PHYSICIANS FOR INFORMED CONSENT

December 11, 2019

Senator Joseph Vitale and Members of the Health Committee
c/o Senator Joseph Vitale
569 Rahway Ave
Woodbridge, NJ 07095

RE: Oppose SB2173

Dear Senator Vitale and Members of the Health Committee,

On behalf of hundreds of physician and scientist members of Physicians for Informed Consent, I am writing out of our concern that the ability of New Jersey parents to exempt their children from vaccination is being thwarted, without robust scientific justification.

The data currently available shows that increasing vaccination rates or limiting exemptions will not eliminate measles outbreaks. For example, in 2007, the Centers for Disease Control and Prevention (CDC) conducted a study on waning immunity after two doses of measles, mumps and rubella (MMR) vaccine.[1] The results, published in *Archives of Pediatrics and Adolescent Medicine*, showed that:

1. About 35% of vaccinated 7-year-olds are susceptible to subclinical measles.
2. About 60% of vaccinated 15-year-olds are susceptible to subclinical measles.
3. By age 24–26, a projected 33% of vaccinated adults are susceptible to clinical measles.

This means that about half of all New Jersey schoolchildren, who are fully vaccinated with the MMR vaccine, can still be infected with and spread measles, irrespective of the exemption rate.[2,3,4]

The CDC conducted another study in 2016, published in *The Journal of Infectious Diseases*, which concluded that a third dose (booster shot) of the MMR vaccine is short-lived, lasts only one year, and would not solve the problem of waning immunity.[5]

In addition, there are other infectious diseases where a child's vaccination status does not significantly affect the safety of other students at school.[6]

1. Tetanus is not contagious, so being vaccinated for it or not doesn't prevent others from getting it.[7]
2. Hepatitis B is spread through sex and intravenous drug use in the United States, so being vaccinated for it or not doesn't prevent others from getting it in schools.[8]
3. The whooping cough vaccine doesn't prevent the spread of whooping cough, so being vaccinated for it or not doesn't prevent one from spreading whooping cough or others from getting it.[9]
4. The diphtheria vaccine does not prevent the spread of diphtheria, so being vaccinated for it or not doesn't prevent one from spreading diphtheria or others from getting it.[10]
5. The polio vaccine used in the United States does not prevent the spread of polio, so being vaccinated for it or not doesn't prevent one from spreading polio or others from getting it.[11,12]

It's also important to measure the threat of infectious diseases. For example, before the measles vaccine was introduced in 1963 there was a 1 in 10,000 (0.01%) chance of dying from measles[13] (that's about the same as

one's lifetime chance of being struck by lightning). In addition, three treatments are available for rare severe complications from measles: vitamin A, immune globulin, and the antiviral medication, ribavirin.[14,15,16,17]

By comparison, the chance of a child dying in his or her first year of life (the infant mortality rate) is currently 1 in 170[18] in the U.S. overall (0.6%)—which is 60 times greater than the risk of a child dying from measles in 1962, a time period when almost every child had measles by age 15 and 99.99% fully recovered.[19]

Infant mortality rate (IMR) is a recognized major indicator of the health of a population, not the number of measles cases nor the number of exemptions.[20] West Virginia and Mississippi, which for years have only allowed medical exemptions to vaccination have almost double the infant mortality rate of New Jersey. And Massachusetts and Washington have a lower infant mortality than New Jersey, even while allowing non-medical exemptions.[21] This means that laws limiting exemptions are unlikely to improve public health—and may worsen public health.

Additionally, it's important to remember that since the enactment of the National Childhood Vaccine Injury Act of 1986,[22] which has shielded both vaccine manufacturers and physicians from vaccine injury lawsuits, the National Vaccine Injury Compensation Program has awarded over $4 billion to families who incurred vaccine injuries and deaths.[23] These families are our canaries in a coal mine and they have a heightened awareness of their risk of vaccine injury. For example, the risk of seizure after the MMR vaccine occurs in about 1 in 50 children with a history of seizures, and 1 in 250 in siblings of children with a history of febrile seizures (and 5% of those would develop epilepsy).[24,25]

We urge you to review our educational materials (enclosed) and oppose any legislation that thwarts the ability of parents to exempt their children from vaccination.

Respectfully,

Shira Miller, M.D.
Founder and President
Physicians for Informed Consent

Enclosed: Measles Disease Information Statement (DIS), Vaccine Risk Statement (VRS), Immunocompromised Schoolchildren Risk Group Information Statement (RGIS) and Waning Immunity and the MMR Vaccine

[1] https://www.ncbi.nlm.nih.gov/pubmed/17339511
[2] https://www.ncbi.nlm.nih.gov/pubmed/2815970
[3] https://www.ncbi.nlm.nih.gov/pubmed/2230231
[4] https://www.ncbi.nlm.nih.gov/pubmed/29921344
[5] https://www.ncbi.nlm.nih.gov/pubmed/26597262
[6] https://physiciansforinformedconsent.org/immunocompromised-schoolchildren/
[7] https://www.cdc.gov/vaccines/pubs/pinkbook/index.html
[8] Ibid.
[9] https://www.ncbi.nlm.nih.gov/pubmed/24277828
[10] https://www.ncbi.nlm.nih.gov/pubmed/5026197
[11] https://www.ncbi.nlm.nih.gov/pubmed/17429085
[12] http://polioeradication.org/polio-today/polio-prevention/the-vaccines/ipv/
[13] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1522578/
[14] https://physiciansforinformedconsent.org/measles/dis/
[15] https://www.ncbi.nlm.nih.gov/pubmed/23629813
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[18] https://www.cdc.gov/nchs/products/databriefs/db293.htm
[19] https://physiciansforinformedconsent.org/measles/dis/
[20] https://www.cdc.gov/reproductivehealth/maternalinfanthealth/infantmortality.htm
[21] https://www.cdc.gov/nchs/pressroom/sosmap/infant_mortality_rates/infant_mortality.htm
[22] https://www.congress.gov/bill/99th-congress/house-bill/5546
[23] https://www.hrsa.gov/sites/default/files/hrsa/vaccine-compensation/data/monthly-stats-june-2019.pdf
[24] https://www.ncbi.nlm.nih.gov/pubmed/15265850
[25] https://www.ncbi.nlm.nih.gov/pubmed/17267419

MEASLES

What Parents Need to Know

PHYSICIANS FOR INFORMED CONSENT

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1. WHAT IS MEASLES?

Measles is a self-limiting childhood viral infection.

- Measles symptoms include a prodromal (initial) phase of cough, runny nose, eye irritation and fever, followed by a generalized rash on days 4–10 of the illness.[1]
- Measles is contagious during the prodromal phase and for 3-4 days after rash onset.[1]
- Most measles cases are benign and not reported to public health departments.[2]
- Before the measles mass vaccination program was introduced, nearly everyone contracted measles and obtained lifetime immunity by age 15.[1]
- In rare situations, measles can cause brain damage and death.[3,4]

Centers for Disease Control and Prevention (CDC) publishes measles case-fatality rates based on reported cases. However, nearly 90% of measles cases are benign and not reported to the CDC.[2] Calculating case-fatality rates based on reported cases (that constitute only 10% of all cases) results in a case-fatality rate that is 10 times higher than what it actually is in the general population. Data analysis herein is based on total measles cases (both reported and unreported).

