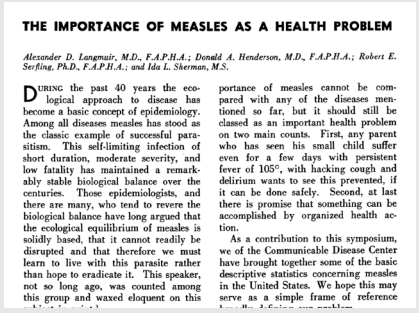
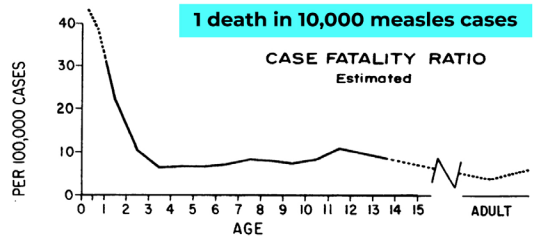
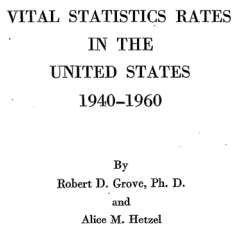
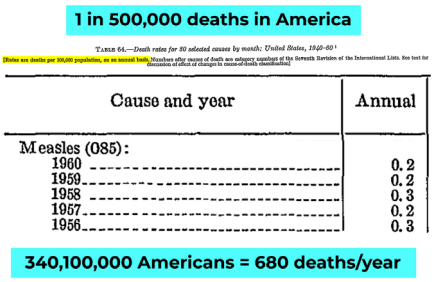
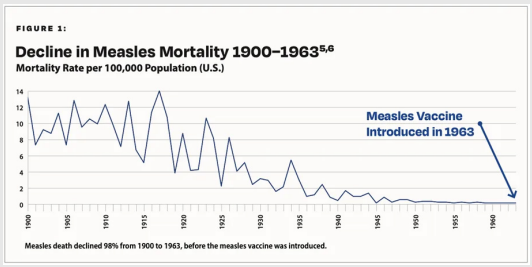
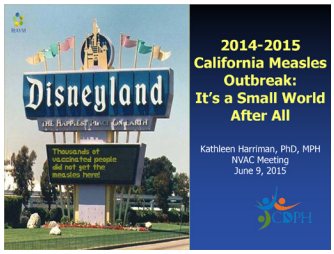
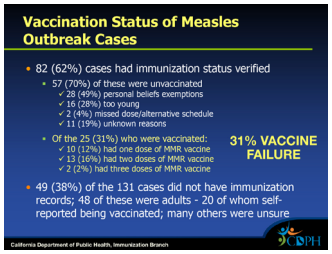
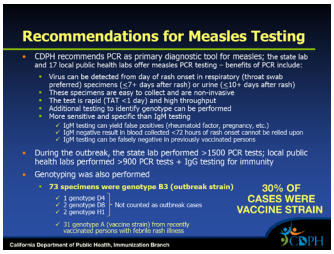
# THE TRUTH ABOUT MEASLES

