

VARICELLA ACTIVE SURVEILLANCE AND EPIDEMIOLOGIC STUDIES: 1995-1996

BACKGROUND

Varicella vaccine, a live, attenuated strain of varicella-zoster virus, was approved by the US Food and Drug Administration in March 1995. In July 1996, the Advisory Committee on Immunization Practices of the Centers for Disease Control and Prevention (CDC) published its guidelines for prevention of varicella and recommended routine use of varicella vaccine for infants 12 to 18 months of age as well as for older susceptible individuals.¹ The vaccine has generated controversy, concerning the questions of duration of immunity and a possible shift in incidence of varicella to older age groups, where morbidity and mortality are far more severe.

In September 1994, the Acute Communicable Disease Control Unit entered into a cooperative agreement with the Centers for Disease Control and Prevention to conduct active surveillance for varicella in the Antelope Valley. Our objectives were (1) to define baseline varicella epidemiology before licensure and widespread vaccine use; (2) to identify changes in varicella epidemiology occurring as a result of vaccine use; and (3) to describe the clinical and epidemiologic features of varicella in vaccinated cases. In September 1995, the project was awarded supplemental funding to (4) monitor vaccine use in the study population.

METHODS

We selected the Antelope Valley (population 300,000) for the study, in part, because its geographic isolation encourages the use of local schools and health care providers. Varicella surveillance units (N=289) included all primary care physicians; all hospitals and clinics; organizations, schools, child care, or recreational facilities with an enrollment of ≥ 12 ; employers with ≥ 500 employees; correctional facilities; and miscellaneous others likely to identify and report cases of varicella. Surveillance units submitted varicella case logs, containing the name, address, and telephone number of identified cases, via fax or mail every two weeks. Each available case was interviewed by telephone to collect detailed demographic, clinical, and health impact data. Varicella vaccine administration data were collected monthly from health-care providers. To calculate incidence rates, we used the 1995 and 1996 population estimations projected from the 1990 Modified Age, Race, and Sex (MARS) file produced by the US Census Bureau and modified by the County of Los Angeles Urban Research Section of the Internal Services Department. We began data collection January 1, 1995.

RESULTS

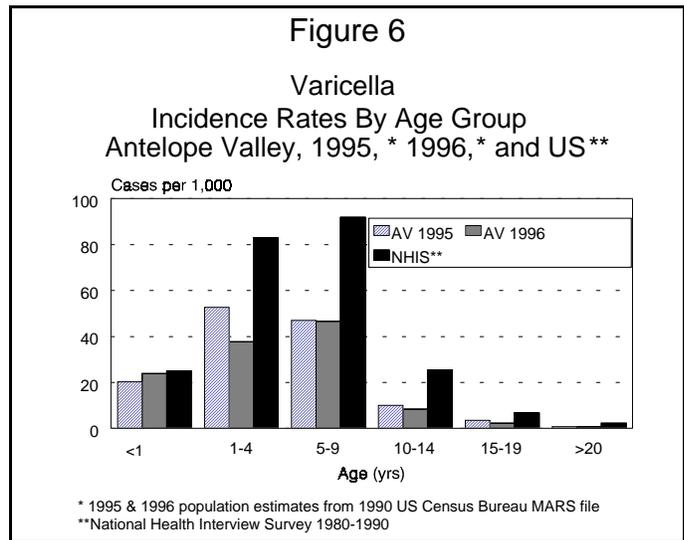
Between January 1, 1995, and December 31, 1996, 5,851 cases of varicella were identified among residents of the Antelope Valley, 3,181 in 1995 and 2,670 in 1996 (Table 7). Ninety-one percent of reported cases were verified by case interview; 6% were unavailable or declined to participate; and 3% were excluded because illness or school absence was determined not to be due to varicella. Thirty-eight percent of cases were ascertained from schools, 29% from households of reported cases, 21% from health-care providers, 11% from day care/preschools, and 3% from other sources.

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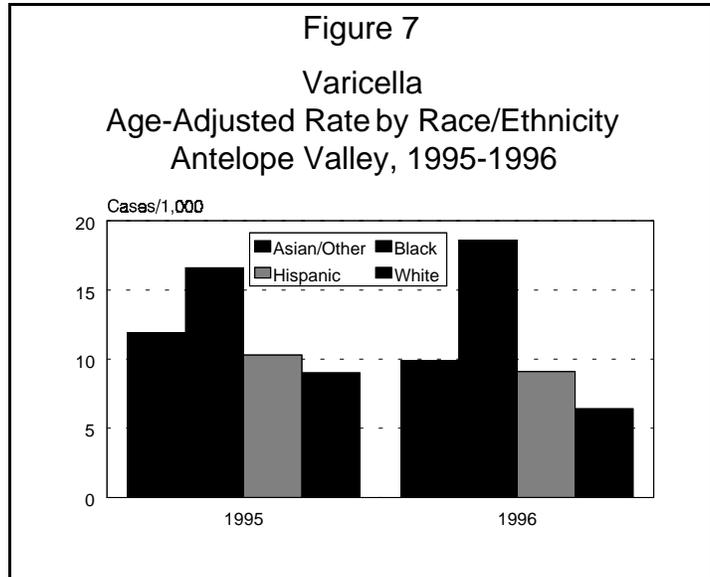
Table 6: Reported Cases of Varicella, Antelope Valley, 1995 and 1996