2. WHAT ARE THE RISKS?

In the modern era, it is rare to suffer permanent disability or death from measles in the United States. Between 1900 and 1963, the mortality rate of measles dropped from 13.3 per 100,000 to 0.2 per 100,000 in the population, due to advancements in living conditions, nutrition, and health care—a 98% decline (Fig. 1).[2,5] Malnutrition, especially vitamin A deficiency, is a primary cause of about 90,000 measles deaths annually in underdeveloped nations.[6] In the U.S. and other developed countries, 75–92% of hospitalized measles cases are low in vitamin A.[7,8]

Research studies and national tracking of measles have documented the following:

- 1 in 10,000 or 0.01% of measles cases are fatal.[3]
- 3 to 3.5 in 10,000 or 0.03–0.035% of measles cases result in seizure.[9]
- 1 in 20,000 or 0.005% of measles cases result in measles encephalitis.[4]
- 1 in 80,000 or 0.00125% of cases result in permanent disability from measles encephalitis.[4]
- 7 in 1,000 or 0.7% of cases are hospitalized.[10]
- 6 to 22 in 1,000,000 or 0.0006–0.0022% of cases result in subacute sclerosing panencephalitis (SSPE).[11]

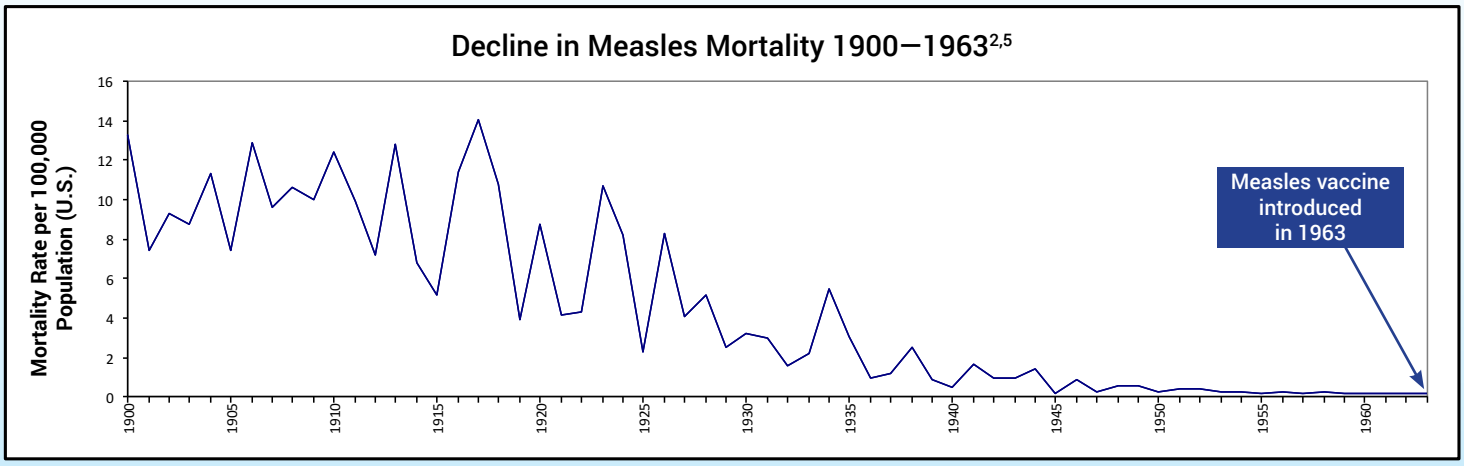

Figure 1: Measles death declined 98% from 1900 to 1963, before the measles vaccine was introduced.

3. WHAT TREATMENTS ARE AVAILABLE FOR MEASLES?

Since measles resolves on its own in almost all cases, usually only rest and hydration are necessary. When treatment is recommended, options include the following:

- High-dose vitamin A[12]
- Immune globulin (available for immunocompromised patients, such as those on chemotherapy)[13]
- The antiviral medication, ribavirin[14-16]

Vitamin A

The World Health Organization (WHO) recommends that serious measles cases be treated with high-dose vitamin A, 50,000–200,000 IU, orally on two consecutive days.[13]

4. ARE THERE ANY BENEFITS FROM GETTING MEASLES?

There are studies that suggest a link between naturally acquired measles infection and a reduced risk of Hodgkin's and non-Hodgkin's lymphomas, as well as a reduced risk of atopic diseases such as hay fever, eczema and asthma.[17-21] In addition, measles infections are associated with a lower risk of mortality from cardiovascular disease in adulthood.[22] Moreover, infants born to mothers who have had naturally acquired measles are protected from measles via maternal immunity longer than infants born to vaccinated mothers.[23]

5. WHAT ABOUT THE VACCINE FOR MEASLES?

The measles vaccine was introduced in the U.S. in 1963 and is now only available as a component of the measles, mumps, and rubella (MMR) vaccine. It has significantly reduced the number of reported measles cases; however, immunity from the vaccine wanes so that by age 15, about 60% of vaccinated children are susceptible to subclinical infection with measles virus, and by age 24–26, a projected 33% of vaccinated adults are susceptible to clinical infection.[24] The manufacturer's package insert contains information about vaccine ingredients, adverse reactions, and vaccine evaluations. For example, "M-M-R II has not been evaluated for carcinogenic or mutagenic potential, or potential to impair fertility."[11] Furthermore, the risk of permanent injury and death from the MMR vaccine has not been proven to be less than that of measles (Fig. 2).[25]

Measles Mortality vs. Leading Causes of Death in Children Under Age 10 (per 100,000 Population)[26,27]

