

Measles

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Measles in history

- Persian-born physician **Rhazes** (*circa 865-925 A.D.*) is at the bedside of a young patient afflicted with measles.
- First to describe measles and smallpox with clinical accuracy, and first to observe and report pupillary reaction to light, Rhazes wrote the earliest known book on pediatric care.



Measles in history (2)

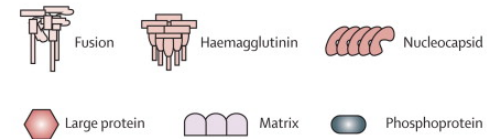
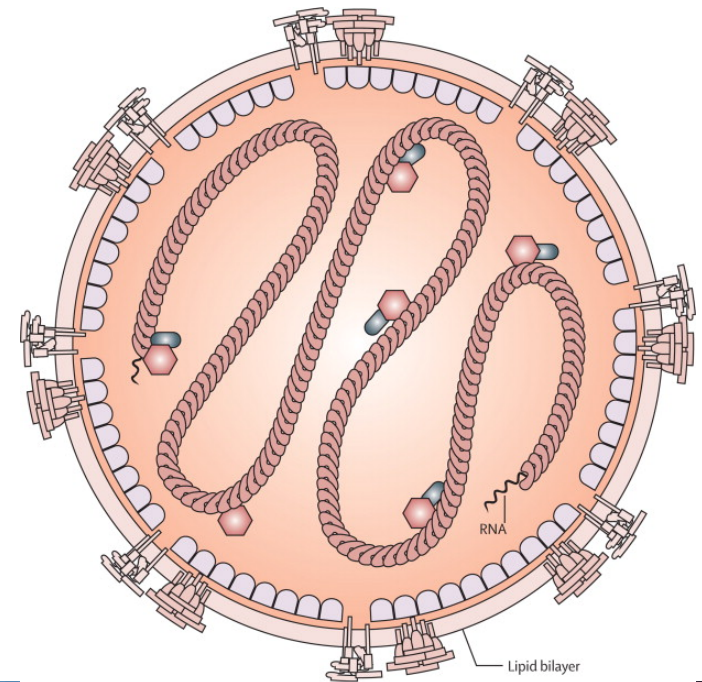
Aztec smallpox victims in the sixteenth century



- Hernan Cortez' conquest of Mexico was greatly assisted by the decimation of the Aztec population by a measles epidemic

Measles virus

- Rubeola (**measles**) virus
- SS-RNA Paramyxoviridae
- Infects only humans & primates
- Transmitted by aerosolized particles
- High infectivity between 7-10 days post exposure through 4 days into the rash
- Incubation 7-14 days



