
Personal belief exemptions for vaccination put people at risk. Examine the evidence for yourself.

Enforcement of mandatory immunization requirements for children entering childcare facilities and schools has resulted in high immunization coverage levels. While all states and the District of Columbia allow exemptions from the requirements for medical reasons, and all but two offer exemptions to accommodate religious beliefs, 20 states allow exemptions

based on parents' personal beliefs. Several recent outbreaks of measles, pertussis, and varicella (chickenpox) have been traced to pockets of unvaccinated children in states that allow personal belief exemptions. To understand the impact of vaccine refusal, examine the evidence for yourself.

1. **Measles in the United States during the postelimination era.** Parker Fiebelkorn A, Redd SB, Gallagher K, et al. *J Infect Dis* 2010; 202(10):1520–28.

Summary: A descriptive analysis of all cases of measles reported in the United States during 2001–2008.

Key findings: A total of 557 confirmed cases of measles and 38 outbreaks were reported during 2001–2008. Of these outbreaks, the 3 largest occurred primarily among personal belief excluders (defined as persons who were vaccine eligible, according to recommendations of the Advisory Committee on Immunization Practices or the World Health Organization, but remained unvaccinated because of personal or parental beliefs). During 2004–2008, a total of 68% of reported measles cases were among unvaccinated U.S. residents, who were age-eligible for vaccination but who claimed a personal belief exemption to state immunization requirements.

Link: www.ncbi.nlm.nih.gov/pubmed/20929352

2. **Measles outbreak in a highly vaccinated population, San Diego, 2008: role of the intentionally undervaccinated.** Sugerman DE, Barskey AE, Delea MG, et al. *Pediatrics* 2010;125(4):747–55.

Summary: Researchers mapped vaccination-refusal rates by school and school district, analyzed measles-transmission patterns, and conducted discussions and surveys to examine beliefs of parents who decline vaccination for their children.

Key findings: An intentionally unvaccinated 7-year-old child who was unknowingly infected with measles returned from Switzerland, resulting in 11 additional measles cases and in known measles exposure of more than 800 people. In San Diego, high personal belief exemption (PBE) rates were found in 10 schools (range, 42%–100%); schools and districts with high refusal rates were clustered geographically. Across all surveyed kindergartens, higher PBE rates correlated strongly with lower measles vaccination rates.

Link: www.ncbi.nlm.nih.gov/pubmed/20308208

3. **Parental refusal of varicella vaccination and the associated risk of varicella infection in children.** Glanz JM, McClure DL, Magid DJ, Daley MF, France EK, Hambidge SJ. *Archives of Pediatrics & Adolescent Medicine* 2010; 164(1):66–70.

Summary: A case-control study of 133 physician-diagnosed cases of varicella among Kaiser Permanente Colorado members between 1998 and 2008; each case was matched with 4 randomly selected controls (i.e., people who did not have varicella disease).

Key findings: Compared with children of vaccine-accepting parents, children of vaccine-refusing parents had a 9-fold higher risk of vari-

cella illness. Overall, 5% of varicella cases in the study population were attributed to vaccine refusal.

Link: www.ncbi.nlm.nih.gov/pubmed/20048244

4. **Parental refusal of pertussis vaccination is associated with an increased risk of pertussis infection in children.** Glanz JM, McClure DL, Magid DJ, et al. *Pediatrics* 2009;123(6):1446–51.

Summary: A case-control study of 156 physician-diagnosed cases of pertussis among Kaiser Permanente Colorado members between 1996 and 2007; each case was matched with 4 randomly selected controls (n=595).

Key findings: Vaccine refusers had a 23-fold higher risk for pertussis when compared with vaccine acceptors, and 11% of pertussis cases in the entire study population were attributed to vaccine refusal.

Link: www.ncbi.nlm.nih.gov/pubmed/19482753

5. **Invasive Haemophilus influenzae type b disease in five young children — Minnesota, 2008.** CDC. *Morbidity and Mortality Weekly Report (MMWR)* 2009;58(03):58–60.