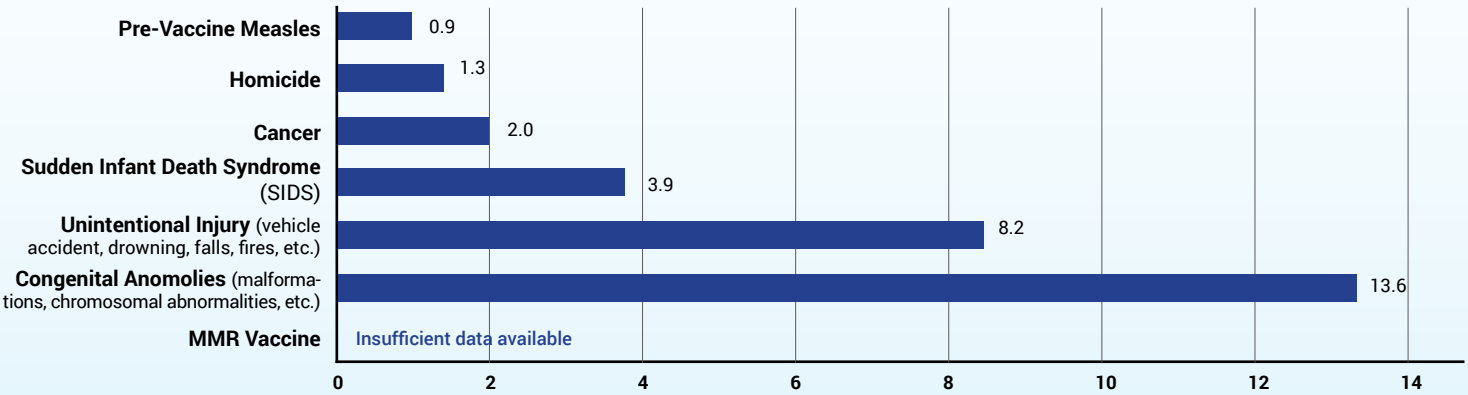

Figure 2: This graph shows the measles death rate before the vaccine was introduced, when measles was a common childhood viral infection, and compares it to the leading causes of death in children under age 10 today. Hence, in the pre-vaccine era, the measles death rate per 100,000 was 0.9 for children under age 10. In 2015, the death rate per 100,000 for homicide was 1.3, followed by cancer (2.0), SIDS (3.9), unintentional injury (8.2), and congenital anomalies (13.6). The rate of death or permanent injury from the MMR vaccine is unknown because the research studies available are not able to measure it with sufficient accuracy.[25]

All references and the Measles Vaccine Risk Statement (VRS) are available at physiciansforinformedconsent.org/measles.

REFERENCES

1. Centers for Disease Control. Epidemiology and prevention of vaccine-preventable diseases. 13th ed. Hamborsky J, Kroger A, Wolfe S, editors. Washington, D.C.: Public Health Foundation; 2015. 209-15.

2. **Between 1959 and 1962, annually there were about 4 million cases, of which 440,000 (11%) were reported.**
   - Centers for Disease Control. Epidemiology and prevention of vaccine-preventable diseases. 13th ed. Hamborsky J, Kroger A, Wolfe S, editors. Washington, D.C.: Public Health Foundation; 2015. Appendix E3.
   - Centers for Disease Control. Measles prevention: recommendations of the Immunization Practices Advisory Committee (ACIP). MMWR. 1989 Dec;38(S-9):1.

3. **Between 1959 and 1962, annually there were 400 measles deaths out of 4 million cases, about 1 in 10,000 cases.**
   - Same sources as reference 2.
   - Langmuir AD, Henderson DA, Serfling RE, Sherman IL. The importance of measles as a health problem. Am J Public Health Nations Health. 1962 Feb;52(2)Suppl:1-4.

4. **Measles surveillance in the 1980s and 1990s showed that there are half as many cases of measles encephalitis as there are measles deaths, 1 in 20,000 cases (50% of 1 in 10,000 cases of death). Of these cases, 25% (1 in 80,000 cases) result in residual neurological injury.**
   - Same sources as references 1 and 3.

5. Grove RD; Hetzel AM; U.S. Department of Health, Education, and Welfare. Vital statistic rates in the United States 1940-1960. Washington, D.C.: U.S. Government Printing Office;1968. 559-603.

6. **The measles case-fatality rate in underdeveloped nations, where vitamin A deficiency is prevalent, is about 3–6% of reported cases, 30 to 60 times higher than in developed countries.**
   - Pan American Health Organization. Washington, D.C.: Regional Office for the Americas of the World Health Organization. Basic measles facts; [cited 2019 Jul 30]. https://www.paho.org/hq/index.php?option=com_content&view=category&layout=blog&id=1637&lang=en&limitstart=10&Itemid=101.

7. Butler JC, Havens PL, Sowell AL, Huff DL, Peterson DE, Day SE, Chusid MJ, Bennin RA, Circo R, Davis JP. Measles severity and serum retinol (vitamin A) concentration among children in the United States. Pediatrics. 1993 Jun;91(6):1177-81.

8. Hussey GD, Klein M. A randomized, controlled trial of vitamin A in children with severe measles. N Engl J Med. 1990 Jul 19;323(3):160-4.

9. **Measles surveillance in the 1980s and 1990s showed that there are 3 to 3.5 times more measles seizures than measles deaths (3 to 3.5 per 10,000 cases).**
   - Same sources as references 1 and 3.

10. **Measles surveillance in the 1980s and 1990s showed that there are about 70 times more measles hospitalizations than measles deaths (7 per 1,000 cases).**
    - Same sources as reference 3.
    - Centers for Disease Control. Current trends measles — United States, 1989 and first 20 weeks 1990, June 1990. MMWR. 1990 Jun;39(21):353-5,361-3.

11. Merck. Whitehouse Station (NJ): Merck and Co., Inc. M-M-R II (measles, mumps, and rubella virus vaccine live); revised 2017 May [cited 2019 Aug 4]. https://www.merck.com/product/usa/pi_circulars/m/mmr_ii/mmr_ii_pi.pdf.

12. Perry RT, Halsey NA. The clinical significance of measles: a review. J Infect Dis. 2004 May 1;189 Suppl 1: S4-16.

13. California Department of Public Health. Sacramento (CA): California Health and Human Services Agency. Measles investigation quicksheet: May 2019; [cited 2019 Aug 3]. https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/Immunization/Measles-Quicksheet.pdf.

14. Roy Moulik N, Kumar A, Jain A, Jain P. Measles outbreak in a pediatric oncology unit and the role of ribavirin in prevention of complications and containment of the outbreak. Pediatr Blood Cancer. 2013 Oct;60(10):E122-4.

15. Pal G. Effects of ribavirin on measles. J Indian Med Assoc. 2011 Sep;109(9):666-7.

16. Uylangco CV, Beroy GJ, Santiago LT, Mercoleza VD, Mendoza SL. A double-blind, placebo-controlled evaluation of ribavirin in the treatment of acute measles. Clin Ther. 1981;3(5):389-96.

17. Alexander FE, Jarrett RF, Lawrence D, Armstrong AA, Freeland J, Gokhale DA, Kane E, Taylor GM, Wright DH, Cartwright RA. Risk factors for Hodgkin's disease by Epstein-Barr virus (EBV) status: prior infection by EBV and other agents. Br J Cancer. 2000 Mar;82(5):1117-21.

18. Glaser SL, Keegan TH, Clarke CA, Trinh M, Dorfman RF, Mann RB, DiGiuseppe JA, Ambinder RF. Exposure to childhood infections and risk of Epstein-Barr virus—defined Hodgkin's lymphoma in women. Int J Cancer. 2005 Jul 1;115(4):599-605.

19. Montella M, Maso LD, Crispo A, Talamini R, Bidoli E, Grimaldi M, Giudice A, Pinto A, Franceschi S. Do childhood diseases affect NHL and HL risk? A case-control study from northern and southern Italy. Leuk Res. 2006 Aug;30(8):917-22.

