



VARICELLA ACTIVE SURVEILLANCE PROJECT (VASP) 2005 SUMMARY ANTELOPE VALLEY, CALIFORNIA

BACKGROUND

While usually a mild childhood disease, varicella tends to be more severe in adults, neonates, and immuno-compromised persons and has the capacity to lead to complications that may include pneumonia, encephalitis, and sometimes death. Prior to 1995, about 4 million cases of varicella occurred annually in the US. Of these cases, approximately 11,000 were hospitalized and 100 died (CDC, unpublished data, 1999). When the varicella vaccine was approved for use in 1995, the Los Angeles County (LAC) Department of Health Services (DHS) and the Center for Disease Control and Prevention (CDC) entered into a cooperative agreement to establish active surveillance for varicella in Antelope Valley. The resulting program, the Varicella Active Surveillance Project (VASP), has collected baseline data on varicella incidence, outbreaks, and vaccine coverage since 1995. In 2000, surveillance was enhanced with the addition of herpes zoster (HZ)—for children and adolescents 19 years of age and younger, case interviews and chart reviews have been systematically completed since 2000. As a consequence, the collection of baseline adult HZ and PHN incidence will be an important public health priority. VASP will be collecting detailed case history on all reported cases of HZ and has also added surveillance sites that will better capture adult HZ with the addition of all skilled nursing facilities, dermatology practices, pain management clinics, and additional internal medicine practices. It will be important to track the impact of this new vaccine with regards to its impact on morbidity and hospitalization due to adult HZ.

METHODS

Population Demographics: The Antelope Valley (AV) is a well-defined geographic area, covering approximately 2,000 square miles in the northern eastern section of LAC and includes over 35 communities. In 2005, there were an estimated 350,000 residents: 51% White, 30% Hispanic, 18% African American, and 4% Asian.

Case Definitions: For the purposes of our surveillance the following definitions were employed.

- *Varicella case*—has illness with acute onset of a diffuse papulovesicular rash without other known cause diagnosed or reported by a healthcare provider, school nurse, or parents/guardians.
- *Breakthrough varicella case*—has had documented varicella vaccine at least 42 days prior to onset of varicella.
- *HZ case*—has a unilateral macular-papular or vesicular rash, involving at least one dermatome, diagnosed by a licensed healthcare provider.

Each HZ or varicella case with a completed case interview and/or chart review that validates the case definition and resides within the surveillance area is considered a *confirmed case*. If a provider, reports a HZ or varicella case that cannot be validated with case interview or chart review it is considered a *probable case*.

Data Collection: In 2005, 286 surveillance sites participated VASP's project. Sites included: public and private schools, day care centers, public health clinics, pain management clinics, long term care facilities, adult day care, hospitals, private practice physicians (pediatrics, family practice, neurology, dermatology, and internal medicine), health maintenance organizations and correctional facilities. All reporting sites submitted a "Varicella/Zoster Surveillance Case Log" to VASP on a biweekly basis and applicable reporting sites submitted a "Varicella Vaccine Log" on a monthly basis—this reports all administered varicella doses administered that month.

A member of VASP conducted a structured telephone interview with each case or their parent/guardian. This provided detailed demographic, clinical, and health impact data, as well as identified any additional cases or susceptible contacts within the household. Previous varicella vaccine exposure was documented



