

*Facts to Counter the Fear*

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# MEASLES

Toxicologist, Ashley Everly

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# Measles, in Television (1969 vs. 2015)

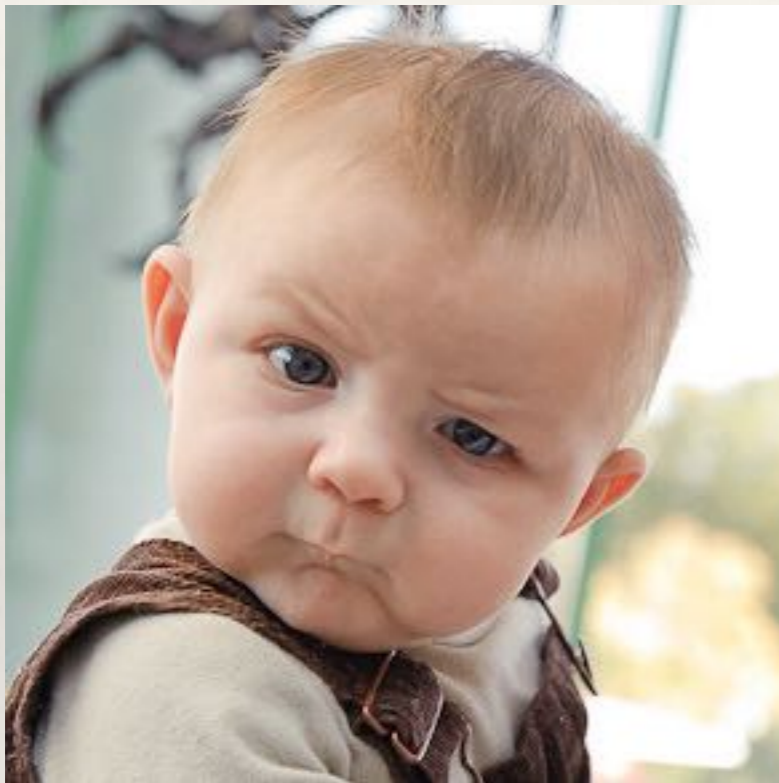
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Video: The Brady Bunch vs.  
Law and Order SVU

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# What Happened?

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Is measles a childhood rite of passage? Or is it deadly and to be feared?

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# Measles Symptoms & Complications

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- ❖ **Typical symptoms:**

- ❖ Fever, runny nose, red and watery eyes, small white spots on the inside of the mouth, then days later, the rash appears starting on the face and upper neck, and spreading downward.

- ❖ **Severe measles:**

- ❖ Blindness, encephalitis (infection that causes brain swelling), diarrhea and dehydration, and respiratory illnesses such as pneumonia.

**Source:** World Health Organization

<https://www.who.int/immunization/diseases/measles/en/>

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# Global Data

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- ❖ Incidence: 19 cases of measles per million persons in the world.
- ❖ 110,000 deaths from measles in 2017.
- ❖ Case fatality rates as high as 20% from West Africa.
  - ❖ “The overwhelming majority (more than 95%) of measles deaths occur in countries with low per capita incomes and weak health infrastructures.”
  - ❖ “Severe measles is more likely among poorly nourished young children, especially those with insufficient vitamin A, or whose immune systems have been weakened by HIV / AIDS or other diseases.”

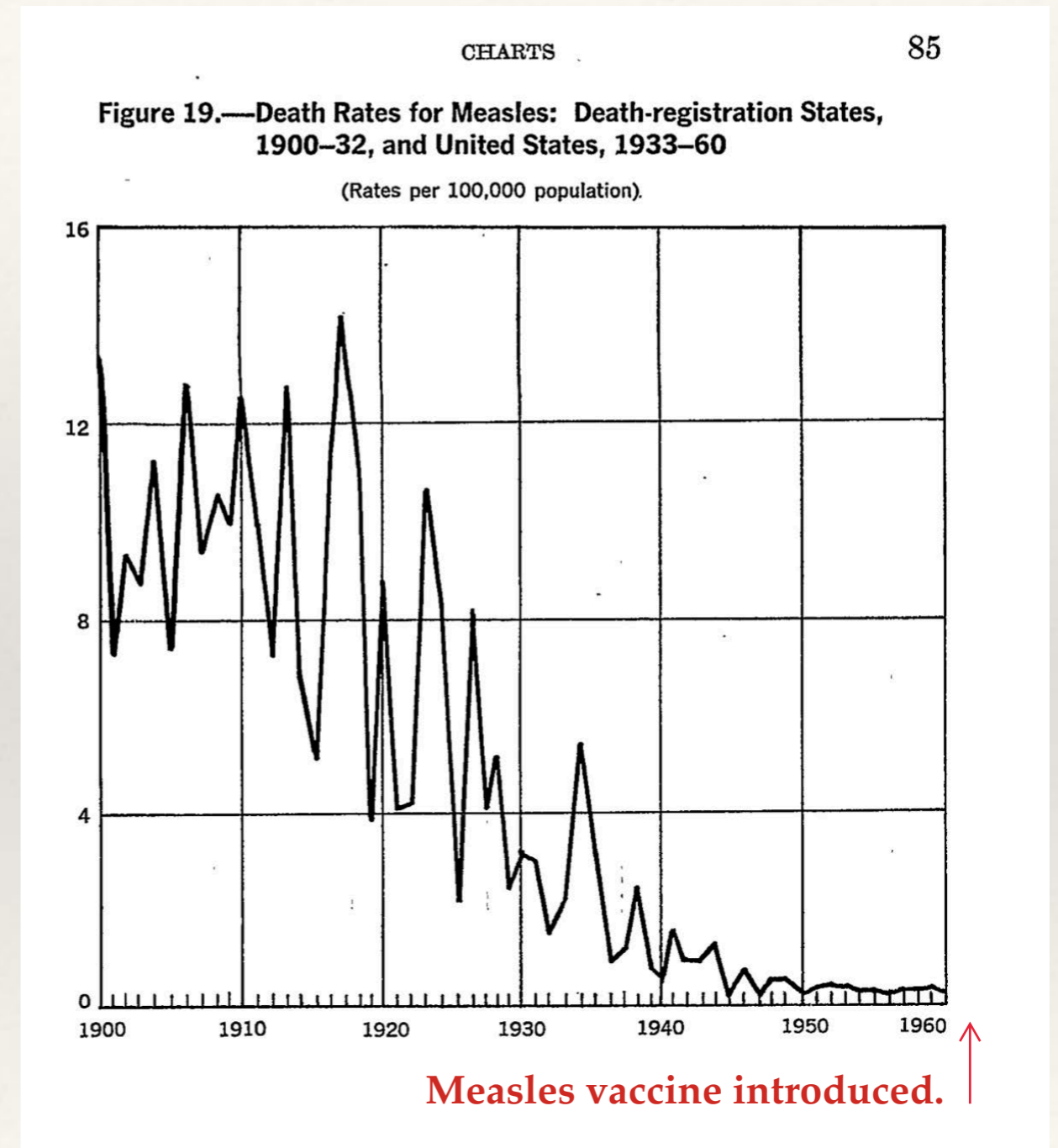
**Sources:** World Health Organization, Reviews of Infectious Diseases  
<https://www.who.int/en/news-room/fact-sheets/detail/measles>  
<https://www.ncbi.nlm.nih.gov/pubmed/6878998>

# US Data - Deaths

- ❖ **Before the vaccine:**
  - ❖ The measles vaccine was introduced in 1963.
  - ❖ If you lived in the US in 1960, you had a 1 in 500,000 chance of dying of measles, according to a 1968 report by the National Center for Health Statistics. [0.0002% death rate]

Sources: Centers for Disease Control (CDC)

[https://www.cdc.gov/nchs/data/vsus/vsrates1940\\_60.pdf](https://www.cdc.gov/nchs/data/vsus/vsrates1940_60.pdf)



# Death rate per 100,000 persons living in the US

TABLE 65.—Death rates for detailed causes: Death-registration States, 1900-1932, and United States, 1933-60—Continued  
Section F, 1949-1960—Continued