Measles is Highly Infectious

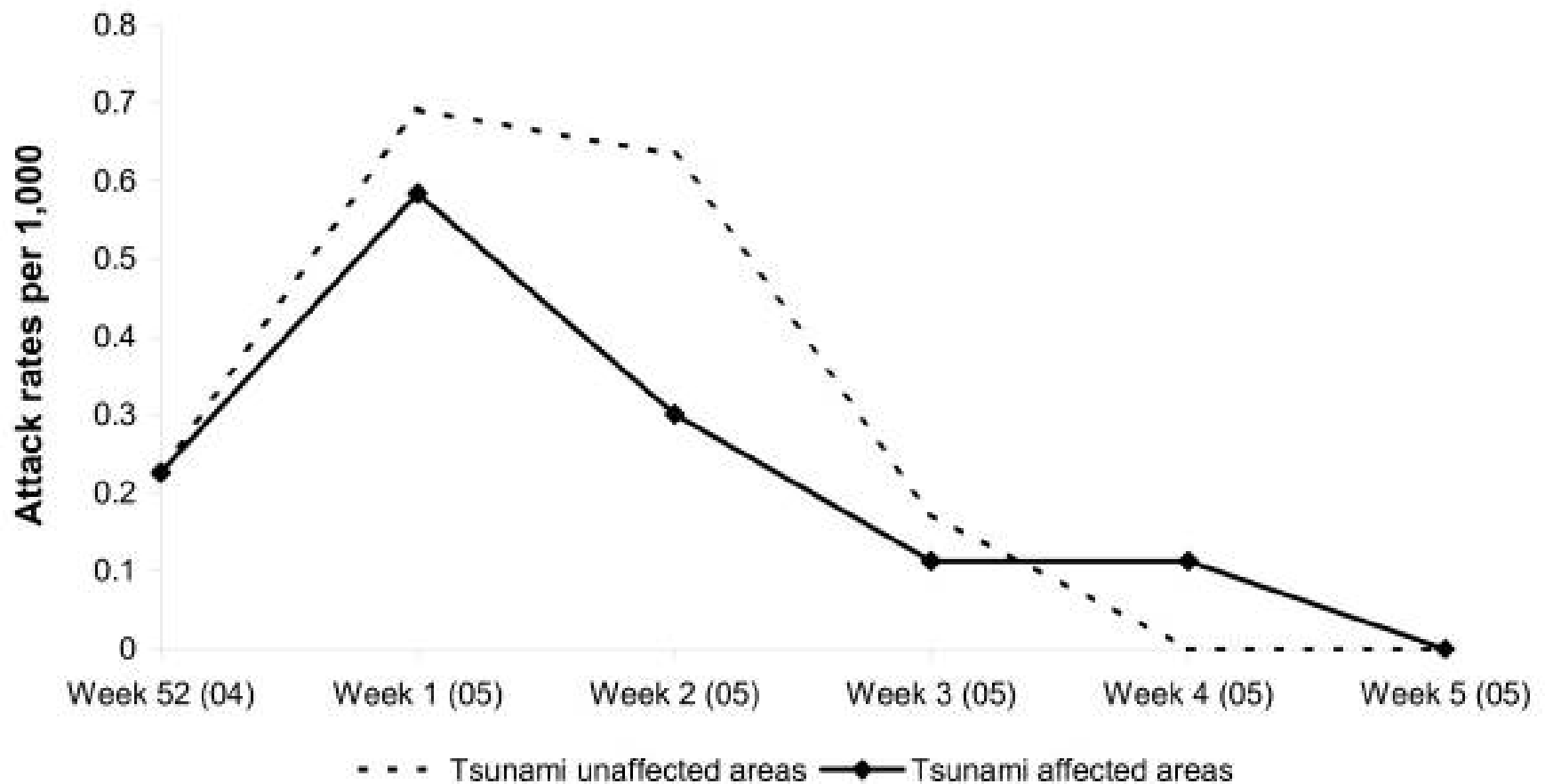
Reproductive Ratios (R_0)

<u>Disease</u>	<u>R_0</u>
Measles	12-18
Pertussis	12-17
Diphtheria	6-7
Mumps	4-7
Polio	6-7
Rubella	5-7
Smallpox	5-7

Results of Measles Outbreaks during crisis

Countries, type of displaced population/Reference	Type of disaster/Year	Total displaced populations	Documentation surveillance approach	AR (Case/Pop. at Risk)	CFR (Death/Cases)	Documentation on laboratory confirmation	Documentation on malnutrition
Cambodian refugees in Thailand [37]	Conflict 1979--1980	Average: 53666 (Pop. in camp)	Not described	(161/924) 17.4%	(10/161) 6.2%	No	Yes
Ethiopian refugees in Wad Kowli (Sudan) [20]	Conflict + Famine 1985	85000 (Pop. in camp)	Not described	(2639/85000) 3.1%	(855/2639) 32.4%	Not described	Yes
Mozambican refugees in Malawi [7]	Conflict 1988--1989	78568 (Pop. in camp)	Passive surveillance	(744/78568) 0.95%	(103/744) 13.8%	Not described	No
Vietnamese refugees in Hong Kong [8]	Conflict 1991--1992	7017 (Pop. in camp)	Passive surveillance	(262/1026) 25.5%	(2/262) 0.76%	Not described	Yes
Burundian refugees in Tanzania [11]	Conflict 2000--2001	170500 (pop. in camp)	Passive surveillance + Active case findings	(1062/170500) 0.62%	(0/1062) 0.0%	Yes	No

Attack rates of measles by week of onset in tsunami-affected and unaffected areas, Cuddalore district, Tamilnadu, India, December 2004 – January 2005



Incidence of measles by age in tsunami affected and un-affected villages of Cuddalore district, Tamil Nadu, December 2004- January 2005