AS SEEN ON EP413 OF *THE HIGHWIRE*

## MORTALITY PRE-VACCINE

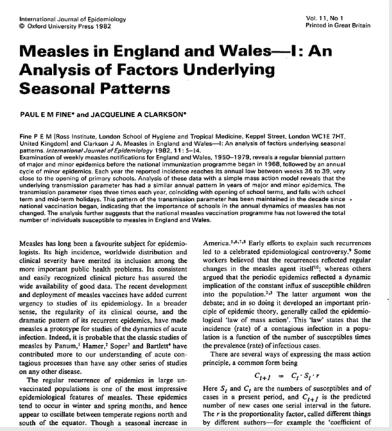
| Source | Chart/Quote |
|---|---|
| CDC MMWR: Measles Prevention: Recommendations of the Immunization Practices Advisory Committee (ACIP) | "Before measles vaccine was available, more than 400,000 measles cases were reported each year in the United States (6). However, since virtually all children acquired measles, the true number of cases probably exceeded 4 million per year (i.e., the entire birth cohort)." |
| The Importance Of Measles as a Health Problem |  THE IMPORTANCE OF MEASLES AS A HEALTH PROBLEM<br>*Alexander D. Langmuir, M.D., F.A.P.H.A.; Donald A. Henderson, M.D., F.A.P.H.A.; Robert E. Serfling, Ph.D., F.A.P.H.A.; and Ida L. Sherman, M.S.*<br>DURING the past 40 years the ecological approach to disease has become a basic concept of epidemiology. Among all diseases measles has stood as the classic example of successful parasitism. This self-limiting infection of short duration, moderate severity, and low fatality has maintained a remarkably stable biological balance over the centuries. Those epidemiologists, and there are many, who tend to revere the biological balance have long argued that the ecological equilibrium of measles is solidly based, that it cannot readily be disrupted and that therefore we must learn to live with this parasite rather than hope to eradicate it. This speaker, not so long ago, was counted among this group and waxed eloquent on this portance of measles cannot be compared with any of the diseases mentioned so far, but it should still be classed as an important health problem on two main counts. First, any parent who has seen his small child suffer even for a few days with persistent fever of 105°, with hacking cough and delirium wants to see this prevented, if it can be done safely. Second, at last there is promise that something can be accomplished by organized health action.<br>As a contribution to this symposium, we of the Communicable Disease Center have brought together some of the basic descriptive statistics concerning measles in the United States. We hope this may serve as a simple frame of reference |  1 death in 10,000 measles cases<br>CASE FATALITY RATIO<br>Estimated<br>PER 100,000 CASES<br>AGE<br>ADULT<br>Figure 3—Measles Rates by Age |
| Vital Statistics Rates in The United States 1940-1960 |  VITAL STATISTICS RATES IN THE UNITED STATES 1940–1960<br>By Robert D. Grove, Ph. D. and Alice M. Hetzel |  1 in 500,000 deaths in America<br>TABLE 64.—*Death rates for 10 selected causes by month; United States, 1940–60*<br>Cause and year / Annual<br>Measles (085):<br>1960 0.2<br>1959 0.2<br>1958 0.3<br>1957 0.2<br>1956 0.3<br>340,100,000 Americans = 680 deaths/year |
| Physicians for Informed Consent |  FIGURE 1:<br>Decline in Measles Mortality 1900–1963[5,6]<br>Mortality Rate per 100,000 Population (U.S.)<br>Measles Vaccine Introduced in 1963<br>Measles death declined 98% from 1900 to 1963, before the measles vaccine was introduced. | |

## 2015 DISNEYLAND MEASLES OUTBREAK

| | |
|---|---|
| California Department of Public Health, Immunization Branch |  Disneyland<br>Thousands of vaccine-free people did not get the measles here!<br>2014-2015 California Measles Outbreak: It's a Small World After All<br>Kathleen Harriman, PhD, MPH<br>NVAC Meeting<br>June 9, 2015<br>  Vaccination Status of Measles Outbreak Cases<br>• 82 (62%) cases had immunization status verified<br>• 57 (70%) of these were unvaccinated<br>✓ 28 (49%) personal beliefs exemptions<br>✓ 16 (28%) too young<br>✓ 2 (4%) missed dose/alternative schedule<br>✓ 11 (19%) unknown reasons<br>• Of the 25 (31%) who were vaccinated:<br>✓ 10 (13%) had one dose of MMR vaccine<br>✓ 13 (16%) had two doses of MMR vaccine<br>✓ 2 (2%) had three doses of MMR vaccine<br>31% VACCINE FAILURE<br>• 49 (38%) of the 131 cases did not have immunization records; 48 of these were adults - 20 of whom self-reported being vaccinated; many others were unsure<br>California Department of Public Health, Immunization Branch<br>  Recommendations for Measles Testing<br>• CDPH recommends PCR as primary diagnostic tool for measles; the state lab and 17 local public health labs offer measles PCR testing - benefits of PCR include:<br>• Virus can be detected from day of rash onset in respiratory (throat swab preferred) specimens (≤7+ days after rash) or urine (≤10+ days after rash)<br>• These specimens are easy to collect and are non-invasive<br>• The test is rapid (TAT <1 day) and high throughput<br>• Additional testing to identify genotype can be performed<br>• More sensitive and specific than IgM testing<br>✓ IgM testing can yield false positives (rheumatoid factor, pregnancy, etc.)<br>✓ IgM negative result in blood collected <72 hours of rash onset cannot be relied upon<br>✓ IgM testing can be falsely negative in previously vaccinated persons<br>• During the outbreak, the state lab performed >1500 PCR tests; local public health labs performed >900 PCR tests + IgG testing for immunity<br>• Genotyping was also performed<br>• 73 specimens were genotype B3 (outbreak strain)<br>✓ 1 genotype D4<br>✓ 2 genotype D8 - Not counted as outbreak cases<br>✓ 2 genotype H1<br>✓ 31 genotype A (vaccine strain) from recently vaccinated persons with febrile rash illness<br>30% OF CASES WERE VACCINE STRAIN<br>California Department of Public Health, Immunization Branch |

# EPIDEMICS ARE CYCLICAL PRE AND POST-VACCINE

[Measles in England and Wales—I: An Analysis of Factors Underlying Seasonal Patterns]



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**Measles in England and Wales—I: An Analysis of Factors Underlying Seasonal Patterns**

PAUL E M FINE* and JACQUELINE A CLARKSON*

Fine P E M (Ross Institute, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, United Kingdom) and Clarkson J A. Measles in England and Wales—I: An analysis of factors underlying seasonal patterns. *International Journal of Epidemiology* 1982, 11: 5–14.