Cause of death	1940	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
I.—Infective and parasitic diseases—Continued												
Syphilis and its sequelae—Continued												
Other syphilis of central nervous system.....026	0.6	0.5	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1
All other syphilis.....027-029	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Gonococcal infection.....030-035	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Typhoid fever.....040	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paratyphoid fever and other Salmonella infections.....041, 042	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cholera.....043	—	—	—	—	—	—	—	—	—	—	—	—
Brucellosis (undulant fever).....044	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dysentery, all forms.....045-048	1.0	0.6	0.7	0.6	0.6	0.4	0.3	0.3	0.3	0.2	0.2	0.2
Food poisoning (infection and intoxication).....049	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Scarlet fever.....050	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Streptococcal sore throat.....051	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Erysipelas.....052	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Septicemia and pyemia.....053	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.8	1.0	1.0	1.1
Diphtheria.....055	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Whooping cough.....056	0.5	0.7	0.6	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.2	0.1
Meningococcal infections.....057	0.6	0.6	0.7	0.9	0.8	0.6	0.6	0.5	0.5	0.4	0.4	0.4
Plague.....058	0.0	0.0	—	—	—	—	—	0.0	—	—	0.0	—
Leprosy.....060	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tetanus.....061	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.1
Anthrax.....062	—	0.0	0.0	0.0	—	—	—	—	0.0	0.0	—	—
Acute poliomyelitis.....080	1.8	1.3	1.0	2.0	0.9	0.8	0.6	0.3	0.1	0.1	0.3	0.1
Late effects of acute poliomyelitis.....081	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Acute infectious encephalitis.....082	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3
Late effects of acute infectious encephalitis.....083	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
Smallpox.....084	0.0	0.0	0.0	—	0.0	—	—	—	—	—	—	—
Measles.....085	0.6	0.3	0.4	0.4	0.3	0.3	0.2	0.3	0.2	0.3	0.2	0.2
Yellow fever.....091	—	—	—	—	—	—	—	—	—	—	—	—
Infectious hepatitis.....092	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Rabies.....094	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tick-borne typhus.....104	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Typhus, other and unspecified, and other rickettsial diseases...100-103, 105-108	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Malaria.....110-117	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Schistosomiasis.....123	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hydatid disease.....125	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Filariasis.....127	0.0	0.0	—	0.0	—	—	—	—	—	—	—	—
Ancylostomiasis.....129	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	—	0.0	0.0	—
Other diseases due to helminths.....124, 126, 128, 130	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All other infective and parasitic diseases.....036-039, 054, 059, 063-074, 086-090, 093, 095, 096, 120-122, 131-138	0.7	0.7	0.8	0.8	0.8	0.7	0.7	0.8	0.7	0.7	0.8	0.8

0.2 per 100,000 is equivalent to 1 in 500,000.

Sources: Centers for Disease Control (CDC)

[https://www.cdc.gov/nchs/data/vsus/vsrates1940\\_60.pdf](https://www.cdc.gov/nchs/data/vsus/vsrates1940_60.pdf)

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# US Data - 1960 Case Fatality Rate

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- ❖ The CDC website states that in 1960, 1 in 1000 who contracted measles, died of measles. [**0.1% case fatality rate**]
- ❖ This rate is based on 500 deaths per 500,000 reported measles cases.
- ❖ **Under-reporting factor:**
  - ❖ It's estimated that the completeness of **reporting was around 10%**.
  - ❖ Actual number of measles cases was estimated at 4-5 million annually.
  - ❖ Revised death rate of 500 deaths annually out of 5 million cases = 1 in 10,000. [**0.01% case fatality rate**]

**Sources:** Centers for Disease Control (CDC), Journal of Infectious Diseases  
<https://www.cdc.gov/vaccines/pubs/pinkbook/meas.html#complications>  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC172858/pdf/080260.pdf>



# US Data & Under-reporting

## INTRODUCTION

It is useful to review what has happened since the licensing of measles vaccine in 1963, both to assess the progress in eliminating the disease and to identify what remains to be done. Before the introduction of the measles vaccine in 1963, 400,000 to 500,000 cases were reported and an estimated 5 million cases of measles occurred in the United States annually (Fig. 1). By 1979, 16 years after the introduction of the measles vaccine, the incidence of measles had declined 93% (75). At that time, the federal government initiated a campaign to eliminate indigenous measles from the United States by 1982. The strategy consisted of achieving and maintaining high coverage with a single dose of measles vaccine at 15 months of age, careful surveillance by public health departments, and aggressive outbreak control. In addition, during the 1970s, all states passed laws mandating documentation of immunization against measles and other childhood diseases for entry into school.

By the early 1980s, high immunization rates were achieved for school-age children; more than 95% of children were completely immunized by the time of school entry. In 1983, reported measles cases fell to a record low at that time of 1,497 (an incidence of 0.6/100,000 population) (31). Immunization efforts during the 1980s, however, failed to eradicate indigenous measles, and the number of reported cases averaged 3,700/year until 1989 (9, 21, 58). During the 1980s, measles cases continued to occur both in epidemics and during interepidemic periods (46).

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## MEASLES IN HIGHLY VACCINATED POPULATIONS: EARLY IN THE MEASLES EPIDEMIC OF 1989 TO 1991

During the 1970s and 1980s, measles outbreaks in school-age children accounted for the majority of reported measles cases (Table 1) (9). From 1985 to 1988 there were a median of 47 outbreaks among school-age populations and only 8 outbreaks among preschool populations; 42% of the affected children had been appropriately vaccinated for measles (9, 19, 41). In 1989, the number of outbreaks among school-age children swelled to 170 and the number of total reported measles cases increased to more than 18,000, with 41 deaths. The epidemic continued unabated through 1990, when 27,786 cases were reported, with more than 60 deaths (Fig. 1) (24). The overall incidence rate in 1990 surged to 11.2/100,000 population, compared with a low of 0.6/100,000 in 1983. In 1989, the majority of reported cases were in school-age or college-age individuals and a minority were in preschool children (Fig. 2). Outbreaks among school-age children compared with preschool children were both more numerous ( $n = 101$ ) and larger (median, 25 cases) (77). Approximately 80% of the affected school-age children were appropriately vaccinated.

Studies have documented that epidemics of measles can be sustained in school-age populations despite their having very high vaccination rates. For example, an outbreak of measles was sustained in two Texas schools when only 4.2% of the students were seronegative before the epidemic (42, 65). Typical of outbreaks among highly vaccinated populations, attack rates are low, on the order of 1 to 4%. Although Texas had laws requiring documented immunizations for school entry, 20% of the patients with measles in the 1985 Texas outbreak had not been immunized. There are four explanations for the increased rates of measles among highly vaccinated populations: (i) primary vaccine failure, (ii) secondary vaccine failure or waning immunity, (iii) nonrandom mixing patterns among school-age populations, and (iv) failure to enforce school entry immunization laws.

Sources: Journal of Infectious Diseases

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC172858/pdf/080260.pdf>

# US Data & Under-reporting

JOURNAL ARTICLE

## Completeness of Measles Case Reporting: Review of Estimates for the United States FREE

Rafael Harpaz 

*The Journal of Infectious Diseases*, Volume 189, Issue Supplement\_1, May 2004, Pages S185–S190,  
<https://doi.org/10.1086/378501>

**Published:** 01 May 2004



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### Abstract

Measles surveillance is complex: the patient must seek health care, the diagnosis must be recognized by the physician, and the case must be reported to health departments. The portion of total (incident) measles cases that is reported to health departments is termed “completeness of reporting.” Few studies describe this measure of the quality of surveillance in the United States; these studies use different methods, but they are all limited because the actual number of measles cases needed to derive completeness of reporting could not be determined. Estimates of completeness of reporting from the 1980s and 1990s vary widely, from 3% to 58%. One study suggests that 85% of patients with measles sought health care, the proportion of compatible illnesses for which measles was considered varied from 13% to 75%, and the proportion of suspected cases that were reported varied from 22% to 67%. Few cases were laboratory-confirmed, but all were reported. Surveillance in the United States is responsive, and its sensitivity likely increases when measles is circulating. Continued efforts to reinforce the clinical recognition and reporting of measles cases are warranted.

**Sources:** Journal of Infectious Diseases

[https://academic.oup.com/jid/article/189/Supplement\\_1/S185/822206](https://academic.oup.com/jid/article/189/Supplement_1/S185/822206)

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# US Data from 1985-1992

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- ❖ **1985-1992:** 1-2 in 1000 died of measles (reported cases).
- ❖ **Under-reporting factor:**
  - ❖ Estimates of completeness in reporting from the 1980s and 90s range from **3% to 58%** of actual measles cases. Why? Mild illness.
  - ❖ As low as 3 in 100,000 to 1 in 862 [**0.003% - 0.12% case fatality rate**]
- ❖ **None of this includes un-diagnosed and un-reported cases of measles which can and do occur as a result of MMR vaccination.**

**Sources:** CDC, Journal of Infectious Diseases

<https://www.cdc.gov/vaccines/pubs/pinkbook/meas.html#complications>

[https://academic.oup.com/jid/article/189/Supplement\\_1/S185/822206](https://academic.oup.com/jid/article/189/Supplement_1/S185/822206)

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# Recent Measles Deaths in the US

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- ❖ The last confirmed measles death occurred in 2015.
  - ❖ A fully vaccinated woman in her 20s living in Washington died from measles.
  - ❖ The woman was said to have several health conditions and on immune suppressing drugs, and therefore did not show typical signs of measles.
- ❖ Prior to 2015, the last confirmed measles death occurred in 2003.
  - ❖ Two measles deaths in 2003: (1) Immunocompromised child, aged 13 years. (2) International traveler aged 75 years, infected in Israel.
- ❖ *Unconfirmed* doctor's reports suggest one measles death occurs each year.