Status	1995		1996	
	N	(%)	N	(%)
Verified (case interview completed)	2,916	(92)	2,395	(90)
Probable (declined to be interviewed or unreachable)	165	(5)	189	(7)
Excluded (illness determined not due to varicella)	100	(3)	86	(3)
Total Reported	3,181	(100)	2,670	(100)

Age Distribution. Annual incidence rates were highest in children 5- to 9-years of age, followed by 1- to 4-year-olds, infants less than one year old, and 10- to 14-year-olds (Figure 6). There was little difference in age distribution of varicella cases in 1996 compared with 1995, except for a 30% decrease in the annual incidence rate among 1- to 4-year-olds. Compared with national rates calculated from National Interview Survey (NHIS) data, rates calculated from active surveillance data were lower for all age groups.



Race/Ethnicity. Age-adjusted annual incidence rates were higher among Blacks than other racial/ethnic groups (Figure 7). Rates in Black children 5- to 9-years-old increased from 51 cases per 1,000 population in 1995 to 95 cases per 1,000 in 1996 ($p < .05$). This finding may be an artifact of inaccurate midcensus population estimates for the Antelope Valley; data from California Basic Educational Data System (CBEDS) suggest that the number of school-aged African Americans in the Antelope Valley is substantially higher than estimations projected from the 1990 MARS file for the Antelope Valley Health District.



Disease Severity. Varicella rash was graded as mild for 37% of cases, moderate for 44%, and severe for 19%. The vast majority of cases (86%) experienced an overall severity of disease rating of 1 (mild, uncomplicated disease). None received a rating of 5 (severe, life-threatening disease or death). Disease was more severe in adults, with 31% experiencing a severity of disease rating of 2 or higher, compared with 19.7% for children less than one year, 14.6% for 1- to 4-year-olds, 12.1% for 5- to 9-year-olds, 14.0% for 10- to 14-year-olds, and 23.9% for 15- to 19-year olds ($p < .05$). Complications, defined as conditions or events within two weeks of rash onset for which the case-patient was evaluated and treated by a health-care provider, were experienced by 370 (13%) cases in 1995 and 191 (8%) in 1996. Otitis media was the most common complication, followed by bacterial superinfections. Pneumonia was reported by 14 case-patients. There were no cases of encephalitis reported during 1995 or 1996. Approximately 530 (10%) cases received antibiotics and 194 (4%) received acyclovir, including 17% of all adult cases. Thirteen cases were hospitalized, 6 in 1995 (1 in 490 cases of varicella) and 7 in 1996 (1 in 340 cases). No deaths or long-term sequelae were reported among cases.

Health Impact Data. For 1995 and 1996 combined, cases missed 29,666 days of school and 1,782 days of work due to varicella. Caretakers missed 450 days of school and 4,433 days of work. Total days of school and work missed by both cases and caretakers due to varicella were 36,331.

Completeness of Surveillance Data. The efficiency of the National Notifiable Disease Surveillance System for varicella has been estimated to be less than 4%. We used capture-recapture methods to estimate the number of cases missed by our active surveillance system and the number of actual cases of varicella occurring among children 2- to 18-years of age by analyzing the degree of overlap between two incomplete lists of cases (two-source capture-recapture methods).²⁻⁴ The two ascertainment sources used were "schools" (elementary, middle and secondary schools, preschools, and daycare facilities), and "health-care providers" (physicians, clinics, hospitals, and health maintenance organizations). We estimate completeness of surveillance data for this age group from

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all ascertainment sources to be approximately 70%.

Varicella Vaccine Utilization. Although varicella vaccine became available in late May 1995, acceptance by parents and providers appeared to be low throughout much of 1995. Vaccine administration levels increased in 1996, primarily following routine use by a large health maintenance organization and availability through the Vaccines for Children Program. By the end of 1996, 4,039 vaccine doses were reportedly administered among the study population. One- to four-year-olds received 75% of total vaccine doses administered through 1996, and adults ≥ 20 years received $< 2\%$. Thirty-two cases fit the case definition for breakthrough disease (varicella occurring in a person who received varicella vaccine more than 30 days before rash onset), for a rough estimated breakthrough rate of eight cases per 1,000 vaccine doses administered.

SUMMARY AND DISCUSSION

The three active surveillance sites (Travis County, TX, Philadelphia, PA, and Los Angeles, CA) are providing data on varicella epidemiology not previously available and may be the best sources for data on early changes in varicella epidemiology resulting from vaccine use. Baseline age distribution of varicella cases was as predicted with peak incidence occurring among school aged children 5 to 9 years old. The decline in cases among 1- to 4-year-olds in 1996 may be a result of vaccine use in that age group as part of the routine childhood immunization schedule. The finding of disproportionately high rates among Blacks requires further analysis but most likely is an artifact of inaccurate population estimates for the Antelope Valley.

The Los Angeles County Project is likely to be funded through September 1999. The study provides a unique opportunity to monitor changes in varicella morbidity and mortality and vaccine field efficacy as vaccine utilization increases. The experiences of the active surveillance sites in the design and implementation of varicella surveillance will assist state health departments as they plan for enhanced varicella surveillance to assess the long-range health impact of varicella vaccination.

REFERENCES

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