Examination of weekly measles notifications for England and Wales, 1950–1979, reveals a regular biennial pattern of major and minor epidemics before the national immunization programme began in 1968, followed by an annual cycle of minor epidemics. Each year the reported incidence reaches its annual low between weeks 35 to 39, very close to the opening of primary schools. Analysis of these data with a simple mass action model reveals that the underlying transmission parameter has had a similar annual pattern in years of major and minor epidemics. The transmission parameter rises three times each year, coinciding with opening of school terms, and falls with school term and mid-term holidays. This pattern of the transmission parameter has been maintained in the decade since national vaccination began, indicating that the importance of schools in the annual dynamics of measles has not changed. The analysis further suggests that the national measles vaccination programme has not lowered the total number of individuals susceptible to measles in England and Wales.

Measles has long been a favourite subject for epidemiologists. Its high incidence, worldwide distribution and clinical severity have merited its inclusion among the more important public health problems. Its consistent and easily recognized clinical picture has assured the wide availability of good data. The recent development and deployment of measles vaccines have added current urgency to studies of its epidemiology. In a broader sense, the regularity of its clinical course, and the dramatic pattern of its recurrent epidemics, have made measles a prototype for studies of the dynamics of acute infection. Indeed, it is probable that the classic studies of measles by Panum,[1] Hamer,[2] Soper[3] and Bartlett[4] have contributed more to our understanding of acute contagious processes than have any other series of studies on any other disease.

The regular recurrence of epidemics in large unvaccinated populations is one of the most impressive epidemiological features of measles. These epidemics tend to occur in winter and spring months, and hence appear to oscillate between temperate regions north and south of the equator. Though a seasonal increase in America,[5,6,7,8] Early efforts to explain such recurrences led to a celebrated epidemiological controversy.[9] Some workers believed that the recurrences reflected regular changes in the measles agent itself[10], whereas others argued that the periodic epidemics reflected a dynamic implication of the constant influx of susceptible children into the population.[5,8] The latter argument won the debate; and in so doing it developed an important principle of epidemic theory, generally called the epidemiological 'law of mass action'. This 'law' states that the incidence (rate) of a contagious infection in a population is a function of the number of susceptibles times the prevalence (rate) of infectious cases.

There are several ways of expressing the mass action principle, a common form being

$$C_{t+1} = C_t \cdot S_t \cdot r$$

Here $S_t$ and $C_t$ are the numbers of susceptibles and of cases in a present period, and $C_{t+1}$ is the predicted number of new cases one serial interval in the future. The $r$ is the proportionality factor, called different things by different authors—for example the 'coefficient of

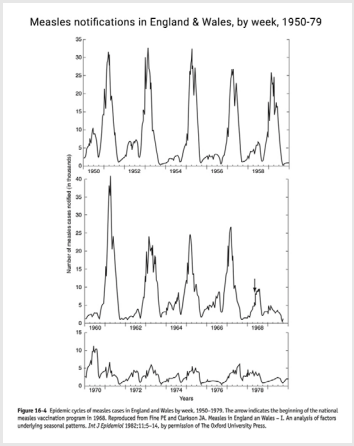



Figure 16-4 Epidemic cycles of measles cases in England and Wales by week, 1950–1979. The arrow indicates the beginning of the national measles vaccination program in 1968. Reproduced from Fine PE and Clarkson JA. Measles in England an Wales – I. An analysis of factors underlying seasonal patterns. *Int J Epidemiol* 1982;11:5–14, by permission of The Oxford University Press.

# THOSE VACCINATED FOR MEASLES CAN CARRY AND SPREAD THE VIRUS ASYMPTOMATICALLY

[Measles Vaccine Virus RNA in Children More Than 100 Days after Vaccination]

"Limited data are available on detection of measles vaccine virus (MeVV) RNA in human subjects following vaccination. Available evidence suggests MeVV RNA can be identified up to 14 days after vaccination, with detection beyond this rare."