**Sources:** CDC, The Seattle Times, Forbes:

<https://www.cdc.gov/measles/downloads/measlesdataandstatsslideset.pdf>

<https://www.seattletimes.com/seattle-news/health/undetected-measles-led-to-womans-death/>

<https://www.forbes.com/sites/tarahaelle/2015/07/02/first-u-s-measles-death-in-more-than-a-decade/>

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# Comps & Perspective

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- ❖ **Using the National Center for Health Statistics 0.0002% death rate:** With a current population of 326 million, there would be **652** measles deaths per year, in the US, **if there were no vaccine.**
- ❖ **Using a case fatality rate of 0.01% and estimating 9 million cases per year:** There would be **900** deaths per year, **if there were no vaccine.**
- ❖ **Comparables:**
  - ❖ **Car accidents:** Fatalities occur at a rate of 0.01% = **33,578** deaths per year.
  - ❖ **Falling:** In 2016 there were **34,673** deaths from unintentional falls.

**Sources:** CDC, U.S. News, National Safety Council

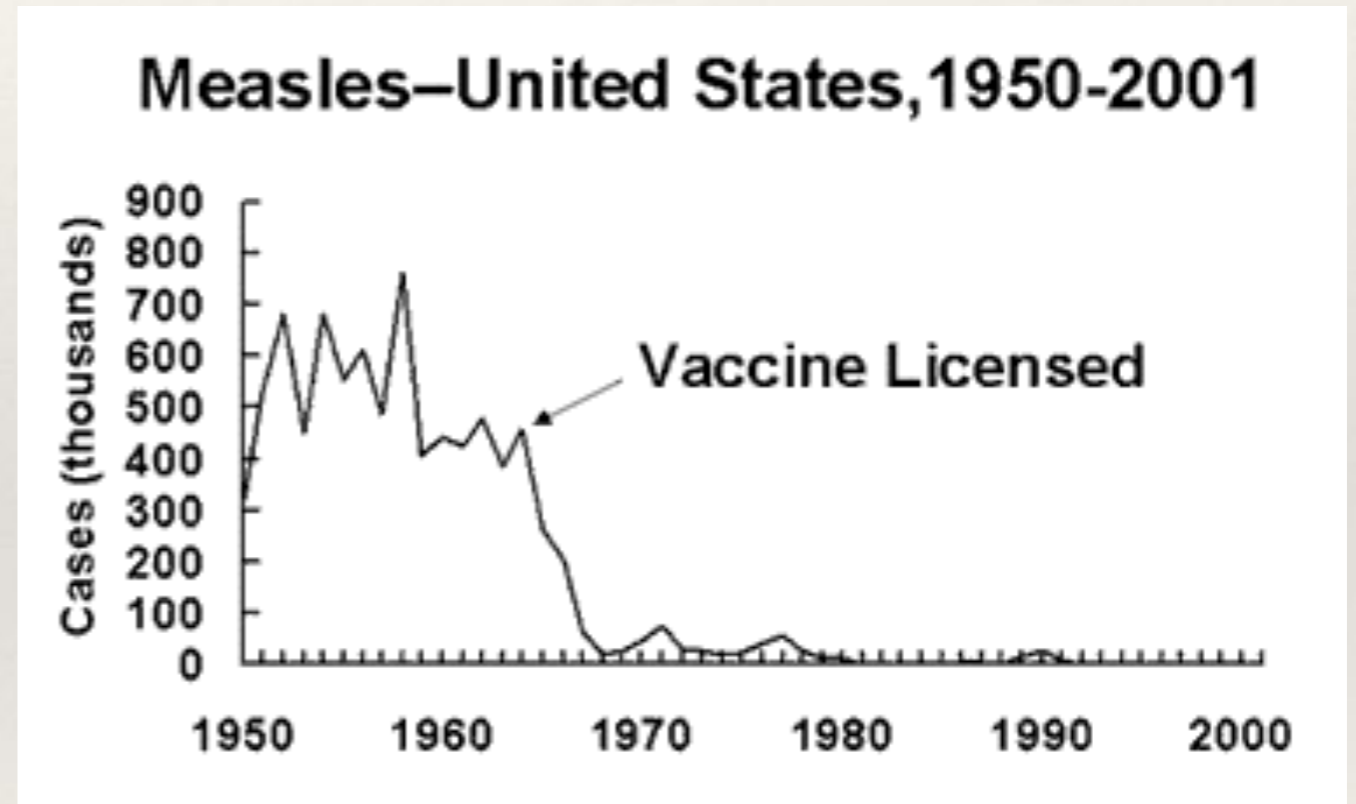
<https://www.cdc.gov/vitalsigns/motor-vehicle-safety/index.html>

<https://www.usnews.com/news/healthiest-communities/slideshows/top-10-causes-of-death-in-america>

<https://www.nsc.org/work-safety/safety-topics/slips-trips-falls>

# Success of the MMR Vaccine

- ❖ The combination **Measles / Mumps / Rubella** vaccine was introduced in 1971, to prevent illness and associated risk of harm.
- ❖ Incidence rates fell after after vaccine was introduced.
- ❖ Considered highly effective and successful.
- ❖ US celebrates as measles is declared “eradicated” in the year 2000.

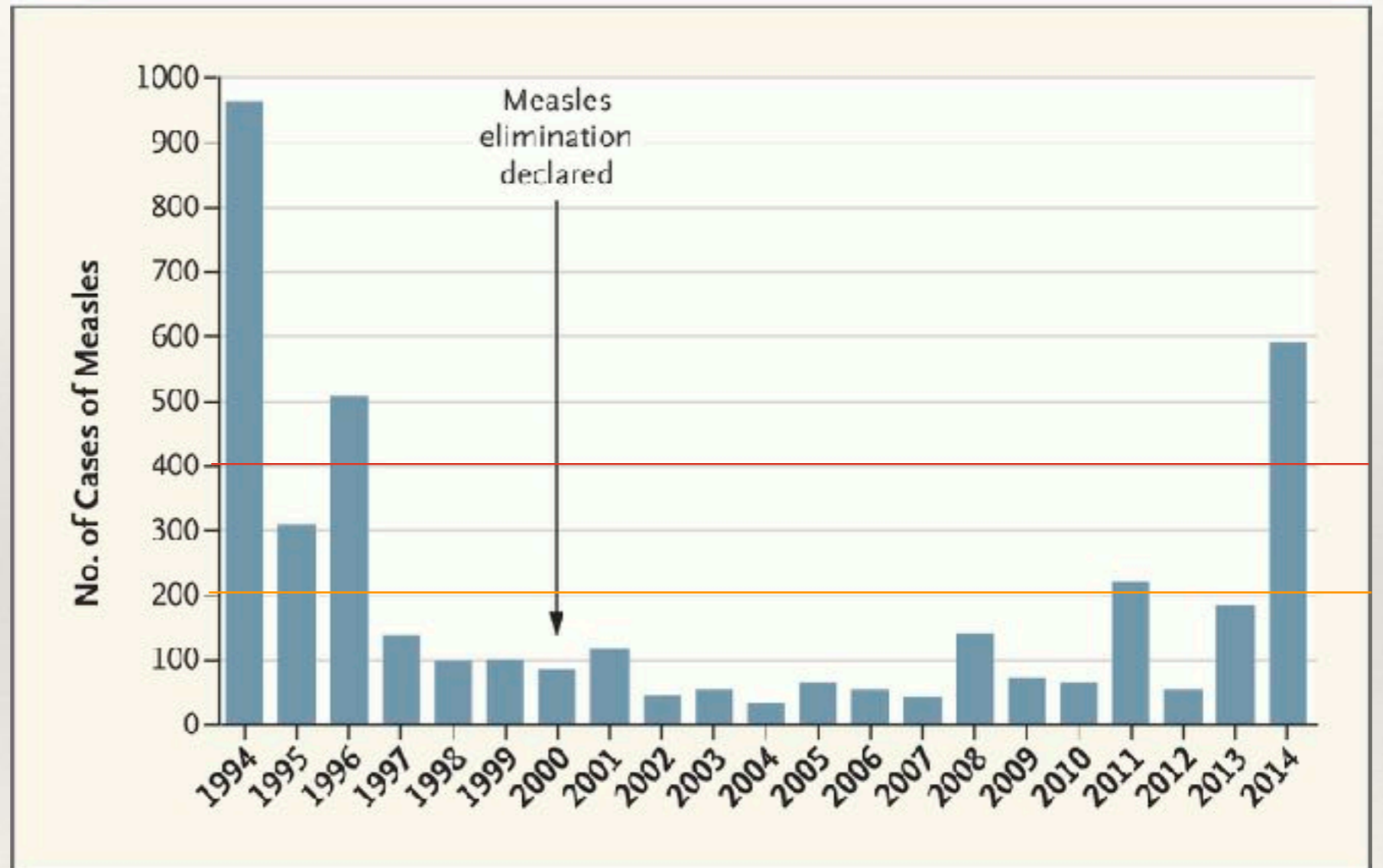


Source: History of Vaccines

<https://www.historyofvaccines.org/content/graph-us-measles-cases>

# The Year of Eradication

In the year 2000, twenty states reported confirmed measles cases, and there was a total of 86 confirmed cases of measles.