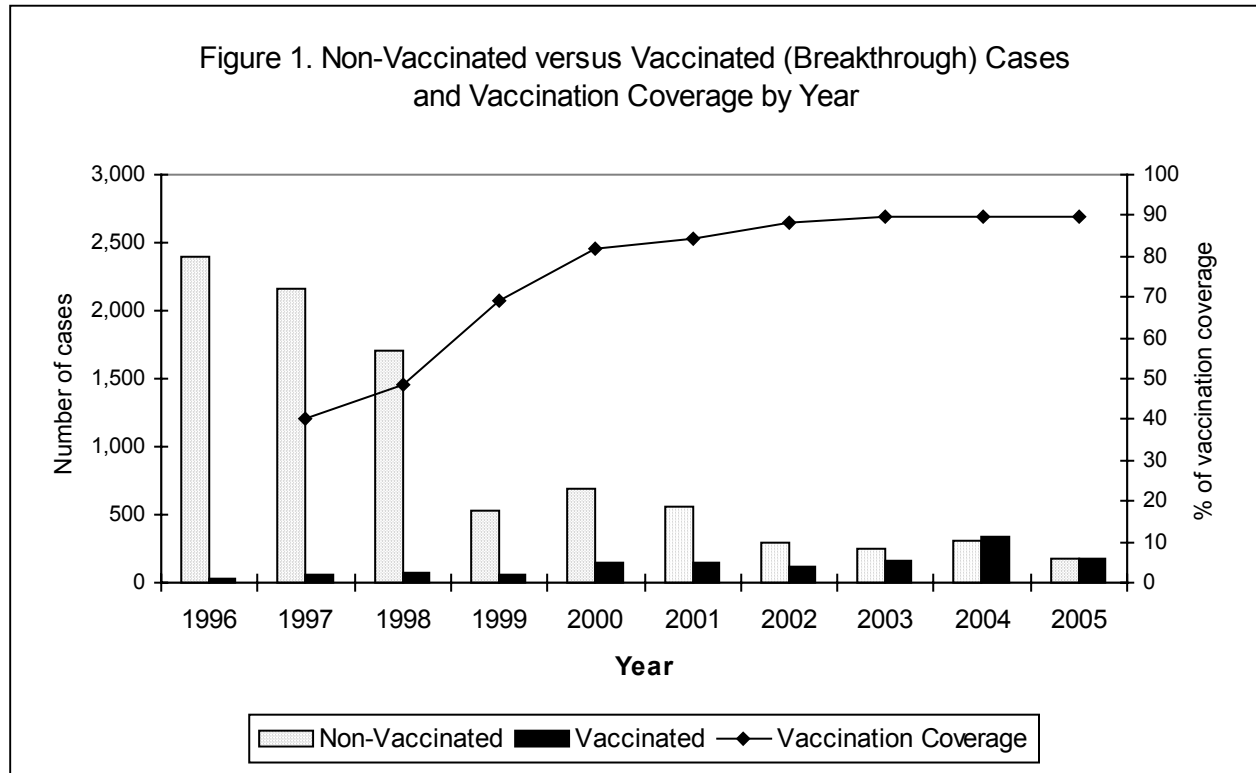
by one of three methods: provider documentation, vaccine card, and school vaccine records. Data entry for varicella and HZ was entered into an MS Access database and analysis performed with SAS 9.1. Completeness of reporting was estimated using capture-recapture methods.

RESULTS

Varicella Disease: Compared to the number of verified varicella cases reported in 1995 (2,934 cases), cases declined by 87% in 2005 (355 cases). This corresponds to an overall decline in varicella incidence from 10.3 per 1,000 persons in 1995 to 1.0 per 1,000 persons in 2005. Looking specifically at 2001 through 2003, the overall varicella incidence remained relatively unchanged (1.2 per 1,000 persons); however, in 2004, varicella incidence increased to 1.8 cases per 1,000 persons and then declined to 1.0 per 1,000 in 2005. Since 1995, the 5-9 year-old age group has had the highest varicella incidence of any age group. The 10-14 year old age group has shown the second highest rates with 3.7 per 1000 persons in 2005. There has been a consistent trend of increasing age of varicella cases—the mean age increased from 9.6 to 10.5 years in 2004 and 2005, respectively.

Since 1995, the hospitalizations from varicella infection have significantly declined. In 1995, 12 hospitalizations due to varicella were reported. In contrast, from 2000 to 2005, between zero to three hospitalizations were documented annually—no hospitalizations due to varicella were reported in 2005. The number of complications after varicella infection also was significantly less in 2005—only 1 (0.28%) case reported complications (otitis media), compared to 17 (4.2%) and 22 (3.4%) cases with complications reported in 2003 and 2004, respectively.

The proportion of reported and verified breakthrough varicella cases has steadily increased since initiating this project from 1% in 1996 to nearly 49% of cases in 2005 (Figure 1). Yet the cumulative breakthrough cases as a percentage of the cumulative vaccine doses remained almost unchanged with 1.97% and 2.0% reported in 2004 and 2005. The median age of breakthrough cases has steadily increased; the median age was 5.7 and 8 years in 2000 and 2005, respectively.





The number of documented varicella outbreaks has shown a consistent decline from 81 reported in 1995 to 7 in 2003. However, in 2004, the number of documented outbreaks increased dramatically to 25. In 2005, the number returned to a level similar to 2003 with eight documented outbreaks (104 cases). Of these eight outbreaks, six occurred in elementary schools and two middle schools. These outbreaks had an average of 13 cases per outbreak. The mean age of the varicella cases was 11.3 years; 48% of the cases were classified as breakthrough.