20. Shaheen SO, Barker DJP, Heyes CB, Shiell AW, Aaby P, Hall AJ, Goudiaby A. Measles and atopy in Guinea-Bissau. Lancet. 1996 Jun 29;347(9018):1792-6.

21. Rosenlund H, Bergström A, Alm JS, Swartz J, Scheynius A, van Hage M, Johansen K, Brunekreef B, von Mutius E, Ege MJ, Riedler J, Braun-Fahrländer C, Waser M, Pershagen G; PARSIFAL Study Group. Allergic disease and atopic sensitization in children in relation to measles vaccination and measles infection. Pediatrics. 2009 Mar;123(3):771-8.

22. Kubota Y, Iso H, Tamakoshi A, JACC Study Group. Association of measles and mumps with cardiovascular disease. The Japan Collaborative Cohort (JACC) study. Atherosclerosis. 2015 Aug;241(2):682-6.

23. Waaijenborg S, Hahné SJ, Mollema L, Smits GP, Berbers GA, van der Klis FR, de Melker HE, Wallinga J. Waning of maternal antibodies against measles, mumps, rubella, and varicella in communities with contrasting vaccination coverage. J Infect Dis. 2013 Jul;208(1):10-6.

24. **Children with measles antibody levels less than 900 mIU/mL are susceptible to subclinical infection with measles virus but not to clinical infection. About 60% of children 15 years of age have a measles antibody level less than 900 mIU/mL.**
    - LeBaron CW, Beeler J, Sullivan BJ, Forghani B, Bi D, Beck C, Audet S, Gargiullo P. Persistence of measles antibodies after 2 doses of measles vaccine in a postelimination environment. Arch Pediatr Adolesc Med. 2007 Mar;161(3):294-301.

25. Physicians for Informed Consent. Newport Beach (CA): Physicians for Informed Consent. Measles – vaccine risk statement (VRS); updated 2019 Sep. https://www.physiciansforinformedconsent.org/measles/vrs.

26. Centers for Disease Control and Prevention. Washington, D.C.: U.S. Department of Health and Human Services. 10 leading causes of death by age group, United States—2015; [cited 2017 Jun 21]. https://www.cdc.gov/injury/images/lc-charts/leading_Causes_of_death_age_group_2015_1050w740h.gif.

27. U.S. Department of Health, Education, and Welfare. Vital statistics of the United States 1962, volume 2—mortality, part A. Washington, D.C.: U.S. Government Printing Office; 1964. 94.

MMR VACCINE (Measles, Mumps, and Rubella)

Is It Safer Than Measles?

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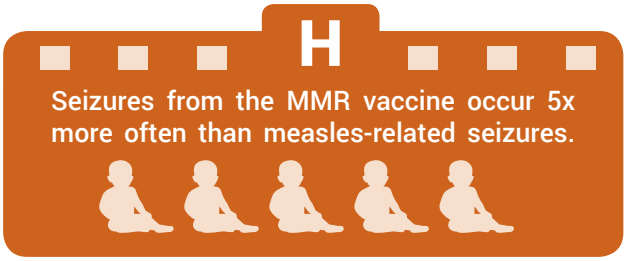
1. WHAT ARE SIDE EFFECTS OF THE MMR VACCINE?

Common side effects of the MMR vaccine include fever, mild rash, and swelling of glands in the cheeks or neck.[1] A more serious side effect is seizure, which occurs in about 1 in 640 children vaccinated with MMR[2]—about five times more often than seizure from measles infection.[3]



The World Health Organization (WHO) states that serious allergic reactions to the vaccine occur in about 1 in 100,000 doses.[4] However, other severe side effects include deafness, long-term seizures, coma, lowered consciousness, permanent brain damage, and death.[1] While the Centers for Disease Control and Prevention (CDC) states that these side effects are rare, the precise numbers are unknown.[1] Additionally, the manufacturer's package insert states, "M-M-R II has not been evaluated for carcinogenic or mutagenic potential, or potential to impair fertility."[5]

2. HOW ARE RISKS OF VACCINE SIDE EFFECTS MEASURED?

Methods to measure vaccine risks include surveillance systems, clinical studies, and epidemiological studies.

3. HOW ACCURATE IS SURVEILLANCE OF ADVERSE EVENTS FROM THE MMR VACCINE?

The government tracks reported cases of vaccine side effects through the Vaccine Adverse Event Reporting System (VAERS). Approximately 40 cases of death and permanent injury from the MMR vaccine are reported to VAERS annually.[6] However, VAERS is a passive reporting system—authorities do not actively search for cases and do not actively remind doctors and the public to report cases. These limitations can lead to significant underreporting.[7] The CDC states, "VAERS receives reports for only a small fraction of actual adverse events."[8] Indeed, as few as 1% of serious side effects from medical products are reported to passive surveillance systems,[9] and as few as 1.6% of MMR-related seizures are reported to VAERS.[10] In addition, VAERS reports are not proof that a side effect occurred, as the system is not designed to thoroughly investigate all cases.[11] As a result, VAERS does not provide an accurate count of MMR vaccine side effects.

4. HOW ACCURATE ARE CLINICAL TRIALS OF THE MMR VACCINE?

The CDC states, "Prelicensure trials are relatively small—usually limited to a few thousand subjects—and usually last no longer than a few years. Prelicensure trials usually do not have the ability to detect rare adverse events or adverse events with delayed onset."[7] Since measles is fatal in about 1 in 10,000 cases and results in permanent injury in about 1 in 80,000 cases,[3] a few thousand subjects in clinical trials are not enough to prove that the MMR vaccine causes less death and permanent injury than measles (Fig. 1). In addition, the lack of adequate clinical trials of the MMR vaccine resulted in the manufacturer's package insert data to be reliant on passive surveillance for rates of MMR-related neurological adverse reactions, permanent disability, and death.[5]

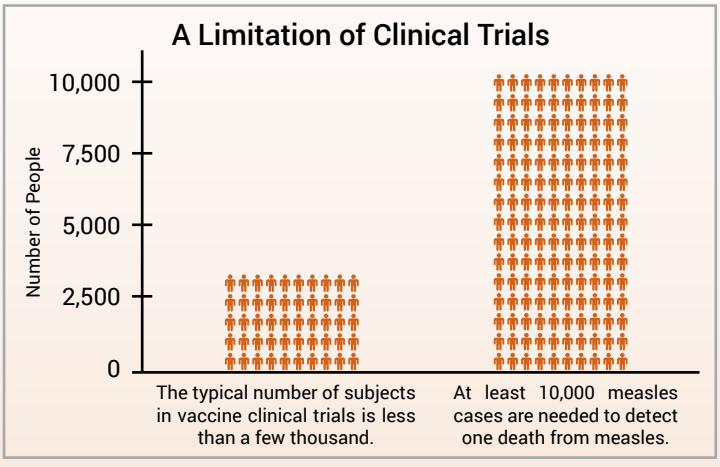


Figure 1: There are not enough subjects in clinical trials to prove that the MMR vaccine poses less risk than measles.