"We report detection and confirmation of MeVV RNA from the respiratory tract of 11 children between 100 and 800 days after most recent receipt of measles-containing vaccine."

**Table 3.** Count of measles vaccine virus detections and days from most recent measles-containing vaccine.

| DAYS SINCE LAST MCV * | NUMBER OF MEVV CASES |
|---|---|
| 0–19 | 106 |
| 20–39 | 10 |
| 40–59 | 5 |
| 60–79 | 4 |
| 80–100 | 3 |
| >100 | 11 |
| UNKNOWN | 2 |

* MCV = measles-containing vaccine.

[Measles, the need for a paradigm shift]

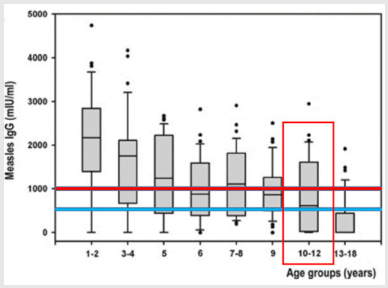
"Essentially, there have been no trials evaluating the clinical efficacy of MCV schedules in preventing measles disease or monitoring the long-term quality of the immune response."

[Protective titres of measles neutralising antibody]

"The study suggests that measles NT titres >1, 000 mIU/ml may prevent measles infection and NT titres >500 mlU/ml may prevent symptomatic infection but vaccinees with undetectable or low NT titres may not necessarily be susceptible to symptomatic infection."

Measles Virus-Specific Antibody Levels in Individuals in Argentina Who Received a One-Dose Vaccine

"Despite active vaccination strategies, reemergence or resurgence of MV continues to occur, impairing elimination programs. The occurrence of several measles outbreaks in highly immunized populations (5, 34, 40, 51) has focused attention on vaccine efficacy and the durability of vaccine-induced immunity. It is likely that many factors contribute to the presence of susceptible individuals among highly vaccinated populations. These include failure to seroconvert and decline of immunity with time after vaccination (19, 37). Other important factors that might influence the immune response comprise the age at the time of vaccination (27, 33), the number of doses, and the strain included in the vaccine (18, 23, 28)."




Estimated susceptibility to asymptomatic secondary immune response against measles in late convalescent and vaccinated persons

"In our study, secondary immune response susceptibility was not reduced by a second vaccination, although revaccination reduces susceptibility to measles [Hutchins et al., 1990; Robertson et al., 1992; Tulchinsky et al., 1993]."

## OUTBREAKS IN HIGHLY VACCINATED POPULATIONS

Sri Lanka eliminates Measles

"The vaccination coverage in the country has been consistently high - over 95% with both the first and second dose of measles and rubella vaccine provided to children under the routine immunization programme."

UNICEF supports Ministry of Health to accelerate supplementary measles immunization activity in Sri Lanka

"UNICEF, together with WHO, will support the Ministry of Health in implementing a supplementary measles immunization activity (SIA) in Sri Lanka aimed at controlling the ongoing measles outbreak, midst over 700 measles cases reported in the country since May 2023."

## VACCINE IMMUNITY WANES AND CAN CAUSE OUTBREAKS IN VACCINATED AND UNVACCINATED

The Future of Measles in Highly Immunized Populations: A Modeling Approach

"The simulation reveals that in the prevaccine era, approximately 10.6% of the population was susceptible to measles, most of whom were children less than 10 years of age. With the institution of the measles immunization program, the proportion of susceptibles in the population fell to 3.1% from 1978 through 1981, but then began to rise by approximately 0.1% per year to reach about 10.9% In the year 2050. The susceptibles at this time were distributed evenly throughout all age groups. The model did not consider the potential effect of waning immunity."

Implications of Vaccination and Waning Immunity

"Here, we parametrize such a model for measles and show how vaccination can have a range of unexpected consequences as it reduces the natural boosting of immunity as well as reducing the number of naive susceptibles."

"In particular, we show that moderate waning times (40-80 years) and high levels of vaccination (greater than 70%) can induce large-scale oscillations with substantial numbers of symptomatic cases being generated at the peak."

"In addition, we predict that, after a long disease-free period, the introduction of infection will lead to far larger epidemics than that predicted by standard models. These results have clear implications for the long-term success of any vaccination campaign and highlight the need for a sound understanding of the immunological mechanisms of immunity and vaccination."

Subclinical measles infection in vaccinated seropositive individuals in arctic Greenland

"The antibody measurements...lead to the conclusion that the rise in measles antibodies observed, 2-4 years after measles vaccination, was...caused...by an infection with measles virus."