Sources: New England Journal of Medicine

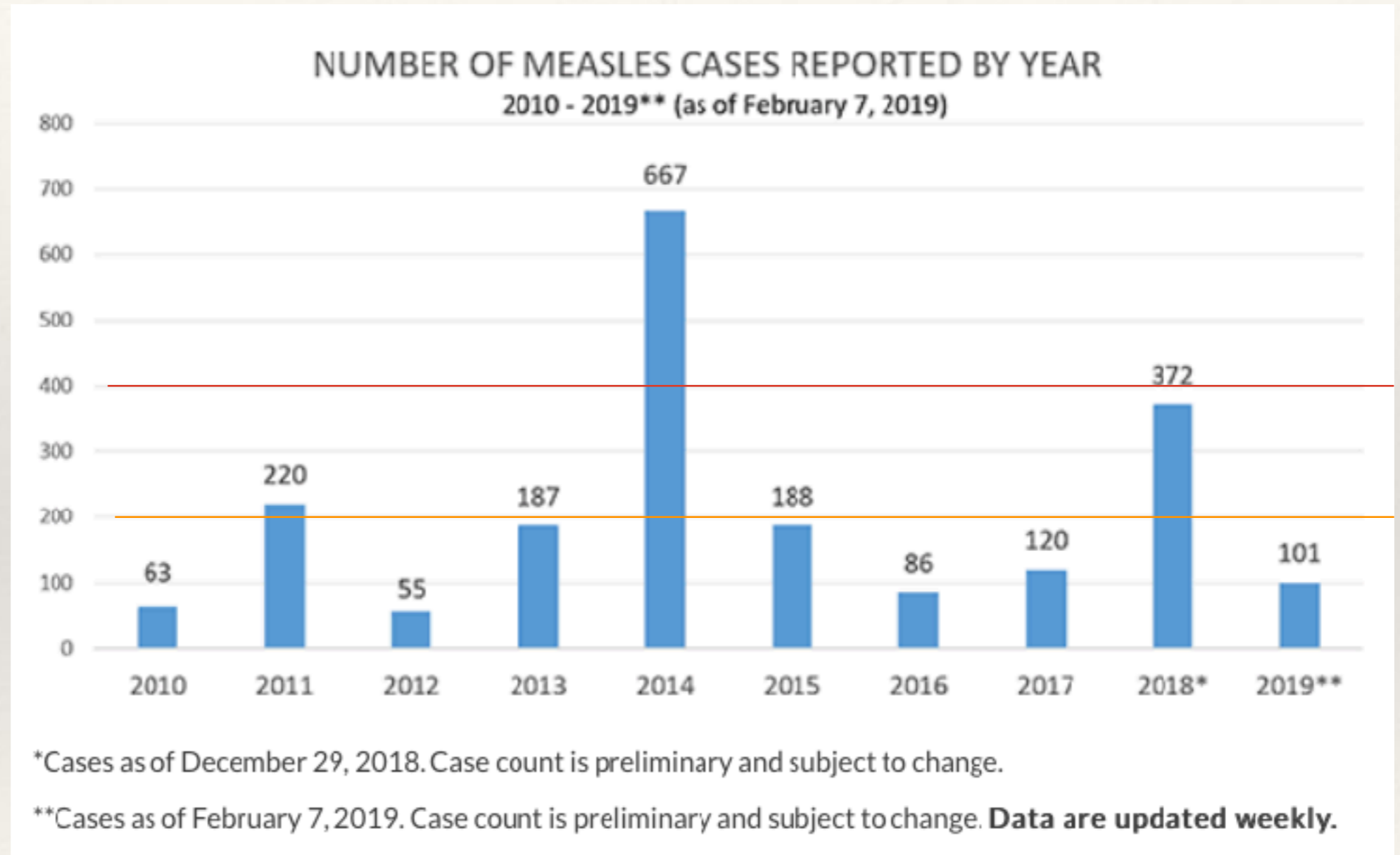
<https://www.nejm.org/doi/full/10.1056/NEJMp1408696>

<https://www.cdc.gov/MMWR/Preview/MMWRhtml/mm5106a2.htm>

# Measles Cases in the US

There were no deaths from measles despite 667 cases in 2014.

From 2004 - 2018, there were over 2000 reported cases of measles. There were no infant or child deaths during this time.



Sources: Centers for Disease Control  
<https://www.cdc.gov/measles/cases-outbreaks.html>



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# Measles Cases in Young Children

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- ❖ **2011:** 27 infants, 51 children (age 1-4)
- ❖ **2013:** 18 infants, 40 children (age 1-4)
- ❖ **2014:** 20 infants, 48 children (age 1-4)
- ❖ **2015:** 26 infants, 18 children (age 1-4)

**No cases of encephalitis and no deaths were reported.**

Data unavailable for 2012.

**Sources:** CDC

<https://www.cdc.gov/measles/cases-outbreaks.html>

<https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6322a4.htm>

<https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6414a1.htm>

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# Efficacy of the MMR

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- ❖ Despite claims of efficacy, **measles outbreaks** have occurred in fully vaccinated populations or in areas of near-complete coverage.
  - ❖ 1,363 cases of measles outbreak in Quebec, Canada, in 1989, despite **99% vaccination rate** for the total population.
  - ❖ In 1984, a measles outbreak occurred in a high school with a documented **vaccination rate of 98%** in Massachusetts.
  - ❖ An outbreak occurred in Texas in 1985, in a fully vaccinated secondary school population. **More than 99% of the students had been vaccinated.**
  - ❖ Outbreak in New York in 2011 was traced to a fully vaccinated 22 year old.

**Herd immunity is unattainable with the vaccine.**

**Sources:** Canada Journal of Public Health, New England Journal of Medicine, Science Magazine, Oregon Law Review

<https://www.ncbi.nlm.nih.gov/pubmed/1884314?>

<https://www.ncbi.nlm.nih.gov/pubmed/3821823>

<https://www.sciencemag.org/news/2014/04/measles-outbreak-traced-fully-vaccinated-patient-first-time>

<https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/18592/Holland.pdf>

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# Vaccine-Associated Measles

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- ❖ MMR and MMRV-vaccinated individuals can contract measles from the vaccine, due to vaccine virus shedding.
  - ❖ **Case study:** healthy 18-month-old child living in Italy developed symptoms of measles 7 days after MMRV vaccination. Measles virus was detected via throat swab up to 25 days later.
  - ❖ **Case study:** two-year-old child from Canada developed measles **five weeks** post-MMR-vaccination.

**Source:** Euro Surveillance

<https://www.eurosurveillance.org/images/dynamic/EE/V20N20/art21134.pdf>  
<https://www.eurosurveillance.org/content/10.2807/1560-7917.ES2013.18.49.20649>

# Vaccine-Associated Measles



- ❖ **Case study:** healthy 13-month-old living in the US developed measles symptoms 9 days post-MMR-vaccination.

Source: Clinical Case Reports

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5676287/>

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# Vaccine Details

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- ❖ MMR II is manufactured by **Merck** and is a live-virus vaccine.
- ❖ Listed ingredients & excipients:
  - ❖ Chick embryo cell culture, **WI-38 human diploid lung fibroblasts**, vitamins, amino acids, **fetal bovine serum**, sucrose, **glutamate**, recombinant **human albumin**, neomycin, sorbitol, hydrolyzed gelatin, sodium phosphate, sodium chloride.
- ❖ Administered at 12 or 15 months of age, and again at 4-6 years.
  - ❖ During outbreaks, doctors are advised that they may administer the MMR vaccine to children as young as 6-9 months, however it has not been tested for safety in children under a year of age.

Sources: CDC

<https://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/b/excipient-table-2.pdf>  
<https://www.cdc.gov/vaccines/schedules/downloads/child/0-18yrs-child-combined-schedule.pdf>

**Table 1** Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger  
United States, 2019

These recommendations must be read with the Notes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Table 1. To determine minimum intervals between doses, see the catch-up schedule (Table 2). School entry and adolescent vaccine age groups are shaded in gray.