5. HOW ACCURATE ARE EPIDEMIOLOGICAL STUDIES OF THE MMR VACCINE?

Epidemiological studies are hindered by the effects of chance and possible confounders—additional factors that could conceivably affect the groups being studied. For example, there is a well-known 2002 Danish study published in the *New England Journal of Medicine* involving about 537,000 children that looked for an association between the MMR vaccine and certain adverse events.[12] The raw data in the study was adjusted, in an attempt to account for potential confounders, and the study found no association between the MMR vaccine and the adverse events. However, because there is no evidence that the estimated confounders used to adjust the raw data were actually confounders, the study did not rule out the possibility that the MMR vaccine increases the risk of an adverse event that leads to permanent injury by up to 77%. Consequently, the study did not rule out the possibility that such adverse events might occur up to four times more often than death from measles: 1 in 2,400 compared to 1 in 10,000 (Fig. 2 and Table 1). The range of possibilities found in the study, between the adjusted data and the raw data, makes the result inconclusive; even large epidemiological studies are not accurate enough to prove that the MMR vaccine causes less death or permanent injury than measles.

6. IS THE MMR VACCINE SAFER THAN MEASLES?

It has not been proven that the MMR vaccine is safer than measles. The vaccine package insert raises questions about safety testing for cancer, genetic mutations, and impaired fertility. Although VAERS tracks some adverse events, it is too inaccurate to measure against the risk of measles. Clinical trials do not have the ability to detect less common adverse reactions, and epidemiological studies are limited by the effects of chance and possible confounders. Safety studies of the MMR vaccine are particularly lacking in statistical power. A review of more than 60 MMR vaccine studies conducted for the Cochrane Library states, "The design and reporting of safety outcomes in MMR vaccine studies, both pre- and post-marketing, are largely inadequate."[13] Because permanent sequalae (aftereffects) from measles, especially in individuals with normal levels of vitamin A, are so rare,[3] the level of accuracy of the research studies available is insufficient to prove that the vaccine causes less death or permanent injury than measles.

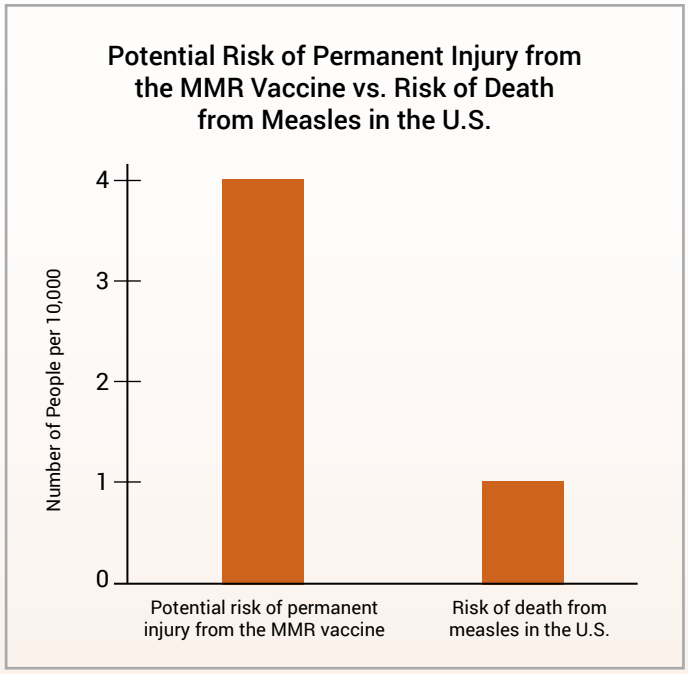


Figure 2: A 2002 Danish study did not rule out the possibility that the MMR vaccine can cause an adverse event leading to permanent injury four times more often than measles can be fatal.

Table 1: Statistical Analysis of an Epidemiological Study with Over Half a Million Children

RR = Relative risk
(risk in group vaccinated with MMR) ÷
(risk in group not vaccinated with MMR)

CI = Confidence interval
(possible range of RR due to effects of chance)

Adjusted RR reported in study
= 0.92 (95% CI, 0.68 to 1.24)

Unaltered RR recorded in study
(263/1,647,504) ÷ (53/482,360)
= 1.45 (95% CI, 1.21 to 1.77)

Potential RR = 1.77
(potential 77% greater risk than unvaccinated group risk)

Unvaccinated group risk recorded in study
= 53 in 97,000

77% of 53 in 97,000
= 1 in 2,400 additional risk in group vaccinated with MMR

All references and the Measles Disease Information Statement (DIS) are available at physiciansforinformedconsent.org/measles.

REFERENCES

1. Centers for Disease Control and Prevention. Washington, D.C.: U.S. Department of Health and Human Services. Vaccines and immunizations: MMR vaccine side effects. [updated 2017 May 8; cited 2017 Jun 21]. https://www.cdc.gov/vaccines/vac-gen/side-effects.htm#mmr.
2. Vestergaard M, Hviid A, Madsen KM, Wohlfahrt J, Thorsen P, Schendel D, Melbye M, Olsen J. MMR vaccination and febrile seizures: evaluation of susceptible subgroups and long-term prognosis. JAMA. 2004 Jul 21;292(3):356.
3. Physicians for Informed Consent. Newport Beach (CA): Physicians for Informed Consent. Measles – disease information statement (DIS); updated 2019 Sep. https://www.physiciansforinformedconsent.org/measles/dis.
4. World Health Organization. Measles vaccines: WHO position paper. Wkly Epidemiol Rec. 2009 Aug 28;84(35):355.
5. Merck. Whitehouse Station (NJ): Merck and Co., Inc. M-M-R II (measles, mumps, and rubella virus vaccine live); revised 2017 May [cited 2019 Aug 4]. https://www.merck.com/product/usa/pi_circulars/m/mmr_ii/mmr_ii_pi.pdf.
6. Centers for Disease Control and Prevention. Washington, D.C.: U.S. Department of Health and Human Services. CDC wonder. about the Vaccine Adverse Event Reporting System (VAERS); [cited 2017 Jun 21]. https://wonder.cdc.gov/vaers.html. Query for death and permanent disability involving all measles-containing vaccines, 2011-2015.
7. Centers for Disease Control and Prevention. Manual for the surveillance of vaccine-preventable diseases. 5th ed. Miller ER, Haber P, Hibbs B, Broder K. Chapter 21: surveillance for adverse events following immunization using the Vaccine Adverse Event Reporting System (VAERS). Atlanta: Centers for Disease Control and Prevention; 2011. 1,2,8.
8. Vaccine Adverse Event Reporting System. Washington, D.C.: U.S. Department of Health and Human Services. Guide to interpreting VAERS data; [cited 2017 Jun 21]. https://vaers.hhs.gov/data/dataguide.html.
9. Kessler DA. Introducing MEDWatch. A new approach to reporting medication and device adverse effects and product problems. JAMA. 1993 Jun 2;269(21):2765-8
10. Doshi P. The unofficial vaccine educators: are CDC funded non-profits sufficiently independent? [letter]. BMJ. 2017 Nov 7 [cited 2017 Nov 20];359:j5104. http://www.bmj.com/content/359/bmj.j5104/rr-13.
11. Centers for Disease Control and Prevention. Washington, D.C.: U.S. Department of Health and Human Services. CDC wonder. about the Vaccine Adverse Event Reporting System (VAERS); [cited 2017 Jun 21]. https://wonder.cdc.gov/vaers.html.
12. Madsen KM, Hviid A, Vestergaard M, Schendel D, WohlFahrt J, Thorsen P, Olsen J, Melbye M. A population-based study of measles, mumps, and rubella vaccination and autism. N Engl J Med. 2002 Nov 7;347(19):1477,1480.
13. Demicheli V, Rivetti A, Debalini MG, Di Pietrantonj C. Vaccines for measles, mumps and rubella in children. Cochrane Database of Syst Rev. 2012 Feb 15;(2).