"Measles can apparently also spread among seropositive persons, which eventually could lead to clinically manifest measles in seronegative persons. If this was not the case it will be difficult to explain the rise in measles virus antibodies which occurred in Scoresbysund in about two-thirds of the seropositive vaccinees 2-4 years after the vaccination with live measles vaccine virus."

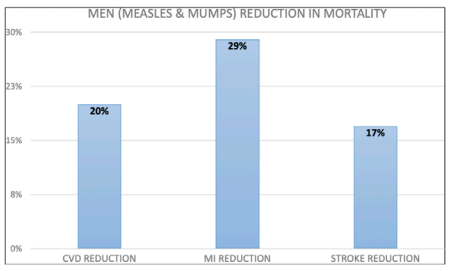
"63% of those vaccinated and with adequate Ab Titres had become infected."

## MEASLES AND OTHER CHILDHOOD ILLNESSES ARE PROTECTIVE LATER IN LIFE

Association of measles and mumps with cardiovascular disease: The Japan Collaborative Cohort (JACC) study

"Methods: 43,689 men and 60,147 women aged 40-79 years at baseline (1988-1990) completed a lifestyle questionnaire, including their history of measles and mumps, and were followed until 2009. Histories of infections were categorized as having no infection (reference), measles only, mumps only, or both infections. Hazard ratios (HR) for mortality from CVD across histories of infections were calculated."

"Men with measles only had multivariable HR (95% confidence interval) of 0.92 (0.85-0.99) for total CVD, those with mumps only had 0.52 (0.28-0.94) for total stroke and 0.21 (0.05-0.86) for hemorrhagic stroke, and those with both infections had 0.80 (0.71-0.90) for total CVD, 0.71 (0.53-0.93) for myocardial infarction, and 0.83 (0.69-0.98) for total stroke."




**DATA SOURCE Association of measles and mumps with cardiovascular disease: The Japan Collaborative Cohort (JACC) study**
https://pubmed.ncbi.nlm.nih.gov/26122188/

Acute infections as a means of cancer prevention: Opposing effects to chronic infections?

Table 1
Epidemiological studies examining the association between febrile infectious childhood diseases (FICD) and the subsequent development of cancer

| Cancer | Case/control | Infection type | Outcome (95% CI)[a] highest vs. lowest | Year [reference] |
|---|---|---|---|---|
| Ovary | 97/97[b] | Measles | No association | 1966 [55] |
| | | Mumps | **Reduced risk** ($p = 0.007$) | |
| | | Rubella | No association | |
| Ovary | 300/300[b] | Chickenpox | OR = **0.70** (0.51–0.97) | 1977 [56] |
| | | Measles | OR = **0.50** (0.32–0.76) | |
| | | Mumps | OR = **0.65** (0.23–0.90) | |
| | | Rubella | OR = **0.65** (0.47–0.92) | |
| Multiple cancers | 255/255[b] | Chickenpox | OR = **0.66** (0.45–0.97) | 1991 [57] |
| | | Measles | OR = 0.61 (0.34–1.09) | |
| | | Mumps | OR = 0.83 (0.55–1.26) | |
| | | Rubella | OR = 0.72 (0.45–1.16) | |
| Melanoma | 139/271[c] | Chickenpox | OR = 0.88 (0.52–1.92) | 1992 [58] |
| | | Measles | OR = 0.73 (0.35–1.54) | |
| | | Mumps | OR = 0.86 (0.53–1.40) | |
| | | Rubella | OR = 0.69 (0.39–1.23) | |
| Non-breast cancers | 379/379[b] | FICD: ≥1 | OR = **0.27** ($p = 0.046$) | 1998 [59] |
| | | Chickenpox | OR = **0.62** ($p = 0.044$) | |
| | | Measles | OR = 0.90 ($p = 0.740$) | |
| | | Mumps | OR = 0.85 ($p = 0.501$) | |
| | | Rubella | OR = **0.38** ($p = 0.003$) | |
| Multiple cancers | 111/109[c] | Chickenpox | OR = 2.09 (0.92–4.78) | 2002 [60] |
| | | Measles | OR = 0.76 (0.22–2.56) | |
| | | Mumps | OR = **2.61** (1.18–5.80) | |
| | | Rubella | OR = 0.91 (0.38–2.16) | |

OR: odds ratio, CI: confidence interval, FICD: febrile infectious childhood diseases.
[a] Results in bold are statistically significant.
[b] Age matched or no significant difference in age between groups.
[c] Adjusted for age and other risk factors.

ICAN Informed Consent Action Network