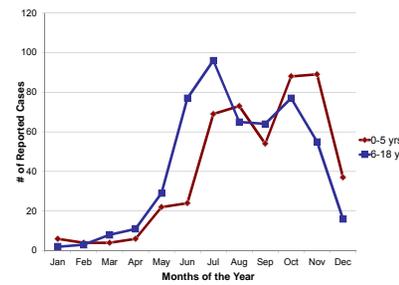


Fig. 2. Reported Pertussis Cases by Month and Age Group

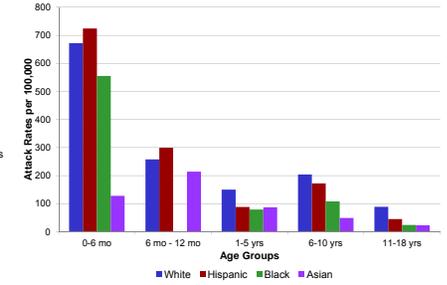


Fig. 3. Attack Rates by Age and Ethnicity

- Immunization History.** From data collected on 976 children, 886 had received at least one dose of pertussis-containing vaccine, while 90 had received no doses. Of 69 completely unimmunized children for reasons other than "under age", 55 cited personal belief exemptions as the reason for lack of immunization, 12 cited a delay in obtaining vaccine, and only one cited a medical exemption
- Clinical Disease.** Cough was reported in over 99% across all age groups, which is consistent with this symptom being required for a case to be reported. However, paroxysmal cough was noted in over 70% of children in all age groups. Whooping as a cough characteristic was highest in children under 1 year (44%) and progressively decreased to 22% in 11-18 year olds. Post-tussive vomiting occurred in comparable percentages in each age group, from 38% in infants under 6 months (57 of 151) to 32% in those 11-18 years of age (70 of 218). Apnea was noted in 26% of infants under 6 months, 14% in 6 month - 12 months, 8% in 1-5 years old, 1% in 6-10 years old, and 2% in 11-18 year old children. (Figure 4).
- Of 51 children hospitalized, 42 (82%) were under 6 months. Of these 42 children, 2 deaths occurred in very young infants (both Hispanic) under 2 months of age, felt to be secondary to hyperviscosity and/or pulmonary hypertension; 1 additional child had encephalopathy, and 2 others had seizures felt to be secondary to the underlying pertussis infection. In children older than 6 months, 2 were reported to have seizures felt to be related to pertussis.

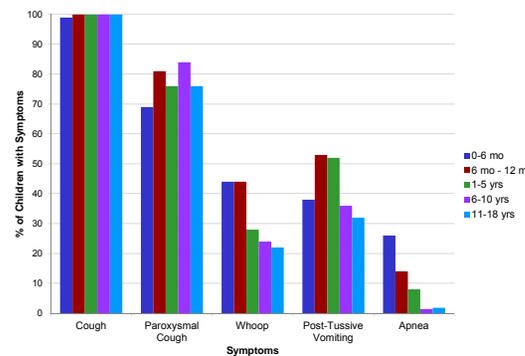


Fig. 4. Percent of children with symptoms, by age group

CONCLUSIONS

- The sudden increase in pertussis disease in California is not well understood, but may include waning vaccine-mediated immunity in children who were being exposed more frequently to *B. pertussis* in community settings, by natural cyclic variations noted in pertussis disease in children, or by possible recent subtle pathogen-specific changes that may have influenced communicability, virulence, and impacted vaccine-specific immunity
- Observed increased rates of infection in young Hispanic children is puzzling, given immunization rates that are similar to other ethnic groups. Possible explanations that were not assessed on our telephone interviews could be family size/exposure density in households, genetic-related increased susceptibility to infection and clinical expression of disease or duration of immunity.
- Based on data suggesting waning pertussis immunity 5-7 yrs after prior immunization, immunization of adolescents with Tdap vaccines was recommended in 2006; given the documented disease in younger, school-aged children 6-10 years of age, the duration of true immunity (providing both lack of clinical or subclinical infection) following immunization, may be less than 5-7 years

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