Vaccines: What About Immunocompromised Schoolchildren?

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1. WHAT DOES IT MEAN TO BE IMMUNOCOMPROMISED?

Immunocompromised children have weakened immune systems that prevent them from optimally fighting infections on their own. Consequently, they may be at increased risk of complications from infectious diseases and require additional precautions and treatments.

2. CAN IMMUNOCOMPROMISED CHILDREN ATTEND SCHOOL?

The Immune Deficiency Foundation states, "Years ago, a diagnosis of a PI [primary immune deficiency] meant extremely compromised lives... Today, with early diagnosis and appropriate therapies, many patients diagnosed with a PI can live healthy, productive lives." Modern treatments have reduced the risk of many immunocompromised children so that they are able to attend school.[1]

Children who are not severely immunocompromised can attend school with the approval of their doctor.

3. CAN IMMUNOCOMPROMISED SCHOOLCHILDREN BE VACCINATED?

Immunocompromised schoolchildren have the option to receive all the vaccines licensed for children in the United States, except for the live virus vaccines (such as vaccines targeting measles, mumps, rubella, or varicella infections).[2] Although vaccination often results in protective levels of antibodies in immunocompromised children,[3-7] clinical vaccine safety trials typically exclude immunocompromised subjects.[8] In addition, vaccines have not been evaluated for their potential to cause cancer, genetic mutations or impaired fertility in the general or immunocompromised population.[9] Due to these limitations, it is not known whether the benefit of vaccinating an immunocompromised child outweighs the risk of vaccine injury to that child.

4. DOES THE VACCINATION STATUS OF OTHER SCHOOLCHILDREN POSE A SIGNIFICANT RISK TO IMMUNOCOMPROMISED SCHOOLCHILDREN?

The vaccination status of other schoolchildren does not pose a significant risk to immunocompromised schoolchildren for the following reasons (Table 1):

- Some vaccines cannot prevent the spread of the bacteria or viruses they target.
- Immune globulin (plasma containing antibodies) is available for immunocompromised children exposed to certain infectious diseases.
- Some infectious diseases rarely cause complications in immunocompromised schoolchildren.
- Not all infectious diseases are contagious.
- Some infectious diseases are not spread in schools.

Immunocompromised schoolchildren are not put at significant risk by the vaccination status of other schoolchildren.

Table 1: Why the Vaccination Status of Other Schoolchildren Is Not a Significant Risk to Immunocompromised Schoolchildren

Some vaccines cannot prevent the spread of the bacteria or viruses they target.

Children vaccinated with the diphtheria, tetanus, and pertussis (whooping cough) vaccine (DTaP) or the inactivated polio vaccine (IPV) can still be infected with diphtheria-causing bacteria, pertussis bacteria, or poliovirus and spread them to others, even with mild or no symptoms of their own.[10-13] The influenza vaccines (TIV and LAIV) have not been observed to significantly reduce the spread of influenza.[14,15] About half of schoolchildren vaccinated with the measles, mumps, and rubella (MMR) vaccine can still be infected with measles virus and spread it to others, even with mild or no symptoms of their own.[16-19]

Immune globulin (plasma containing antibodies) is available for immunocompromised children exposed to certain infectious diseases.

Immune globulin (IG) is available for the prevention of severe symptoms in immunocompromised children exposed to measles or rubella (IG does not provide protection for fetuses of expectant mothers infected with rubella).[20,21] Varicella-zoster immune globulin (VIG) is available for the prevention of severe symptoms in immunocompromised children exposed to varicella (chickenpox).[22] Hepatitis B immune globulin (HBIG) and tetanus immune globulin (TIG) are also available for immunocompromised children.[2]

Some infectious diseases rarely cause complications in immunocompromised schoolchildren.

Fatal cases of mumps are very rare in schoolchildren (1 mumps death per 100,000 mumps cases),[23] and immunocompromised children have been observed to recover just as well from mumps as the general population.[24] Severe cases of pertussis or rubella rarely occur in schoolchildren, and being immunocompromised has not been observed to be a significant risk factor for complications of pertussis or rubella in schoolchildren.[25,26]

Not all infectious diseases are contagious.

Tetanus is not a communicable disease; that is, it cannot spread from person to person under any circumstances.[27]

Some infectious diseases are not spread in schools.

Hepatitis B is not spread by kissing, hugging, holding hands, coughing, sneezing, or sharing eating utensils,[28] and the main routes of hepatitis B transmission (sexual contact, injection drug use, or being born to an infected mother)[29] do not occur in school. Nearly all cases of *Haemophilus influenzae* type b (Hib) occur among children younger than 5 years of age; therefore, nearly all Hib transmission does not occur in school.[30] Human papillomavirus (HPV) is sexually transmitted and is therefore not spread in school.[31]

All references are available at physiciansforinformedconsent.org/immunocompromised-schoolchildren.