HZ Surveillance Among Those Younger Than 20 Years of Age: Both verified HZ cases and HZ incidence rates for children and adolescents younger than 20 years of age have steadily decreased during the past six years of surveillance. The overall incidence among those younger than 20 years of age was 67 per 100,000 persons in 2000 then decreased to 49 per 100,000 in 2005. The decline in HZ incidence has been even more significant among those younger than 10 years of age—from 76 per 100,000 persons in 2000 to 27.8 per 100,000 in 2005. Overall, most cases have been older than age 10—in 2005, 42.8% reported from the 15-19 year old age group, 33.9% from the 10-14 year old age group, the median age was 15 years. Increasingly, reported cases of HZ have had a natural history of varicella infection compared to those with a history of previous vaccination. In 2005, 78% (n=44) of the HZ cases had a positive history of varicella, 12.5% (n=7) had a history of vaccination, 3.5% (n=2) recalled both, and 5.4% (n=3) could not be documented. There were no hospitalizations in children and adolescents due to HZ in 2005.

Over the past five years, an average of 341 cases per year of adult HZ (aged 20 years and older) were reported to VASP. Reported adult cases were not verified by medical chart review or case interview. In 2005, 366 cases were reported with a mean age of 56.6 years. Racial data was not consistently reported for this group. In 2005, the highest age-specific incidence was noted among those 70 years and older with 4.7 cases per 1,000 persons.

DISCUSSION

Over the length of the study, there has been a rising proportion of reported varicella that can be classified as breakthrough varicella disease. In more recent years, the proportion has increased from 15% in 2000 to 49% in 2005. This increase of breakthrough varicella in both outbreak and non-outbreak settings provides supports for the recent Advisory Committee on Immunization Practices (ACIP) discussions for the need for a second varicella vaccine booster dose for elimination purposes.¹ The timing of the booster varicella dose remains under discussion by ACIP at this time. However, the ACIP has recommended that, in varicella outbreak situations, a second varicella dose should be provided to individuals who have been previously vaccinated. The implementation of this recommendation will be a challenge and is under discussion with the Immunization Programs at both the State of California and LAC.

The consistent documentation that HZ incidence has remained unchanged in the under 20 group, and has significantly declined among those the under 10 years old, should allay fears that varicella vaccination might actually *increase* the risk of future HZ in children. These findings have been summarized in a manuscript describing the epidemiology of HZ in pediatrics and adolescents in the Antelope Valley. The manuscript has been submitted for consideration to the *Journal of Infectious Disease*.

In 2005, much effort has been put into the preparation of an adult HZ case report form and strengthening surveillance by increasing methods that will capture adult HZ. This has led to increased outreach to skilled nursing facilities, dermatology, internal medicine and to pain management clinics by VASP. In 2006, VASP plans to implement the new adult HZ case report and follow-up on individual HZ cases that are experiencing post-herpetic neuralgia. We hope obtain accurate baseline incidence rates prior to the implementation of the adult HZ vaccine.

1 CDC. Prevention of Varicella—Provisional Updated ACIP Recommendations for Varicella Vaccine Use. Available at: www.cdc.gov/nip/vaccine/varicella/varicella_acip_recs.pdf, last accessed June 1, 2006.



ONGOING RESEARCH PROJECTS

- **Knowledge, Attitudes and Practices (KAP) of Healthcare Providers Regarding Varicella Vaccination.** Surveys were sent to all identified pediatric and family practice physicians, physician assistants, and nurse practitioners in the Antelope Valley to assess their knowledge, attitudes, and practices regarding varicella vaccination 10 years after its introduction. Questionnaire data has now been completed and data analysis is in progress.
- **Validity of Self-Reported Varicella History among Women in an Antenatal Clinic Population.** The objectives of the project are to assess overall varicella seroprevalence among women in an antenatal clinic population, assess the validity of self-reported varicella disease history compared with varicella-zoster virus (IgG) antibody results, and assess follow-up vaccination rate among seronegative enrollees. The project was conducted in collaboration with both CDC's Herpes Viruses Team and Varicella Zoster Virus laboratory. Overall seropositive rate of enrollees was 97.2% (95% CI: 95.4-98.4); this rate was comparable to NHANES III rate of 96.3% (95% CI: 95.7-96.9). The positive predictive value (PPV) of self-reported varicella disease history among enrollees was 99.7% (95% CI: 98.2-100) and the negative predictive value (NPV) of a negative or uncertain disease history was 6.3% (95% CI: 3.5-10.4). Study findings indicate that self-report history of varicella continues to be a strong predictor of positive serology (varicella immunity) while negative or uncertain history is still a poor predictor of negative serology. A poster presentation was completed at the 40th National Immunization conference in Atlanta summarizing the findings from VASP in the Antelope Valley. A manuscript summarizing the combined findings from VASP West Philadelphia and Antelope Valley will be submitted in 2006.