Vaccine	Birth	1 mo	2 mos	4 mos	6 mos	9 mos	12 mos	15 mos	18 mos	19-23 mos	2-3 yrs	4-6 yrs	7-10 yrs	11-12 yrs	13-15 yrs	16 yrs	17-18 yrs
Hepatitis B (HepB)	1 <sup>st</sup> dose	2 <sup>nd</sup> dose		← 3 <sup>rd</sup> dose →													
Rotavirus (RV) RV1 (2-dose series); RV5 (3-dose series)			1 <sup>st</sup> dose	2 <sup>nd</sup> dose	See Notes												
Diphtheria, tetanus, & acellular pertussis (DTaP; <7 yrs)			1 <sup>st</sup> dose	2 <sup>nd</sup> dose	3 <sup>rd</sup> dose	← 4 <sup>th</sup> dose →				5 <sup>th</sup> dose							
<i>Haemophilus influenzae</i> type b (Hib)			1 <sup>st</sup> dose	2 <sup>nd</sup> dose	See Notes	← 3 <sup>rd</sup> or 4 <sup>th</sup> dose, See Notes →											
Pneumococcal conjugate (PCV13)			1 <sup>st</sup> dose	2 <sup>nd</sup> dose	3 <sup>rd</sup> dose	← 4 <sup>th</sup> dose →											
Inactivated poliovirus (IPV; <18 yrs)			1 <sup>st</sup> dose	2 <sup>nd</sup> dose	← 3 <sup>rd</sup> dose →						4 <sup>th</sup> dose						
Influenza (IIV)	Annual vaccination 1 or 2 doses										Annual vaccination 1 dose only						
<b>OR</b>											<b>OR</b>						
Influenza (LAIV)	Annual vaccination 1 or 2 doses										Annual vaccination 1 dose only						
Measles, mumps, rubella (MMR)					See Notes	← 1 <sup>st</sup> dose →				2 <sup>nd</sup> dose							
Varicella (VAR)						← 1 <sup>st</sup> dose →				2 <sup>nd</sup> dose							
Hepatitis A (HepA)					See Notes	2-dose series, See Notes											
Meningococcal (MenACWY-D ≥9 mos; MenACWY-CRM ≥2 mos)			See Notes											1 <sup>st</sup> dose		2 <sup>nd</sup> dose	
Tetanus, diphtheria, & acellular pertussis (Tdap; ≥7 yrs)																	Tdap
Human papillomavirus (HPV)																	See Notes
Meningococcal B																	See Notes
Pneumococcal polysaccharide (PPSV23)																	See Notes

■ Range of recommended ages for all children    
 ■ Range of recommended ages for catch-up immunization    
 ■ Range of recommended ages for certain high-risk groups    
 ■ Range of recommended ages for non-high-risk groups that may receive vaccine, subject to individual clinical decision-making    
 ■ No recommendation

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# WI-38 Human Diploid Lung Fibroblasts

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- ❖ Derived from the lung tissues of a female fetus at three months gestation in 1964.
- ❖ Fetus was aborted because the family felt they had too many children.
- ❖ DNA fragments from fetal lung fibroblasts remain in the final vaccine solution.
- ❖ Independent research has found that these fragments can spontaneously integrate into the host's genome. "Insertional mutagenesis".

***Carcinogenesis, Mutagenesis, Impairment of Fertility***

**M-M-R II has not been evaluated for carcinogenic or mutagenic potential, or potential to impair fertility.**

Sources: ATCC, [ProCon.org](http://ProCon.org), Sound Choice, FDA

<https://www.atcc.org/products/all/CCL-75.aspx>

[https://vaccines.procon.org/view.resource.php?resourceID=005206#wi\\_38](https://vaccines.procon.org/view.resource.php?resourceID=005206#wi_38)

<https://www.ncbi.nlm.nih.gov/pubmed/26103708>

<https://www.fda.gov/downloads/BiologicsBloodVaccines/UCM123789.pdf>

# Fetal Bovine Serum

Altern Lab Anim. 2002 Mar-Apr;30(2):219-27.

## **The use of fetal bovine serum: ethical or scientific problem?**

Jochems CE<sup>1</sup>, van der Valk JB, Stafleu FR, Baumans V.

### **Author information**

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### **Abstract**

Fetal bovine serum (FBS) is a common component of animal cell culture media. It is harvested from bovine fetuses taken from pregnant cows during slaughter. FBS is commonly harvested by means of a cardiac puncture without any form of anaesthesia. Fetuses are probably exposed to pain and/or discomfort, so the current practice of fetal blood harvesting is inhumane. Apart from moral concerns, several scientific and technical problems exist with regard to the use of FBS in cell culture. Efforts should be made to reduce the use of FBS or, preferably, to replace it with synthetic alternatives.

PMID: 11971757

Source: NIH

<https://www.ncbi.nlm.nih.gov/pubmed/11971757>



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# Human Albumin

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## WARNINGS

**Albumin (Human) 25% is made from human plasma. Products made from human plasma may contain infectious agents, such as viruses, that can cause disease. The risk that such products will transmit an infectious agent has been reduced by screening plasma donors for prior exposure to certain viruses, by testing for the presence of certain current virus infections, and by inactivating certain viruses by pasteurization. Despite these measures, such products can still potentially transmit disease. A theoretical risk for transmission of Creutzfeldt-Jakob disease (CJD) also is considered extremely remote. No cases of transmission of viral diseases or CJD have ever been identified for albumin. There is also the possibility that unknown infectious agents may be present in such products. ALL infections thought by a physician possibly to have been transmitted by this product should be reported by the physician or other healthcare provider to Octapharma, at 866-766-4860. The physician should discuss the risks and benefits of this product with the patient.**

Source: NIH

<https://dailymed.nlm.nih.gov/dailymed/fda/fdaDrugXsl.cfm>

- Panniculitis (inflammation of adipose/fat tissue under the skin)
- Atypical MEASLES
- Fever
- Syncope (temporary loss of consciousness)
- Headache
- Dizziness
- Malaise
- Irritability
- Vasculitis (inflammation of blood vessels which can lead to restricted blood flow and damage to organs)
- Pancreatitis (inflammation of the pancreas)
- Diarrhea
- Vomiting
- Parotitis (Inflammation of a parotid gland, especially infectious parotitis aka MUMPS)
- Nausea
- Diabetes mellitus
- Thrombocytopenia (low platelets / severe bleeding due to reduced ability to form blood clots)
- Purpura (Red/purple discolored spots on the skin due to bleeding underneath the skin)
- Regional lymphadenopathy (enlargement / disease of the lymph nodes)
- Leukocytosis (abnormally high number of white blood cells due to inflammation from infection, tumors, or leukemia)
- Anaphylaxis and anaphylactoid reactions, angioneurotic edema / peripheral or facial edema (severe swelling of the lower layer of skin and tissue just under the epidermis) and bronchial spasm.
- Arthritis or Arthralgia (Arthralgia and/or arthritis, transient or chronic, and polyneuritis are features of infection with wild-type RUBELLA.)
- Myalgia (muscle pain)
- Encephalitis (brain inflammation)
- Encephalopathy (brain disease, damage, or malfunction)
- Measles inclusion body encephalitis (MIBE). Presents with seizures within one year of measles vaccination or measles infection.
- Subacute sclerosing panencephalitis (SSPE). SSPE is a chronic form of progressive brain inflammation caused by a persistent infection with measles virus.
- Guillain-Barré Syndrome (GBS). GBS is a disorder in which the body's immune system attacks your nerves, causing weakness, severe pain, difficulty breathing, and paralysis.
- Acute disseminated encephalomyelitis (ADEM). ADEM is a demyelinating disease of the central nervous system / widespread attack of inflammation in the brain and spinal cord.
- Transverse myelitis (Inflammation of the spinal cord which causes pain, abnormal sensations, weakness, incontinence, or total paralysis.)
- Febrile convulsions / seizures
- Afebrile convulsions / seizures
- Ataxia (loss of full control of bodily movements)
- Polyneuritis (disorder of the peripheral nerves)
- Polyneuropathy (degeneration / malfunction of peripheral nerves in various parts of the body at the same time)
- Ocular palsies (Damage to third cranial nerve affecting eye movements, leading to strabismus and double vision)
- Paresthesia (abnormal burning or prickling sensation in in various parts of the body)
- Aseptic meningitis (inflammation of layers lining the brain, causing fever, headache, vomiting, persistent crying and poor eating in children, mental confusion..)
- Pneumonia and pneumonitis
- Sore throat, cough, rhinitis
- Stevens-Johnson syndrome / Erythema multiforme (form of toxic epidermal necrolysis. A painful red or purple rash that spreads and blisters, eventually causing the top layer of the skin to die and shed. May lead to vision loss.)
- Urticaria / hives
- Rash / Measles-like rash
- Pruritus / severe itching of the skin
- Burning / stinging at injection site
- Wheal and flare / allergic skin reaction
- Redness
- Swelling
- Induration (hardening of soft tissues of the skin / loss of elasticity)
- Tenderness
- Vesiculation / blistering
- Henoch-Schönlein purpura / Acute hemorrhagic edema of infancy (rash caused by inflammation and bleeding in small blood vessels, accompanied with swollen joints, abdominal pain, or bloody urine)
- Nerve deafness / hearing loss
- Otitis media (ear infection)
- Retinitis (inflammation of the retina of the eye)
- Optic neuritis / papillitis / retrobulbar neuritis (demyelinating inflammation of the optic nerve. Vision loss, pain with movement of the eye.)
- Conjunctivitis (eye infection)
- Epididymitis / Orchitis (inflammation of the testicles, characterized by pain, swelling, and burning with urination)
- Death

# Adverse Events

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# Adverse Events

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- ❖ **Measles, mumps, or rubella.**
- ❖ **Mild:** Fever, loss of consciousness, headache, dizziness, irritability, sore throat, cough, rash, ear infection, nausea, vomiting.
- ❖ **Moderate:** diabetes, thrombocytopenia, arthritis, myalgia, severe itching of the skin, febrile seizure.
- ❖ **Severe:** anaphylaxis or allergic reaction, seizure, encephalitis, GBS, demyelinating diseases, polyneuropathy, aseptic meningitis, pancreatitis, hearing loss, vision loss, epidermal necrolysis, death.