REFERENCES

1. Blaese RM, Ludwig M, Buckley R, Seymour JW, Dodds M. Immune Deficiency Foundation school guide for students with primary immunodeficiency diseases. 3rd ed. Towson (MD): Immune Deficiency Foundation; 2014. 6.
2. Centers for Disease Control and Prevention. Recommendations of the Advisory Committee on Immunization Practices (ACIP): use of vaccines and immune globulins in persons with altered immunocompetence. MMWR. 1993 Apr;42(No. RR-04).
3. Ercan TE, Soycan LY, Apak H, Celkan T, Ozkan A, Akdenizli E, Kasapçopur O, Yildiz I. Antibody titers and immune response to diphtheria-tetanus-pertussis and measles-mumps-rubella vaccination in children treated for acute lymphoblastic leukemia. J Pediatr Hematol Oncol. 2005 May;27(5):273-7.
4. Feldman S, Gigliotti F, Shenep JL, Roberson PK, Lott L. Risk of *Haemophilus influenzae* type b disease in children with cancer and response of immunocompromised leukemic children to a conjugate vaccine. J Infect Dis. 1990 May;161(5):926-31.
5. Hodges GR, Davis JW, Lewis HD Jr, Siegel CD, Chin TD, Clark GM, Noble GR. Response to influenza A vaccine among high-risk patients. South Med J. 1979 Jan;72(1):29-32.
6. Moss WJ, Clements CJ, Halsey NA. Immunization of children at risk of infection with human immunodeficiency virus. Bull of the World Health Organ. 2003;81(1):62,64.
7. Barbi M, Bardare M, Luraschi C, Zehender G, Clerici Schoeller M, Ferraris G. Antibody response to inactivated polio vaccine (E-IPV) in children born to HIV positive mothers. Eur J Epidemiol. 1992 Mar;8(2):211-6.
8. Centers for Disease Control and Prevention. Manual for the surveillance of vaccine-preventable diseases. 5th ed. Miller ER, Haber P, Hibbs B, Broder K. Chapter 21: surveillance for adverse events following immunization using the Vaccine Adverse Event Reporting System (VAERS). Atlanta: Centers for Disease Control and Prevention; 2011. 1,2.
9. U.S. Food and Drug Administration. Silver Spring (MD): U.S. Food and Drug Administration. Vaccines licensed for use in the United States; [updated 2018 Feb 14; cited 2018 Feb 27]. https://www.fda.gov/BiologicsBloodVaccines/Vaccines/ApprovedProducts/Ucm093833.htm.
10. Miller LW, Older JJ, Drake J, Zimmerman S. Diphtheria immunization. Effect upon carriers and the control of outbreaks. Am J Dis Child. 1972 Mar;123(3):197-9.
11. Warfel JM, Zimmerman LI, Merkel TJ. Acellular pertussis vaccines protect against disease but fail to prevent infection and transmission in a nonhuman primate model. Proc Natl Acad Sci USA. 2014 Jan 14;111(2):787-92.
12. Cuba IPV Study Collaborative Group. Randomized, placebo-controlled trial of inactivated poliovirus vaccine in Cuba. N Engl J of Med. 2007 Apr 12;356(15):1536-44.
13. Centers for Disease Control and Prevention. Washington, D.C.: U.S. Department of Health and Human Services. U.S. National Authority for Containment of Poliovirus: the need for containment; [cited 2019 Jul 21]. https://www.cdc.gov/cpr/polioviruscontainment/containment.htm.
14. Thomas RE, Jefferson T, Lasserson TJ. Influenza vaccination for healthcare workers who care for people aged 60 or older living in long-term care institutions. Cochrane Database Syst Rev. 2016 Jun 2;(6) CD005187:2.
15. Ohmit SE, Petrie JG, Malosh RE, Cowling BJ, Thompson MG, Shay DK, Monto AS. Influenza vaccine effectiveness in the community and the household. Clin Infect Dis. 2013 May;56(10):1363.
16. **Children with measles antibody levels less than 900 mIU/mL are susceptible to subclinical infection with measles virus but not to clinical infection. About 35% of vaccinated children 7 years of age have a measles antibody level less than 900 mIU/mL. This level steadily declines through childhood, resulting in about 60% of children 15 years of age with a measles antibody level less than 900 mIU/mL. Consequently, about half of schoolchildren are susceptible to infection with measles virus.**
    - LeBaron CW, Beeler J, Sullivan BJ, Forghani B, Bi D, Beck C, Audet S, Gargiullo P. Persistence of measles antibodies after 2 doses of measles vaccine in a postelimination environment. Arch Pediatr Adolesc Med. 2007 Mar;161(3):294-301.
17. Pedersen IR, Mordhorst CH, Glikmann G, von Magnus H. Subclinical measles infection in vaccinated seropositive individuals in arctic Greenland. Vaccine. 1989 Aug;7(4):345-8.
18. Chen RT, Markowitz LE, Albrecht P, Stewart JA, Mofenson LM, Preblud SR, Orenstein WA. Measles antibody: reevaluation of protective titers. J Infect Dis. 1990 Nov;162(5):1036-42.
19. Mizumoto K, Kobayashi T, Chowell G. Transmission potential of modified measles during an outbreak, Japan, March–May 2018. Euro Surveill. 2018 Jun 14;23(24):1800239.
20. McLean HQ, Fiebelkorn AP, Temte JL, Wallace GS; Centers for Disease Control and Prevention. Prevention of measles, rubella, congenital rubella syndrome, and mumps, 2013: summary recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR. 2013 Jun;62(RR-04):17,24.
21. Young MK, Cripps AW, Nimmo GR, van Driel ML. Post-exposure passive immunisation for preventing rubella and congenital rubella syndrome. Cochrane Database Syst Rev. 2015 Sep 9;(9)CD010586:3.
22. Centers for Disease Control and Prevention. Varicella-zoster immune globulin for the prevention of chickenpox: recommendations of the Immunization Practices Advisory Committee (ACIP). MMWR. 1984 Feb;33(7):84-90,95-100.
23. **Before the mumps vaccine was licensed in 1967, nearly everyone contracted mumps in childhood. In 1966, there were 43 mumps deaths out of 4 million cases (the average size of a birth cohort in the 1960s): about 1 mumps death per 100,000 mumps cases.**
    - Wagenvoort JH, Harmsen M, Boutahar-Trouw BJ, Kraaijeveld CA, Winkler KC. Epidemiology of mumps in the Netherlands. J Hyg (Lond). 1980 Dec;85(3):313-26.
    - Centers for Disease Control and Prevention. Reported cases and deaths from vaccine preventable diseases, United States, 1950-2013. Epidemiology and prevention of vaccine-preventable diseases. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington, D.C.: Public Health Foundation; 2015. Appendix E3.
24. de Boer AW, de Vaan GA. Mild course of mumps in patients with acute lymphoblastic leukaemia. Eur J Pediatr. 1989 Jun;148(7):618-9.
25. Centers for Disease Control and Prevention. Epidemiology and prevention of vaccine-preventable diseases. 13th ed. Hamborsky J, Kroger A, Wolfe S, editors. Washington, D.C.: Public Health Foundation; 2015. 262,263,265.
26. Centers for Disease Control and Prevention. Epidemiology and prevention of vaccine-preventable diseases. 13th ed. Hamborsky J, Kroger A, Wolfe S, editors. Washington, D.C.: Public Health Foundation; 2015. 325,326.
27. Centers for Disease Control and Prevention. Epidemiology and prevention of vaccine-preventable diseases. 13th ed. Hamborsky J, Kroger A, Wolfe S, editors. Washington, D.C.: Public Health Foundation; 2015. 345.
28. Centers for Disease Control and Prevention. Washington, D.C.: U.S. Department of Health and Human Services. Hepatitis B questions and answers for the public; [cited 2019 Jul 15]. https://www.cdc.gov/hepatitis/hbv/bfaq.htm#bFAQc01.
29. Centers for Disease Control and Prevention. Epidemiology and prevention of vaccine-preventable diseases. 13th ed. Hamborsky J, Kroger A, Wolfe S, editors. Washington, D.C.: Public Health Foundation; 2015. 154-5.
30. Centers for Disease Control and Prevention. Epidemiology and prevention of vaccine-preventable diseases. 13th ed. Hamborsky J, Kroger A, Wolfe S, editors. Washington, D.C.: Public Health Foundation; 2015. 120.
31. Centers for Disease Control and Prevention. Epidemiology and prevention of vaccine-preventable diseases. 13th ed. Hamborsky J, Kroger A, Wolfe S, editors. Washington, D.C.: Public Health Foundation; 2015. 177.

