



If you catch measles, what are your chances of dying?

When I was a kid, measles was one of those things you were expected to catch. I had it when I was five, and must confess, I don't remember much about the experience. I do remember being confined to bed. And I also remember being told that measles could cause blindness – as a budding reader, this scared me. But I don't recall anyone hinting at anything worse. If my parents were worried, they didn't show it. And I'd certainly never heard of kids who had died – even in playground rumors.

So as the current outbreak of measles in the US continues to spread, I've been intrigued by statements that the disease has a mortality rate of somewhere between one and three young children per thousand infected.

Of course I know as a public health academic that measles is highly infectious and can cause severe harm – even death. But there was a dissonance between what I was reading and what I felt was correct. Surely if one out of every few hundred kids died as a result of measles as I was growing up, I'd have got wind of it?

The mortality rate of around 1 in 1000 though comes with a sound provenance. It's there in black and white on the Centers for Disease Control and Prevention (CDC) web pages:

“For every 1,000 children who get measles, one or two will die from it”

A 2004 review in the Journal of Infectious Diseases provides further insight. Using CDC data on reported measles cases in the US between 1989 and 2000, Orenstein, Perry and Halsey indicated that approximately three children under the age of five died for every thousand that caught measles, and that the overall mortality rate for all ages was also around 3 per thousand people

infected – the table below gives the data they used in deaths per thousand cases.

	Overall	<5 years	5-9 years	10-19 years	20-29 years	>30 years
	n = 67,032	n = 28,730	n = 6,492	n = 18,580	n = 9,161	n = 4,069
Any complication	291	414	365	128	290	344
Death	3	3	1	1	3	7
Diarrhea	82	115	63	34	84	95
Encephalitis	1	1	1	1	2	3
Hospitalization	192	260	94	87	227	272
Otitis media	73	140	47	18	17	17
Pneumonia	59	86	28	20	60	93

Number of complications per 1,000 reported cases of measles in the United States, 1987 - 2000. Walter A. Orenstein, Robert T. Perry and Neal A. Halsey (2004) The Clinical Significance of Measles: A Review. J Infect Dis. (2004) 189 (Supplement 1): S4-S16. doi: 10.1086/377712. Data: Centers for Disease Control & Prevention

MEASLES MORTALITY RATES IN THE US 1987 – 2000

This seems pretty convincing – maybe measles is more dangerous than we used to think back in the 70’s.

But there’s a catch.

The CDC dataset that Orenstein, Perry and Halsey used specifically refers to *reported* cases of measles. The derived mortality rate is for cases that are serious enough to have been flagged and logged by the agency. The question then becomes, how many cases occurred that weren’t reported, and how (if at all) do these alter the estimated mortality rate?

In a 2004 review entitled “Measles Eradication in the United States” (an optimistic title, in the light of current events), Orenstein, Papania and Warton make the point that not every case of measles in the US is reported, or at least it wasn’t, when the disease was more common.

According to their paper, from 1956 to 1960, there were an average of 450 measles-related deaths reported each year in the US, or approximately 1 death per 1000 reported cases. At the time though, it was estimated that more than 90% of Americans had been infected by measles by the age of 15 – equivalent to roughly 4 million children and teens per year. (Langmuir, A.D. (1962), Medical Importance of Measles. *Am J Dis Child* 103(3):224-226.)

These data suggest that the chances of dying from measles in the US in the late 1950's was probably closer to 1 in 10,000.

Accounting for non-reported cases that led to death, and some uncertainty in the numbers, the mortality rate is realistically likely to be around one in a few thousand. But based on the data, it's not likely to be as high the one or two deaths per 1,000 that's being widely cited.

That shouldn't detract from how important it is to prevent measles, and especially to protect young children, the elderly and other susceptible groups from infection. This is not a disease to be dismissed or taken lightly. It still kills nearly 150,000 people a year around the world according to the World Health Organization. It is highly infectious. And for communities to be adequately protected, there need to be high levels of immunization.

Yet from the available evidence, claiming that one or two children out of every 1,000 infected in the current US outbreak will die seems far fetched.

Sadly, using this mortality rate to hammer home the importance of getting kids vaccinated could well backfire. Like myself, many parents from my generation haven't seen evidence for such a high chance of dying from the disease. And to use data that not only feel wrong, but are not backed up with evidence, only serves to undermines trust in public health experts.

Anti-vaccine proponents are smart enough to realize this. Each time the data on infectious diseases and risk are spun beyond their legitimate bounds, anti-vaccine proponents are given a helping hand in winning the hearts and minds of concerned parents.

Instead, public health experts and their advocates need to remain true to the data that support their message. Granted they won't always be clear and compelling. But this should never be an excuse to spin the data to fit the story.

Ironically, for many people it's not the numbers that count when it comes to making decisions over whether to vaccinate or not, so much as who to trust. But in deciding whom to place that trust in, numbers – and how they are used – can be very important indeed.

Update Feb 4 2015: A follow-up analysis of data from the 2008-2011 measles outbreak in France has been posted [here](#)

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