

**OREGON PUBLIC HEALTH DIVISION • OREGON HEALTH AUTHORITY**

**PERTUSSIS UPDATE**

Through October 1, 741 cases of pertussis have been reported in Oregon during 2012; this represents three times the number reported during the same period in 2011, and we have already reached the highest annual tally since 1959. Oregon's incidence of 19.2 cases per 100,000 residents is more than twice the national (9.3/100,000). County incidence rates range from 1.5 to 56.7 and have generally been highest in the northwestern part of the state. Cases peaked during the third week of April and have since trended downward (Figure 1). Pertussis was laboratory-confirmed in 672 (91%) of the cases: 592 (88%) of these by PCR alone, 9 (1.3%) by culture alone, and 71 (11%) by both PCR and culture.

Pertussis incidence among infants (207/100,000) exceeds that of all other age groups and has been creeping up. Since 2011, the 10–14-year age group has had the next highest incidence (88/100,000), closely followed by the 1–4 and 5–9-year-old cohorts (62 and 55 per 100,000, respectively). Pertussis cases to date during 2012 have ranged in age from 8 days to 90 years; the median age has been 10 years. Twenty-three (25%) of the infants have been

hospitalized, for a median of 4 (range, 1–90) days. One young infant with pertussis spent more than 40 days on extracorporeal membrane oxygenation. The median age of hospitalized infants has been 7 (range, 1–43) weeks.

Hispanic infants make up 23% of the Oregon birth cohort, and 12% of Oregon's total population is Hispanic.<sup>1</sup> However, 31 (35%) of the 88 infant cases and 153 (22%) of all cases were of Hispanic ethnicity. The incidence among Hispanic infants has been 288/100,000. Higher incidence among Hispanics was also reported during the 2010 California epidemic and in this year's epidemic in Washington State, but its causes are unknown.<sup>2-3</sup> Oregon's Hispanic cases have not had lower vaccination rates than non-Hispanic cases. It is possible that doctors evaluating Hispanic patients might be testing for pertussis more aggressively than others, but the 118 specimens from the 153 Hispanic cases were submitted by at least 67 different clinicians. A plausible explanation, supported by other studies and consistent with Census data and our case data, is that of higher levels of exposure from larger households: Oregon's Hispanic pertussis cases have tended to have larger household sizes than the non-

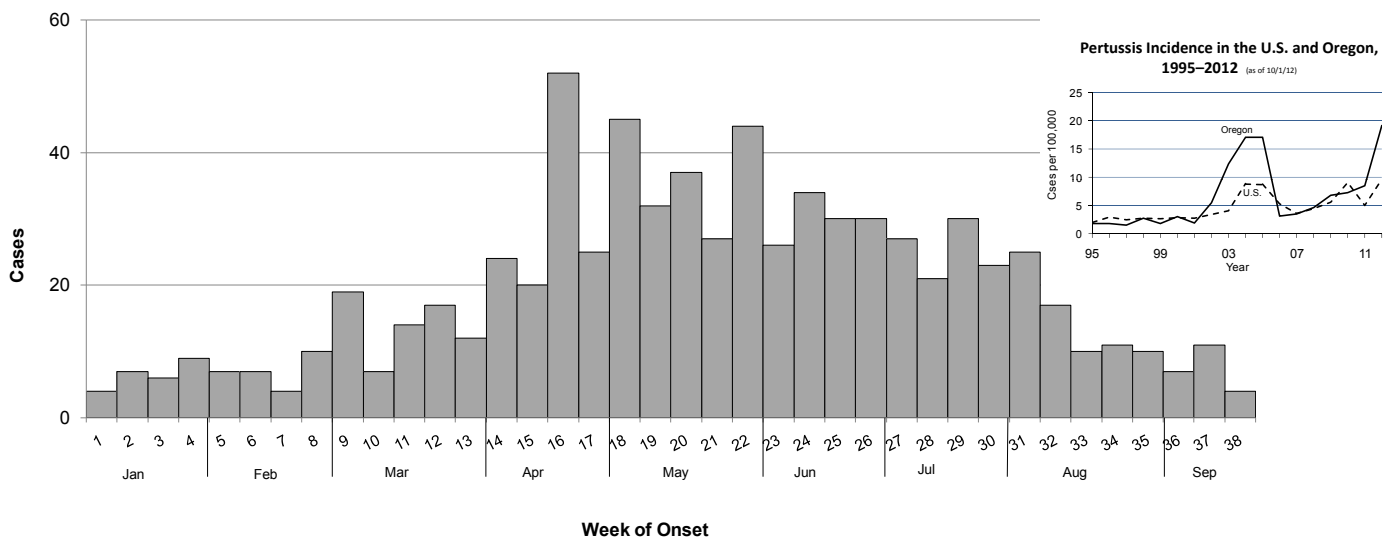
Hispanic cases (average 5.3 vs. 4.5 members;  $P=0.0003$ ).<sup>1,4</sup>

We reviewed data from Oregon's ALERT Immunization Information System to ascertain vaccination status of pertussis cases, relative to the ACIP-recommended schedule; and to calculate incidence by vaccination status and risk associated with lack of vaccination (Table 1). Overall, 96 (43%) of the 221 cases 2 months – 6 years old were up to date for age with DTaP vaccines; 69 (31%) had yet to receive their first DTaP – 44 (64%) of them because their parents declined to consent to their vaccination. Among cases 7–10 years of age, 90 (75%) were fully immunized, suggesting early waning of immunity among these recipients of acellular pertussis vaccines. The substantial rates of Tdap vaccination among cases 13–16 years of age reflect national data that suggest waning immunity from the Tdap vaccine even in early adolescence.

