



## PREVENTION OPPORTUNITIES UNDER THE BIG SKY

### Mortality from Three Vaccine-Preventable Diseases in Montana

This issue of *Montana Public Health* presents a historical review of mortality from three serious vaccine-preventable diseases in Montana from 1910 through 2010 from the Montana Office of Vital Statistics: diphtheria, pertussis, and polio. Both incidence of and mortality from all three diseases declined dramatically with the wide availability of immunization. Vaccination for pertussis is 80-85% effective if the recommended dosage regimen is followed; diphtheria vaccination is more than 95% effective and polio vaccination is more than 99% effective.<sup>1</sup> However, vaccine-preventable diseases might again pose threats to our communities if vaccination coverage declines.

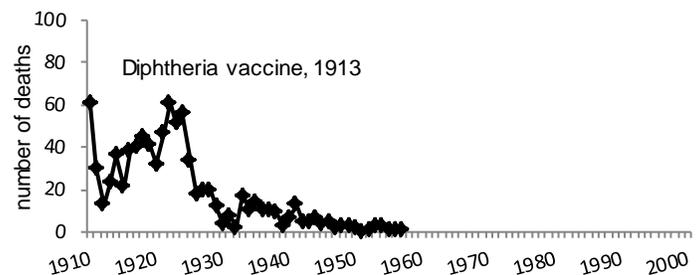
**Diphtheria** Diphtheria antitoxin to treat incident cases was developed in the 1890s; the first vaccine was developed in 1913 and was in wide clinical use by the early 1930s.<sup>1</sup> In Montana, mortality declined sharply from the mid-1920s, although there was a small upsurge in deaths that persisted into the mid-1940s and a few deaths occurred until 1960 (Figure 1).

**Pertussis** Cyclical pertussis outbreaks caused substantial fluctuations in mortality in Montana before vaccine was in wide clinical use in the mid-1940s (Figure 2). Montana experienced a notable decline in mortality although there are still sporadic deaths attributed to pertussis, primarily among infants and toddlers.

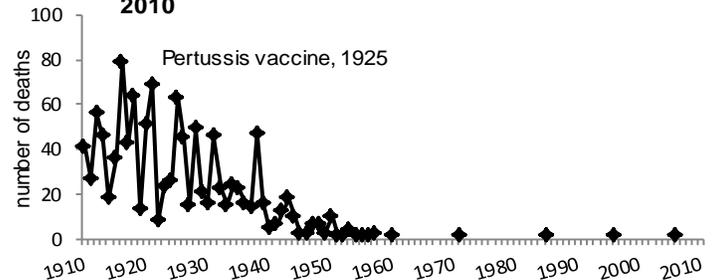
**Polio** The Salk inactivated polio vaccine (IPV) was released in 1955 and the Sabin oral polio vaccine (OPV) in 1963. One case of acute polio was reported in 1966, two in 1969, and two in 1972. The last death attributed to acute polio in Montana occurred in 1959 although there continued to be deaths attributed to post-polio syndrome (PPS) among decedents aged 58 to 93 years between 1960 and 2010 who contracted polio before vaccination was available (open symbols in Figure 3).

Mortality alone does not describe the burden of vaccine-preventable diseases. Many more individuals might experience serious complications or suffer long-term sequelae. The Montana Hospital Discharge Data System receives data on more than 95% of all inpatient admissions in the state. Since 2000 there have been occasional admissions attributed to diphtheria (eleven) or post-polio syndrome (four), but more admissions for pertussis. In 2005 a pertussis outbreak with 586 reported cases occurred (more than 10 fold increase in the number of cases compared to the annual number from 2000 to 2004). A concomitant increase in hospitalizations also occurred although there were no deaths (Figure 4).

