Using Locally Derived Seroprevalence Data on Measles, Mumps, Rubella and Varicella by Birth Cohort to Determine Risks for Vaccine Preventable Diseases During International Travel

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Using Locally Derived Seroprevalence Data on Measles, Mumps, Rubella and Varicella by Birth Cohort to Determine Risks for Vaccine Preventable Diseases During International Travel

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Abstract

Background: Measles, mumps, rubella, and varicella were common diseases in the United States prior to the introduction of their respective vaccines. There are still regions in the world where these diseases are highly prevalent. Even after dramatic reductions in the prevalence of measles, mumps, rubella, and varicella in the United States, there continue to be outbreaks of these diseases, stressing the need for ongoing immunization and pre-travel counseling. Most prior studies of seroprevalence for these viral diseases are often based on national surveillance data. It is therefore important to get a clearer understanding on the local level of immunity so that more focused recommendations can be made for our patient population.

Methods: Leftover, non duplicate outpatient serum samples obtained in Lehigh Valley Pennsylvania were tested for IgG antibodies using commercially available enzyme immunoassays to mumps, measles, rubella, and varicella. Samples were collected sequentially, and identified. Five birth cohorts were created and 460 samples were collected as follows: <1957 (52), 1957-1966 (109), 1967-1976 (117), 1977-1987 (125), and 1989-1995 (81).

Results: Overall seroprevalence (excluding equivocal results) for measles, mumps, rubella, and varicella were 79.4%, 96.0%, 98.1%, and 82.4%, respectively. There was a significant association between birth cohort and immune status for measles (p=0.010) and mumps (p=0.037) only. Pairwise comparisons of the cohorts found that for measles there was a significant difference between the <1957 and 1957-1966 (p=0.001) birth cohorts and <1957 versus 1989-1995 (p=0.001) cohort. Additionally, the overall seroprevalence for our study sample was significantly different than national seroprevalence results for rubella, mumps, and measles.

Conclusion: Our study, performed in the Lehigh Valley, PA on the local seroprevalence for four vaccine preventable diseases (MMRV) showed dramatically lower immunity rates to measles and mumps than previously reported on several national seroprevalence surveys. The immunity rates for many of the later birth cohorts were significantly lower than the rates necessary to sustain herd immunity.

Study Limitations: "A study may be subject to sampling bias due to utilization of a non-probability sampling method.

Local immunity rates may have been underestimated as we did not evaluate for cellular immunity through vaccination records.

Future Directions: Creating a seroprevalence study using a probability sampling method and a larger sample size.

Expansion of demographic data collection (country of birth, race/ethnicity, family income, education level and religious/ethnic beliefs) will help to minimize potential confounders of immunity status.

To include vaccination records of the sample population to evaluate for cellular immunity.

Further assess the low immunity rates in youngest birth cohorts.


Figure 1. Percentage of Birth Cohort Immune to Each Disease (Excluding Equivocal)