Waning Immunity and the MMR Vaccine

Nearly 50 Percent of Vaccinated Schoolchildren Can Become Infected with Measles

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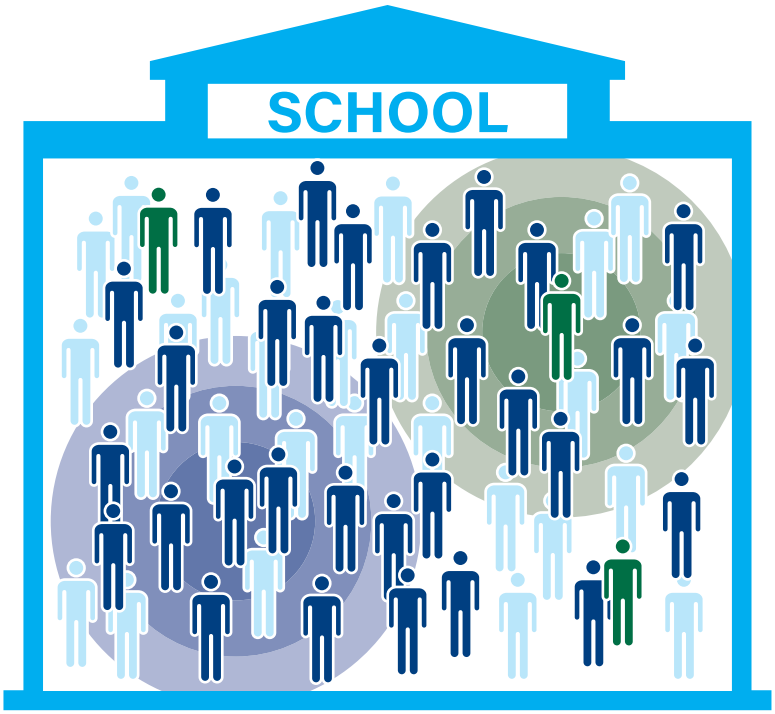

Susceptibility to Measles in School

= **Vaccinated, susceptible to *subclinical infection* and spread of measles**
35% of 7-year-olds
60% of 15-year-olds
>60% of adults

***Subclinical* measles infection:** Cases can develop illness without rash, with or without symptoms that include fever, cough, sore throat, and diarrhea.

= **Vaccinated, susceptible to *clinical infection* and spread of measles**
Projected 33% of adults by age 24–26

***Clinical* measles infection:** Cases develop illness with fever and rash, with other symptoms that can include cough, runny nose, and eye irritation.

= **Vaccinated and immune**
65% of 7-year-olds
40% of 15-year-olds
<40% of adults

Nearly 50% of schoolchildren and most adults vaccinated with two doses of the MMR vaccine can still be infected with measles virus and spread it to others, even with mild or no symptoms of their own.[1-4]

DOES IMMUNITY FROM THE MMR VACCINE WANE OVER TIME?

Yes. In 2007, the Centers for Disease Control and Prevention (CDC) conducted a study on **waning immunity after two doses of the measles, mumps and rubella (MMR) vaccine**.[1] The results, published in *Archives of Pediatrics and Adolescent Medicine*, show:

- About **35%** of vaccinated 7-year-olds are susceptible to ***subclinical* infection** with measles virus.
- About **60%** of vaccinated 15-year-olds are susceptible to ***subclinical* infection** with measles virus.
- By age 24–26, a projected **33%** of vaccinated adults are susceptible to ***clinical* infection**.

Consequently, **nearly 50% of schoolchildren and most adults** vaccinated with the MMR vaccine can still be infected with measles virus and **spread it to others**, even with mild or no symptoms of their own.[1-4] *(See figure above.)*

WOULD ANOTHER BOOSTER SHOT SOLVE THE PROBLEM OF WANING MMR VACCINE IMMUNITY?

No. The CDC conducted another study in 2016, published in *The Journal of Infectious Diseases*, which concludes that a third dose (booster shot) of the MMR vaccine is short-lived, lasting only one year.[5] The authors state:

"**MMR3 [a third dose of MMR] is unlikely to solve the problem of waning immunity in the United States...** We did not find compelling data to support a routine third dose of MMR vaccine."

Note: Children with measles antibody levels less than 900 mIU/mL are susceptible to subclinical infection with measles virus but not to clinical infection. About 35% of vaccinated children 7 years of age have a measles antibody level less than 900 mIU/mL. This level steadily declines through childhood, resulting in about 60% of children 15 years of age with a measles antibody level less than 900 mIU/mL. Consequently, nearly 50% of schoolchildren ([35%+60%]/2) and most adults (greater than 60%) are susceptible to infection with measles virus.[1]

All references are available at physiciansforinformedconsent.org/mmr-waning-immunity.

REFERENCES

1. LeBaron CW, Beeler J, Sullivan BJ, Forghani B, Bi D, Beck C, Audet S, Gargiullo P. Persistence of measles antibodies after 2 doses of measles vaccine in a postelimination environment. Arch Pediatr Adolesc Med. 2007 Mar;161(3):294-301.
2. Chen RT, Markowitz LE, Albrecht P, Stewart JA, Mofenson LM, Preblud SR, Orenstein WA. Measles antibody: reevaluation of protective titers. J Infect Dis. 1990 Nov;162(5):1036-42.
3. Pedersen IR, Mordhorst CH, Glikmann G, von Magnus H. Subclinical measles infection in vaccinated seropositive individuals in arctic Greenland. Vaccine. 1989 Aug;7(4):345-8.
4. Mizumoto K, Kobayashi T, Chowell G. Transmission potential of modified measles during an outbreak, Japan, March–May 2018. Euro Surveill. 2018 Jun 14;23(24):1800239.
5. Fiebelkorn AP, Coleman LA, Belongia EA, Freeman SK, York D, Bi D, Kulkarni A, Audet S, Mercader S, McGrew M, Hickman CJ, Bellini WJ, Shivakoti R, Griffin DE, Beeler J. Measles virus neutralizing antibody response, cell-mediated immunity, and immunoglobulin G antibody avidity before and after receipt of a third dose of measles, mumps, and rubella vaccine in young adults. J Infect Dis. 2016 Apr 1;213(7):1115-23.