Summary: In 2008, during routine surveillance conducted by public health workers in Minnesota for invasive *H. influenzae* type b (Hib) disease, five children ages 5 months to 3 years were reported with invasive Hib disease; one child died.

Key findings: Three of the five children with invasive Hib disease had not been vaccinated. One of the children was too young to complete the primary series of Hib vaccine, and another child, who had completed the primary series, was found to have an immune disorder that impairs response to vaccination.

Link: www.cdc.gov/mmwr/preview/mmwrhtml/mm5803a4.htm

6. **Geographic clustering of nonmedical exemptions to school immunization requirements and associations with geographic clustering of pertussis.** Omer SB, Enger KS, Moulton LH, Halsey NA, Stokley S, Salmon DA. *Am J Epidemiol* 2008;168:1389–96.

Summary: Researchers evaluated the geographic clustering of personal belief exemptions in Michigan (1991–2004: N=4,495 schools) and measured the geographic overlap between exemption clusters and clusters of reported pertussis cases (1993–2004: N=1,109 cases among people 18 years and younger).

Key findings: Researchers reported significant overlap between clusters of exemptions and clusters of pertussis cases. In addition, exemption rates appear to be increasing in Michigan, and nonmedical exemptions tend to be geographically clustered.

Link: www.ncbi.nlm.nih.gov/pubmed/18922998 (Page 1 of 2)