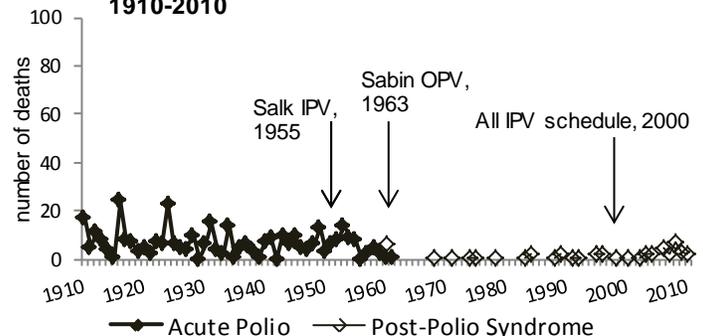
**Figure 1. Deaths from Diphtheria, Montana, 1910-2010**



**Figure 2. Deaths from Pertussis, Montana, 1910-2010**



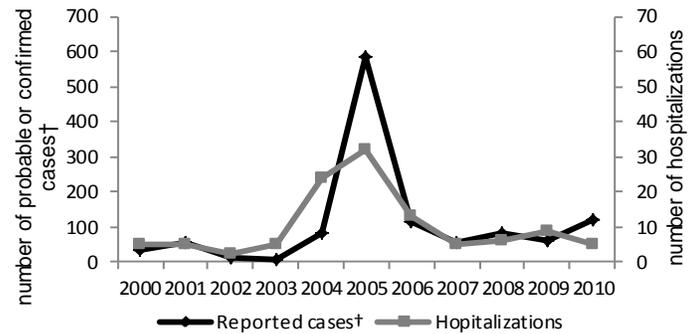
**Figure 3. Deaths from Poliomyelitis, Montana, 1910-2010**



In contrast from 1930 to 1940 when the population of Montana was much smaller, the average number of pertussis cases (then called “whooping cough”) reported each year was 949 (range 197 to 1888) and the annual average number of deaths was 22 (range 5 to 47).

During 2008-2010 the average charge for a pertussis admission was \$18,575, compared with \$8,000 for diphtheria and \$28,625 for PPS. The few patients with PPS were aged over 65 years and had many co-morbidities, contributing to the high cost. In contrast, 72% of pertussis patients were aged less than two years, 16% were 10 to 55 years, and 12% were over 60 years. The total cost of pertussis admissions for 2008, 2009, and 2010 (the only years for which cost data are available) was more than \$371,000; and in these three years the disease incidence was relatively low. Assuming costs were constant between 2000 and 2010, the total cost of pertussis admissions is estimated at \$1.97 million, diphtheria at \$880,000, and PPS at \$120,000.

**Figure 4. Reported Cases of and Hospitalizations for Pertussis, Montana, 2000-2010**



† Definitions of probable and confirmed cases of pertussis changed slightly in 2010.

The great majority of cases of pertussis and other vaccine-preventable diseases can be prevented by achieving Healthy People 2020 goals for childhood immunization, in accordance with the Advisory Committee on Immunization Practices (ACIP) recommendations.<sup>3, 4</sup>

**Recommendations for clinicians**

- Recommend all parents have their child and adolescent fully vaccinated in accordance with ACIP recommendations.<sup>4</sup>
- Recommend those adults in need of protection against pertussis receive a Tdap booster, especially persons who have contact with infants because vaccine protection for pertussis can fade with time.
- Infants are especially vulnerable to pertussis and more than half of infants with pertussis require hospitalization. Pertussis mortality is now rare, but most patients who die from pertussis are infants.

For more information, contact the Immunization Program at 406-444-5580

**References:**

1. <http://www.cdc.gov/vaccines/pubs/pinkbook/index.html>
2. <http://www.cdc.gov/vaccines/stats-surv/nis/tech-notes.htm> and <http://www.cdc.gov/vaccines/stats-surv/nis/default.htm#nis>
3. <http://healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=23>
4. <http://www.cdc.gov/vaccines/recs/acip/default.htm>

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