Source: FDA

<https://www.fda.gov/downloads/BiologicsBloodVaccines/UCM123789.pdf>

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# Rate of Adverse Events

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- ❖ **Difficult to determine. Why?**
  - ❖ The MMR vaccine was not tested for safety against a placebo.
  - ❖ In clinical vaccine trials, manufacturers typically do not monitor for adverse events long term.
  - ❖ Often times adverse events do not manifest until 1-3 weeks post-vaccination, 2-3 months later, sometimes longer.
  - ❖ Health care professionals fail to recognize and report adverse events. Parents aren't aware of possible reactions.

Sources: BMJ, FDA, HHS

<https://www.ncbi.nlm.nih.gov/pubmed/5902680>

<https://www.fda.gov/downloads/BiologicsBloodVaccines/UCM123789.pdf>

<https://healthit.ahrq.gov/sites/default/files/docs/publication/r18hs017045-lazarus-final-report-2011.pdf>

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# VAERS

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## Vaccine Adverse Events Reporting System

- ❖ VAERS is a passive reporting system, relying on individuals to send in reports of their experiences to the CDC and FDA.
- ❖ Less than 1% of all vaccine adverse events are reported to VAERS.
- ❖ VAERS data for 2017:
  - ❖ 2,387 reported adverse events from the MMR vaccine.
  - ❖ Applying the under-reporting factor:
    - ❖ **238,700 adverse events**

Source: HHS

<https://vaers.hhs.gov/about.html>

<https://healthit.ahrq.gov/sites/default/files/docs/publication/r18hs017045-lazarus-final-report-2011.pdf>

<https://vaers.hhs.gov/data/datasets.html>

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# Comparing Adverse Event Rates

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- ❖ Using a conservative estimate of measles mortality (1 in 10,000) and records of adverse events (AEs) in **1960**:
  - ❖ 500 deaths + 48,000 hospitalizations + 1,000 cases of encephalitis = 49,500 adverse events from measles.
  - ❖ 49,500 AEs / 5 million cases = **0.99% AE rate**
- ❖ 10 million doses of the MMR vaccine is administered each year in the US.
  - ❖ 238,700 AEs / 10 million doses = **2.4% AE rate**
- ❖ **The risk of adverse events from the MMR vaccine today, is over twice the risk of adverse events from measles, in 1960.\***

\*This does not include data from the MMRV vaccine.