7. **Measles outbreak associated with a church congregation: a study of immunization attitudes of congregation members.** Kennedy AM, Gust DA. *Public Health Reports* 2008; 123(2):126–34.
Summary: Researchers conducted a focus group and interviews with church leaders and families following a measles outbreak among church members in Indiana.
Key findings: Vaccine refusal was attributed to a combination of personal religious beliefs and safety concerns among a subgroup of church members. Among interviewees from outbreak households, none had received MMR vaccine prior to the outbreak. Four of the six outbreak households reported that they would consider some or all recommended vaccines in the future.
 Link: www.ncbi.nlm.nih.gov/pubmed/18457065
8. **Update: Measles—United States, January–July 2008.** CDC. *Morbidity and Mortality Weekly Report (MMWR)* 2008; 57(33):893–6.
Summary: A descriptive analysis of reported cases of measles occurring in the U.S. from January through July 2008.
Key findings: A total of 131 measles cases were reported to CDC during the first 7 months of 2008, the highest number of year-to-date reports since 1996. Fifteen patients, including 4 children younger than age 15 months, were hospitalized. One hundred twelve of the reported cases were unvaccinated or had unknown vaccination status; of these, 95 were eligible for vaccination. The majority of these 95 cases (66%) were children who were unvaccinated because of philosophical or religious beliefs.
 Link: www.cdc.gov/mmwr/preview/mmwrhtml/mm5733a1.htm
9. **Impact of addition of philosophical exemptions on childhood immunization rates.** Thompson JW, Tyson S, Card-Higginson P, et al. *American Journal of Preventive Medicine*; 2007;32(3):194–201.
Summary: In fall 2003, Arkansas implemented a nonmedical (i.e., religious or philosophical) exemption process (Act 999). Investigators evaluated and compared the number and geographic clustering of exempted students 2 years before (year 1, year 2) and 2 years after (year 3, year 4) philosophical exemptions were made available in Arkansas.
Key findings: The addition of a philosophical or religious exemption from school mandates resulted in a significant increase in the total number of exemptions granted in Arkansas. In year 4, nonmedical exemptions were 2.58-fold higher than in year 1, whereas the absolute number of medical exemptions dropped by more than half compared with year 1. In the 10 districts with the highest exemption rates (range, 7.85–22.97 per 1,000 students), all exemptions granted were categorized as religious or philosophical.
 Link: www.ncbi.nlm.nih.gov/pubmed/17296471
10. **Nonmedical exemptions to school immunization requirements: secular trends and association of state policies with pertussis incidence.** Omer SB, Pan WK, Halsey NA, et al. *JAMA* 2006; 296(14):1757–63.
Summary: Analysis of children claiming nonmedical exemptions at school entry, 1991–2004, and incidence of pertussis in children ages 18 years and younger, 1986–2004.
Key findings: Exemption rates for states that allowed only religious exemptions remained at about 1% between 1991 and 2004; however, in states that allowed exemptions for personal beliefs, the mean exemption rate increased from 0.99% to 2.54%. The study found associations between increased pertussis incidence and state policies that allowed personal belief exemptions or easily-obtained exemptions in general.
 Link: www.ncbi.nlm.nih.gov/pubmed/17032989
11. **Implications of a 2005 measles outbreak in Indiana for sustained elimination of measles in the United States.** Parker AA, Staggs W, Dayan GH, et al. *N Engl J Med* 2006;355:447–55.
Summary: A case-series investigation of the largest documented U.S.-based measles outbreak since 1996; included molecular typing of viral isolates, surveys of vaccination rates, interviews about vaccination attitudes, and cost surveys.
Key findings: This U.S. measles outbreak was caused when an unvaccinated teenager returned from Romania and introduced measles into a group of children whose parents objected to vaccination. Among people exposed at a church gathering, 50 lacked immunity to measles, 16 (32%) of whom acquired measles. During the 6 weeks after the gathering, a total of 34 cases of measles were confirmed. Of the people with confirmed measles, 97% were members of the church, 94% were unvaccinated, and 82% were children ages 5 to 19 years. In this outbreak, 68% of the containment cost was incurred by a single hospital, where an undervaccinated employee potentially exposed children, immunocompromised patients, and employees to measles.
 Link: www.ncbi.nlm.nih.gov/pubmed/16885548
12. **The cost of containing one case of measles: the economic impact on the public health infrastructure—Iowa, 2004.** Dayan GH, Ortega-Sanchez IR, LeBaron CW, Quinlisk MP, Iowa Measles Response Team. *Pediatrics* 2005;116:e1–e4.
Summary: Measurement of activities performed, personnel time and materials allocated, and direct costs incurred in 2004 U.S. dollars by the Iowa public health infrastructure during the study period of March 5 (date of first contact about possible case) through May 12, 2004 (date of final meeting).
Key findings: Total estimated cost of one case of measles: \$142,452, of which 75% was attributable to personnel costs and overhead.
 Link: www.ncbi.nlm.nih.gov/pubmed/15995008
13. **Individual and community risk of measles and pertussis associated with personal exemptions to immunizations.** Feikin DR, Lezotte DC, Hamman RF, Salmon DA, Chen RT, Hoffman RE. *JAMA*. 2000; 284(24):3145–50.
Summary: A population-based, retrospective cohort study of all reported measles and pertussis cases among children ages 3–18 years in Colorado during 1987–1998.
Key findings: Exemptors were 22.2 times more likely to acquire measles and 5.9 times more likely to acquire pertussis than were vaccinated children. At least 11% of vaccinated children in measles outbreaks acquired infection through contact with exemptors.
 Link: www.ncbi.nlm.nih.gov/pubmed/11135778
14. **Health consequences of religious and philosophical exemptions from immunization laws: individual and societal risk of measles.** Salmon DA, Haber M, Gangarosa EJ, Phillips L, Smith NJ, Chen RT. *JAMA* 1999; 281(2):47–53.
Summary: A population-based, retrospective cohort study of measles surveillance data collected by the CDC from 1985 through 1992 and a review of annual state immunization program reports on prevalence of exemptors and vaccination coverage. The study group was restricted to school-aged children (5–19 years old).
Key findings: On average, exemptors were 35 times more likely to contract measles than were vaccinated persons.
 Link: www.ncbi.nlm.nih.gov/pubmed/10404911