Age group (years)	Tsunami affected areas			Tsunami un-affected areas		
	Number of cases (%)	Population	Incidence per 1000	Number of cases (%)	Population	Incidence per 1000
0-4	31 (43.7)	4360	7.1	11 (36.7)	1425	7.7
5-9	32 (45.1)	4786	6.7	16 (53.3)	1564	10.2
10-14	8 (11.3)	5138	1.6	2 (6.7)	1679	1.2

Vaccine coverage estimated at 99.5-103%

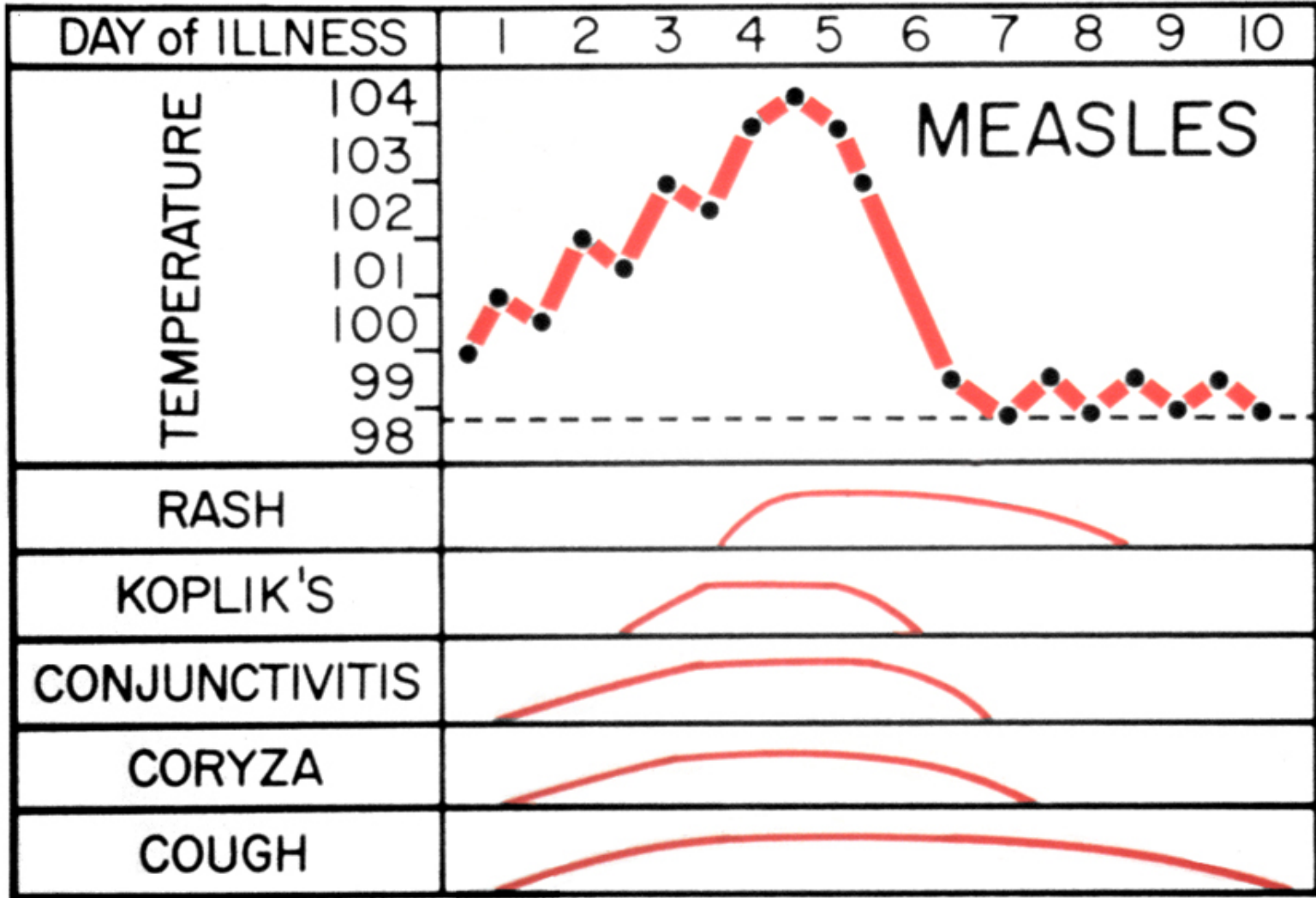
Vaccine efficacy at 85%

Cumulated susceptible population= 97,400 children

Natural History of Measles



Saul Krugman



Measles: Clinical Presentation



Measles maculo-papular confluent rash – head to toes

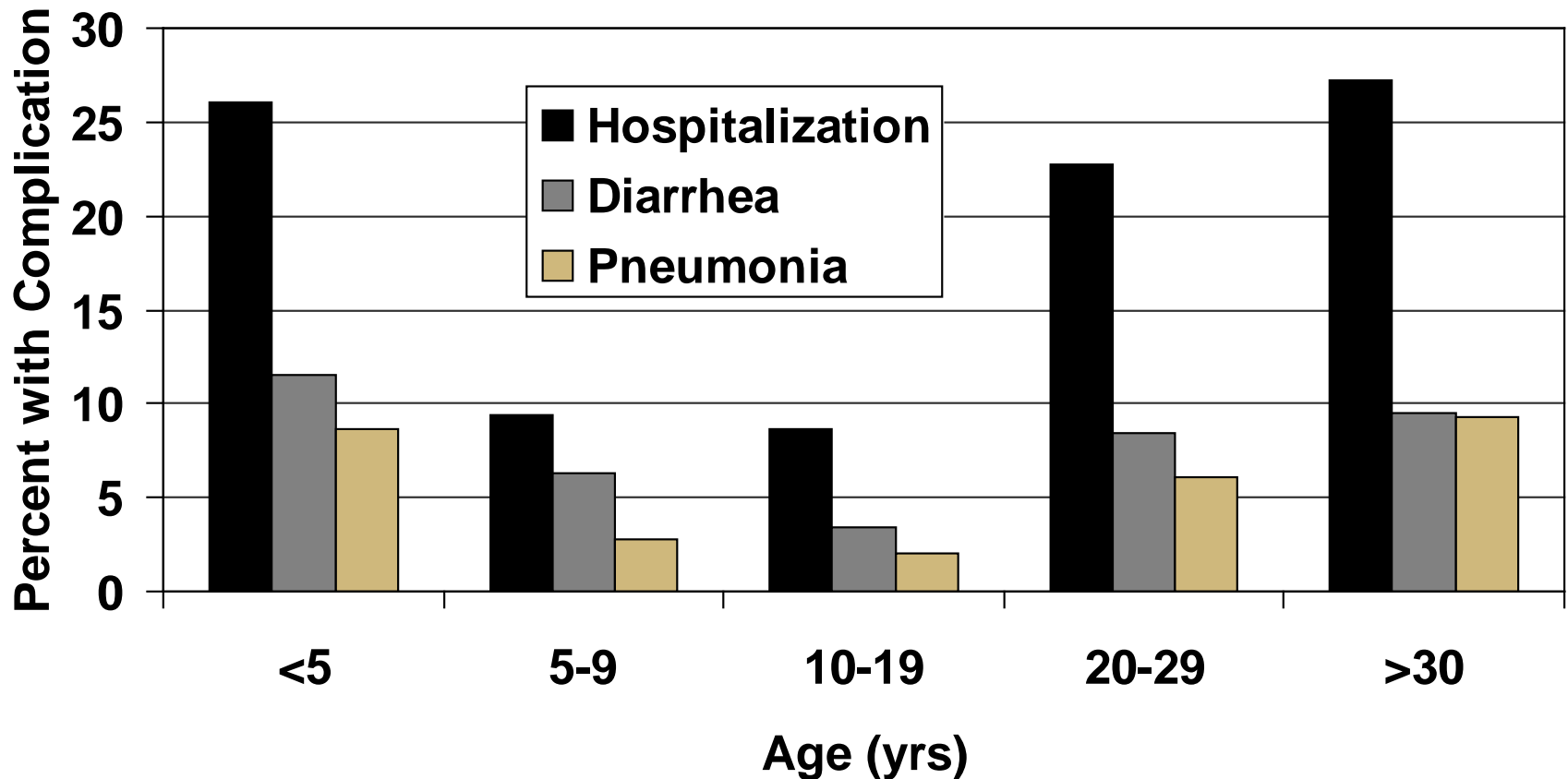