Source: CDC

<https://www.cdc.gov/measles/vaccination.html>

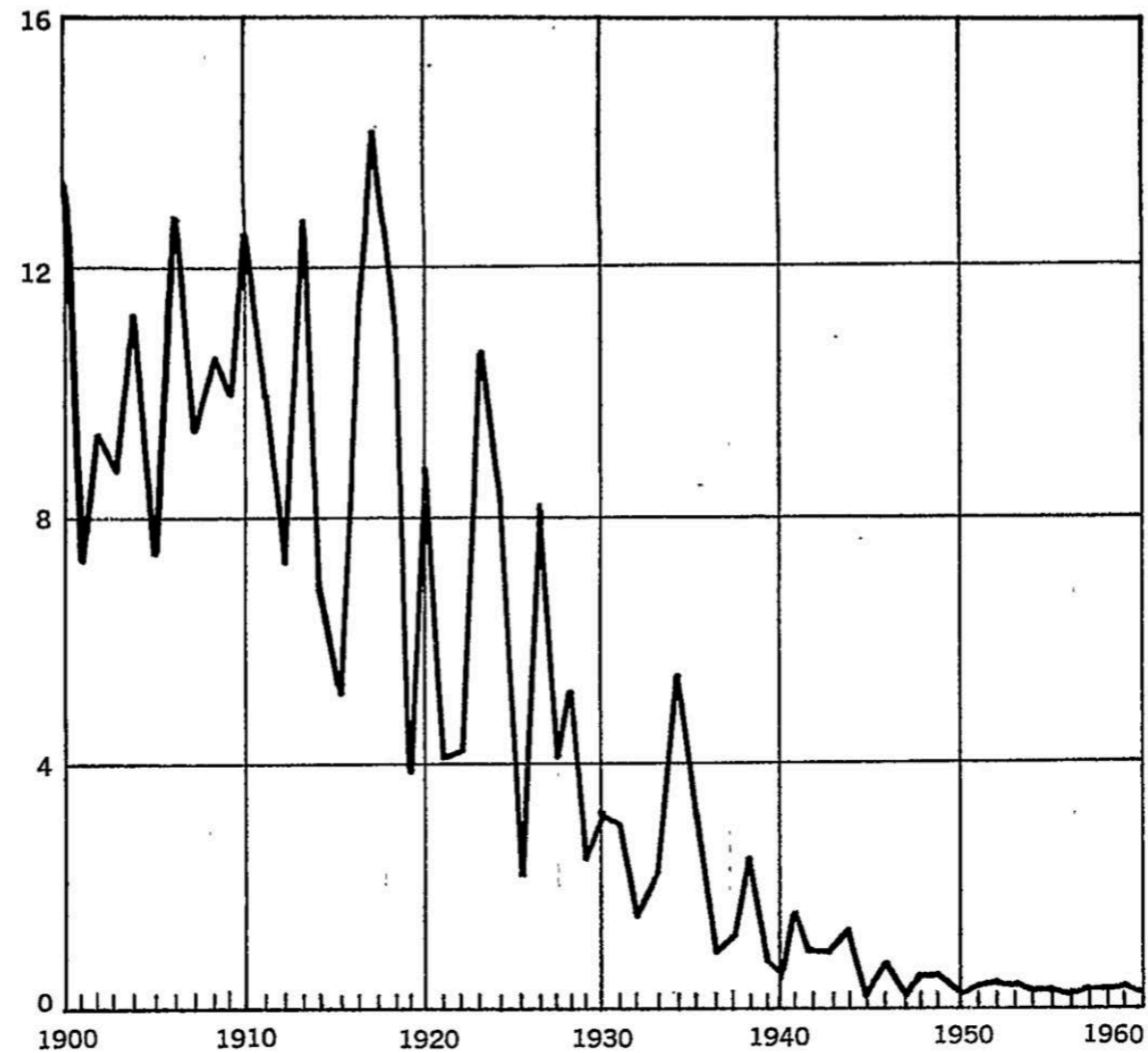
# Decline in Measles Mortality

CHARTS

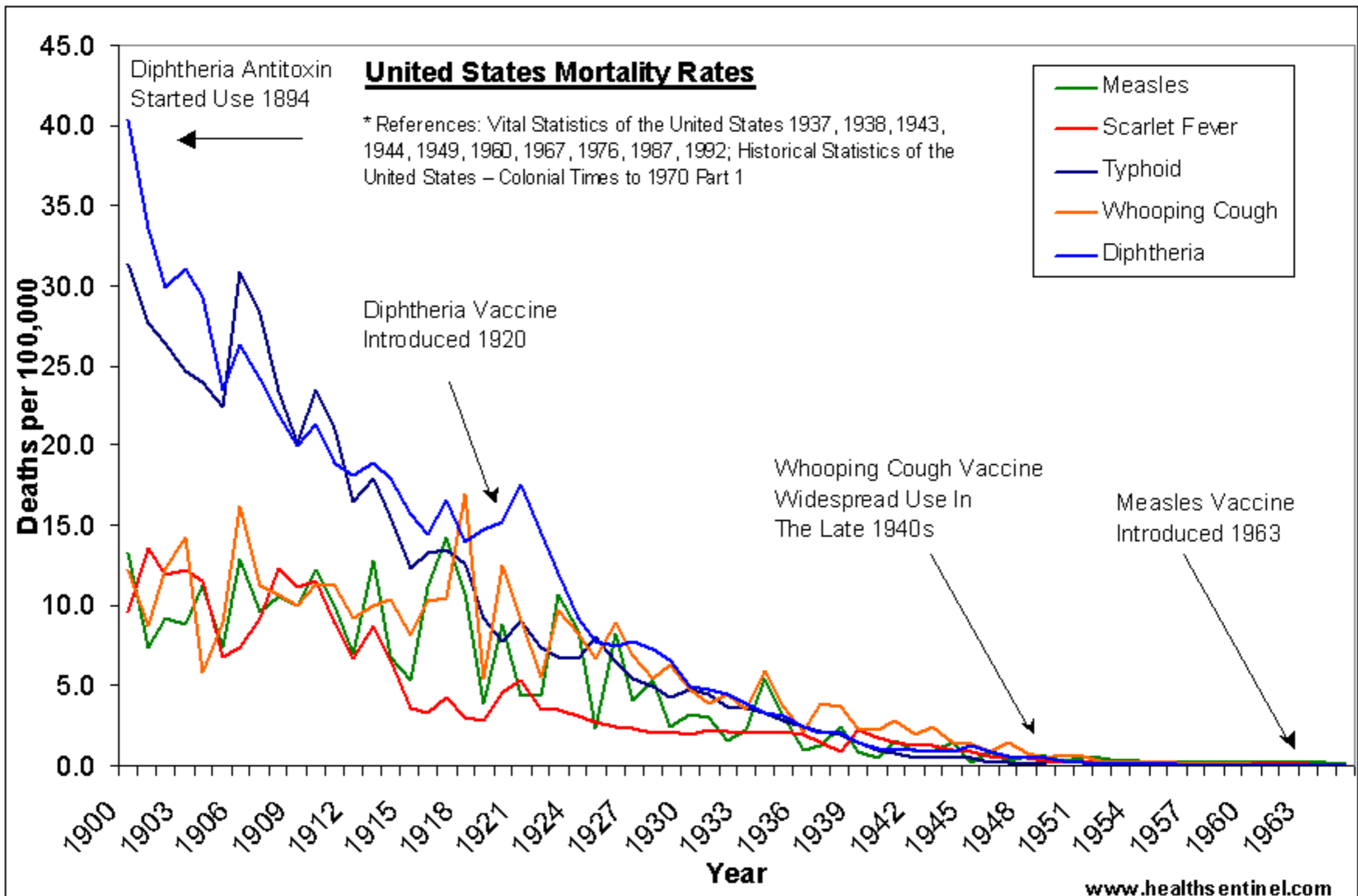
85

Figure 19.—Death Rates for Measles: Death-registration States, 1900–32, and United States, 1933–60

(Rates per 100,000 population).



# Infectious Disease Mortality

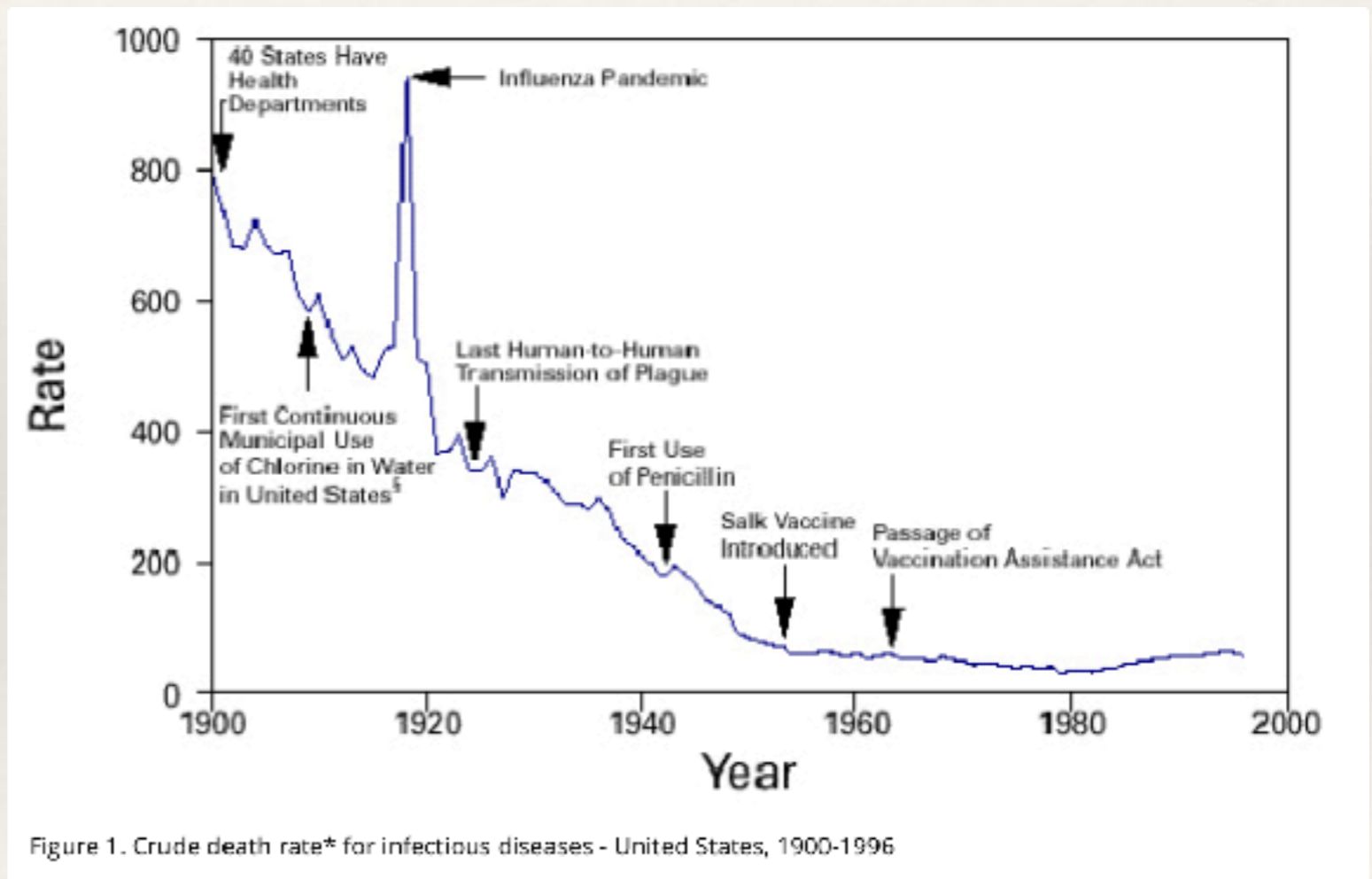




# Factors in the Decline

- ❖ 92% of the decline in infectious disease mortality in the 20th century occurred prior to 1950, and the introduction of vaccines.

- ❖ Improved nutrition
- ❖ Drinking water treatment
- ❖ Sanitary living conditions
- ❖ Better hygiene



Sources: [columbia.edu](http://www.columbia.edu), CDC

[http://www.columbia.edu/itc/hs/pubhealth/rosner/g8965/client\\_edit/readings/week\\_2/mckinlay.pdf](http://www.columbia.edu/itc/hs/pubhealth/rosner/g8965/client_edit/readings/week_2/mckinlay.pdf)

<https://www.cdc.gov/healthywater/drinking/history.html>

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# Malnutrition & Measles

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- ❖ Malnourished children and populations will experience:
  - ❖ Severe and prolonged measles infection.
  - ❖ More severe measles infections at a greater frequency.
  - ❖ Greater risk of secondary infections.
  - ❖ Increased risk of complications and longer hospital stays.
- ❖ **Malnutrition** is largely responsible for the elevated mortality rate and risk of complications in developing nations.

Sources: BMJ, Nutrition Reviews, Journal of Ayub Medical College

<https://www.ncbi.nlm.nih.gov/pubmed/871699>

<https://www.ncbi.nlm.nih.gov/pubmed/6181440>

<https://www.ncbi.nlm.nih.gov/pubmed/19385448>

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# Measles & Vitamin A

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- ❖ **1990:** Measles virus depletes vitamin A. Vitamin A deficiency is associated with increased mortality from measles.
- ❖ **1992 & 1993:** Children with no known vitamin A deficiency show a significant decline in vitamin A during measles infection. The degree to which vitamin A levels are depressed is governs the severity of the illness.
- ❖ **2002:** The World Health Organization recommends vitamin A supplementation as treatment for measles.

**Sources:** New England Journal of Medicine, Nutrition Reviews, Pediatrics, Journal of Tropical Pediatrics

<https://www.ncbi.nlm.nih.gov/pubmed/2194128>

<https://www.ncbi.nlm.nih.gov/pubmed/1436764>

<https://www.ncbi.nlm.nih.gov/pubmed/8502524>

<https://www.ncbi.nlm.nih.gov/pubmed/12521271>

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# Measles & Vitamin A

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- ❖ **2008:** Vitamin A is found to directly inhibit measles virus.
- ❖ **2009:** Vitamin A up-regulates the immune system in uninfected cells to protect against viral infection and replication.
- ❖ **2011:** Vitamin A supplementation can reduce the *incidence* of measles, and prevent death, blindness and subsequent illness in children aged 6 months to 5 years, and potentially save 600,000 lives per year.