All that said, the incidence figures in the last two columns of the table demonstrate that in all age groups, one is better off with vaccination than without it: being unvaccinated is associated with a 1.7–54-fold risk of contracting pertussis. Vaccination remains the single most effective means of preventing pertussis.

How can we explain the 2012 pertussis boom? Experts allude to the cyclical nature

**Figure. Number of pertussis cases reported by week of onset, Oregon, 2012**





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of the disease, an increased awareness among patients and clinicians, better reporting, widespread testing by PCR assays (which are more sensitive than culture), and waning immunity after pertussis vaccination.<sup>5-6</sup> Studies in the Netherlands and Australia have suggested that genetic changes in circulating strains of *Bordetella pertussis* have led to vaccine failure, but others question these findings.<sup>6</sup>

Untoward events associated with diphtheria-tetanus-whole cell pertussis vaccine (DTwP) led to replacement of the fourth and fifth DTwP doses with diphtheria-tetanus-acellular pertussis vaccine (DTaP) in 1992, and in 1997 FDA approved DTaP for the complete childhood series. Acellular vaccines contain a few key pertussis antigens, while the whole-cell vaccines were suspensions of entire killed *B. pertussis* organisms — which undoubtedly accounted for the reactogenicity of the latter. Both vaccines are highly effective for the first two years after the vaccination, but it could be that the additional antigens in DTwP vaccines might induce more durable immune responses.<sup>3</sup> Effectiveness of the tetanus-diphtheria-acellular pertussis (Tdap) booster vaccine recommended for one-time use in adolescents and adults was evaluated among adolescents in Australia and in an outbreak setting in the U.S.; it ranged from 66% to 78%. The duration of Tdap's efficacy is unknown, but like that of DTaP, it can be expected to wane.<sup>5</sup>

**SUFFER THE INFANTS**

The focus of Oregon's pertussis prevention and control efforts is the protection of infants, who are at greatest risk for hospitalization and

**Table. Vaccination history of pertussis cases ≥2 months of age, Oregon, 2012**

Age	Case counts by vaccination status		Incidence per 100,000 by vaccination status		Risk Ratio
	Up to date†	Unvaccinated	Up to date†	Unvaccinated	
2-3 mo	11	19	149.4	8,085	54.1
4-5 mo	9	3	211.3	1,265.8	6.0
6-14 mo	17	8	69.9	481.3	6.9
15 mo-3 yr	32	26	37.1	764.5	20.6
4-6 yr	27	13	32.6	298.2	9.1
7-10 yr	90	14	60.5	178.9	2.9
11-12 yr	24	60	26.9	233.5	8.7
13-16 yr	86	28	42.5	72.6	1.7
17-19 yr	8	12	7.3	17.9	2.6
≥20 yr	12	94	3.3	140.2	42.5

†Persons <11 years of age who had received ACIP-recommended numbers of DTaP doses for their age. Persons ≥11 years of age who had one dose of Tdap were considered fully vaccinated.

death. The medical literature and our data show that the most commonly recognized source of pertussis in infants are their household members. A "cocooning" strategy of vaccinating people who have contact with infants is recommended to protect this vulnerable group.<sup>5</sup> This means maximizing vaccination rates overall, but especially among infants, pregnant women, siblings, parents, health-care personnel and others likely to come in contact with infants; treatment of cases; and antibiotic prophylaxis of contacts who are likely to have contact with infants.

The Oregon Immunization Program will be reaching out — especially through Spanish-language media in the Portland metropolitan area and Willamette Valley — to inform young mothers and families to check their pertussis immunization status to protect their infants.

**FOR MORE INFORMATION**

- Oregon Public Health Division pertussis page: <http://1.usa.gov/cpdpertussis>
- CDC pertussis page: [www.cdc.gov/pertussis/](http://www.cdc.gov/pertussis/)

**REFERENCES**

1. United States Census Bureau. State characteristics: vintage 2011 population estimates. Available at [www.census.gov/popest/data/state/asrh/2011/index.html](http://www.census.gov/popest/data/state/asrh/2011/index.html). Accessed 16 Oct 2012.
2. Winter K, Harriman K, Zipprich J, et al. California Pertussis Epidemic, 2010. J Pediatr 2012 [Epub ahead of print]. Available at [www.jpeds.com/article/S0022-3476%2812%2900558-6/abstract](http://www.jpeds.com/article/S0022-3476%2812%2900558-6/abstract). Accessed 16 Oct 2012.
3. CDC. Pertussis Epidemic — Washington. MMWR 2012; 61:517-22.
4. Haberling DL, Holman RC, Paddock CD, et al. Infant and maternal risk factors for pertussis-related infant mortality in the United States, 1999 to 2004. Pediatr Infect Dis J 2009; 28:194-8.
5. Clark TA, Messonnier NE, Hadler SC. Pertussis control: time for something new? Trends Microbiol. 2012 May;20:211-3.
6. Cherry JD. Epidemic Pertussis in 2012 — the resurgence of a vaccine-preventable disease. N Engl J Med 2012; 367:785-7.