The benefit of vitamin A in the treatment of measles was first suggested in 1932, but was ignored until 1987.

**Sources:** Antiviral Research, FASEB Journal, BMJ, Science Daily, BMJ

<https://www.ncbi.nlm.nih.gov/pubmed/18547655>

<https://www.ncbi.nlm.nih.gov/pubmed/19447880>

<https://www.bmj.com/content/bmj/343/bmj.d5094.full.pdf>

<https://www.sciencedaily.com/releases/2011/08/110825193059.htm>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2521770/>

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# Measles & SSPE

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## Subacute Sclerosing Panencephalitis

- ❖ Very rare, highly delayed, chronic progressive brain inflammation associated with measles infection.
- ❖ Symptoms: Personality changes, myoclonic seizures and / or muscle spasms, loss of vision, dementia, rigidity, respiratory distress, coma, and death. No cure exists.
- ❖ Fewer than 10 cases per year in the US. Greater incidence in developing nations.
- ❖ The MMR vaccine can cause SSPE.

Sources: MedlinePlus, NBC News

<https://medlineplus.gov/ency/article/001419.htm>

<https://www.nbcnews.com/health/health-news/fatal-measles-complication-killed-patients-years-later-n674706>

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# SSPE Risk Factors

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- ❖ Large families / several siblings / crowded home
- ❖ Being a third child or subsequent child
- ❖ Measles infection under 1 year
- ❖ Head injury
- ❖ Low birth weight
- ❖ Unhealthy mothers
- ❖ Rural living
- ❖ Contact with domestic animals, esp. birds and pigs
- ❖ Genetic factors

**Sources:** Acta Neurologica Scandinavica, International Journal of Epidemiology, American Journal of Epidemiology, Virologie, Journal of Pediatrics and Child Health, Archives of Neurology, Neuroepidemiology, Archives of Neurology

<https://www.ncbi.nlm.nih.gov/pubmed/9696527>

<https://www.ncbi.nlm.nih.gov/pubmed/1468866>

<https://www.ncbi.nlm.nih.gov/pubmed/7377184>

<https://www.ncbi.nlm.nih.gov/pubmed/9588651>

<https://www.ncbi.nlm.nih.gov/pubmed/6659364>

<https://www.ncbi.nlm.nih.gov/pubmed/508150>

<https://www.ncbi.nlm.nih.gov/pubmed/3374729>

<https://www.ncbi.nlm.nih.gov/pubmed/12020266>

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# Benefits of Measles?

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In the majority of children the whole episode had been well and truly over in a week...

and many mothers have remarked "how much good the attack has done their children," as they seem **so much better after the measles.**

**Vital Statistics:  
Measles Reports from General Practitioners.  
1959.**

- ❖ Natural infections provide lifetime immunity vs incomplete and waning immunity from vaccines, which requires additional booster shots.
- ❖ Childhood measles infection has been associated with a reduced risk of cancer later in life.
- ❖ Case studies of spontaneous remission of lymphomas as a result of measles infection.

**Sources:** International Journal of Cancer, Leukemia Research, Lancet, BMJ

<https://www.ncbi.nlm.nih.gov/pubmed/15700307/>

<https://www.ncbi.nlm.nih.gov/pubmed/22940258/>

<https://www.ncbi.nlm.nih.gov/pubmed/6112483/>

<https://www.ncbi.nlm.nih.gov/pubmed/4100922/>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1992477/pdf/brmedj02957-0102.pdf>

# The Push

- ❖ Vaccines are a \$60 billion per year market for the pharmaceutical industry.
- ❖ Merck pulls in 12% of the global market for vaccine sales.
- ❖ \$1.4 billion in sales for the MMR vaccine in 2010.
- ❖ Goal of the CVI Strategic Plan in 1998 was to increase demand for vaccines.



The image is a screenshot of a Bloomberg news article. At the top, there is a navigation bar with a hamburger menu icon on the left, the word "Bloomberg" in the center, and a "Subscribe" button on the right. Below the navigation bar, the word "Business" is displayed in a smaller font. The main headline of the article is "Merck Measles Vaccine Sales Surged as California Outbreak Grew" in a large, bold, black font. Below the headline, the authors "Drew Armstrong and Cynthia Koons" and the date "April 28, 2015, 10:03 AM PDT" are listed. The first paragraph of the article reads: "There's nothing like an outbreak to get parents to vaccinate -- or to help vaccine sales." The second paragraph begins with "As a measles outbreak that started in California grew from seven cases on Jan. 7 to more than 100 a month later, sales of Merck & Co.'s measles vaccine surged as well."

Sources: WHO, Bloomberg

[https://www.who.int/influenza\\_vaccines\\_plan/resources/session\\_10\\_kaddar.pdf](https://www.who.int/influenza_vaccines_plan/resources/session_10_kaddar.pdf)

[https://apps.who.int/iris/bitstream/handle/10665/64635/CVI\\_GEN\\_97.04.pdf](https://apps.who.int/iris/bitstream/handle/10665/64635/CVI_GEN_97.04.pdf)

<https://www.bloomberg.com/news/articles/2015-04-28/merck-measles-vaccine-sales-surged-as-california-outbreak-grew>



# Promotion of the Vaccine



**Measles  
is  
misery**

**protect your child now**

The Health Education Council

Vaccination is free for all children between 1 and 15, who have not had measles or been previously immunised against it. Ask your doctor or health clinic now.

**M**easles can cause brain damage.  
**M**umps can cause deafness.  
**R**ubella can severely handicap unborn children.



**Protect them with  
the MMR shot!**

Talk to your doctor immediately.  
The MMR shot is completely free and completely safe.



**MMR**

The free way to three-way protection.

Sponsored by the Health Promotion Unit, Department of Health.

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# Merck: Profits over People

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- ❖ In 2009, court proceedings revealed that Merck had created a fake scientific journal to publish fabricated data on its drug, Vioxx.
- ❖ Merck knew that Vioxx was causing heart attacks in their clinical trials, and removed the data when submitting it to the FDA.
- ❖ Merck is also currently in court over fraudulent claims of the efficacy of the mumps portion of the MMR vaccine.

**Merck Created Hit List to "Destroy," "Neutralize" or "Discredit" Dissenting Doctors**

**Sources:** CBS News, New Scientist, Huffington Post

<https://www.cbsnews.com/news/merck-created-hit-list-to-destroy-neutralize-or-discredit-dissenting-doctors/>

<https://www.newscientist.com/article/dn13685-drug-giant-merck-accused-of-deaths-cover-up/>

<https://www.huffingtonpost.ca/entry/5881914>

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# Additional Concerns

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- ❖ CDC Scientists lodge ethics complaint against the agency.
- ❖ Scientists Preserving Integrity, Diligence, and Ethics in Research:
  - ❖ Research at the CDC is being influenced and shaped by industry interests. Covering up and falsifying data is becoming the norm and not the rare exception.
- ❖ FDA caught burying evidence of fraud in medical trials.

Sources: Huffington Post, Slate

[https://www.huffingtonpost.com/carey-gillam/spider-bites-cdc-ethics-c\\_b\\_12525012.html](https://www.huffingtonpost.com/carey-gillam/spider-bites-cdc-ethics-c_b_12525012.html)

<https://slate.com/technology/2015/02/fda-inspections-fraud-fabrication-and-scientific-misconduct-are-hidden-from-the-public-and-doctors.html>

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# Conclusion

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- ❖ Measles can be deadly in malnourished individuals.
- ❖ SSPE is a concern, but cases are extremely rare.
- ❖ Claimed benefits of the MMR vaccine unlikely to outweigh serious risks.
- ❖ Vaccination rates over 99% do not prevent outbreaks of measles.
- ❖ Mortality rates, popular culture of the 60s, and more, provide evidence that measles was not considered deadly in the US prior to the vaccine, due to improved nutrition and vitamin A sufficiency.
- ❖ Vitamin A sufficiency can help prevent measles complications and is easy to obtain following a healthy diet.
- ❖ Measles infection may provide significant health benefits and natural immunity is lifelong.
- ❖ The information we're given is just the tip of the iceberg!

Have a  
Happy Measle



Have a  
Merry Mumps



Have a  
Cheery Chickenpox



JEANNE BENDICK with  
CANDY BENDICK and ROB BENDICK, jr.

And just about *everybody*  
gets measles,  
mumps,  
and chickenpox,  
sometime or other.

They don't always come at the handiest time.  
They might interfere with Christmas or birthdays or  
the circus,

BUT

once you have had them, you almost certainly will  
never have them again.

SO

have a happy measle, a merry mumps, a cheery chicken-  
pox, and grin and bear whatever else comes along.



1958 Children's Book, sold on Amazon:

<https://www.amazon.com/Happy-Measle-Merry-Cheery-Chickenpox/dp/B005LEBDUG>