Koplik spots in measles

2-3 days after coryza, conjunctivitis and fever
Last 12-72 hrs



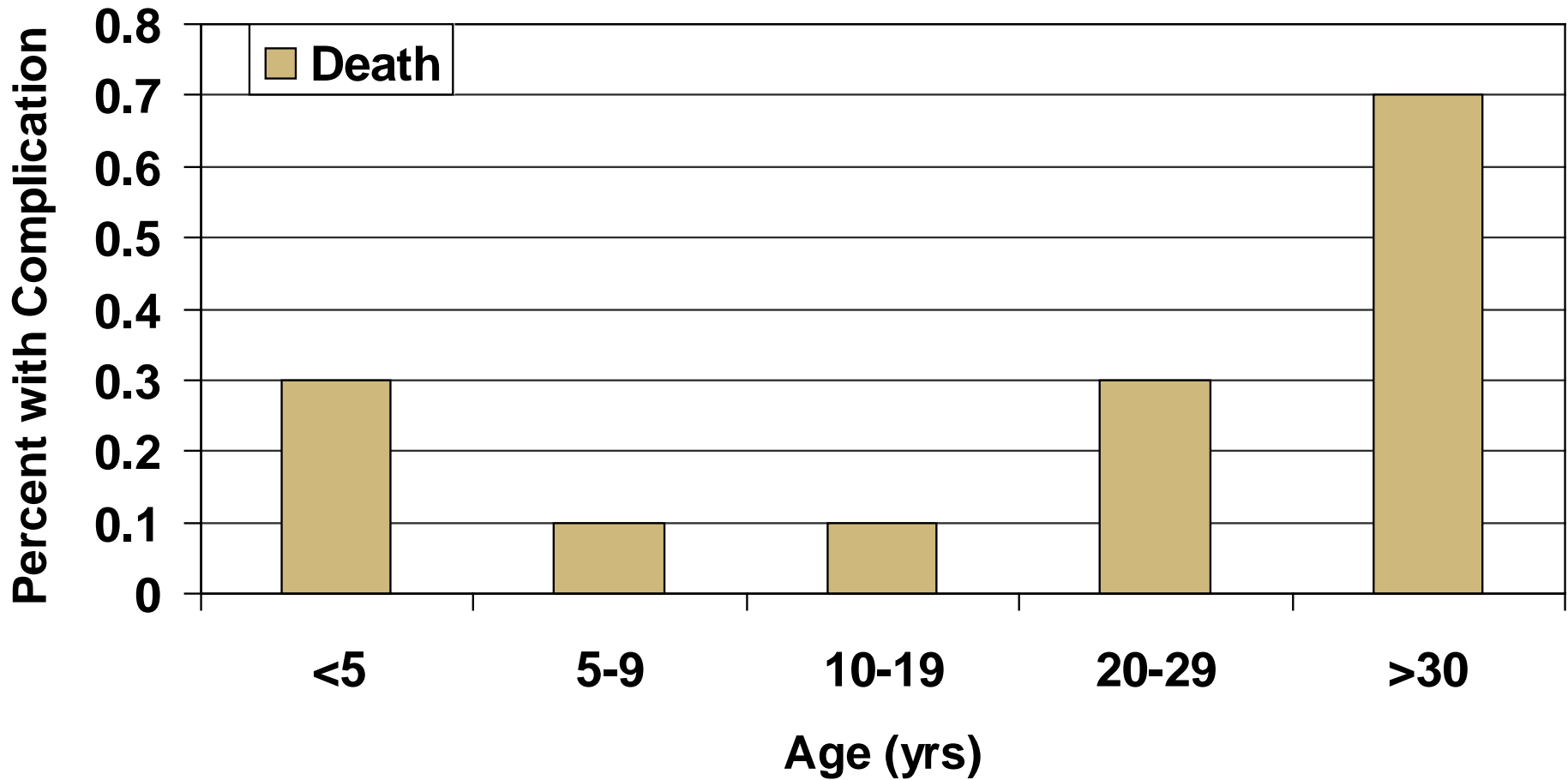
Complication Rates by Age for Reported Cases of Measles - U.S. 1987-2000



Pneumonia in a Child With Measles



Mortality Rates by Age for Reported Cases of Measles - US 1987-2000

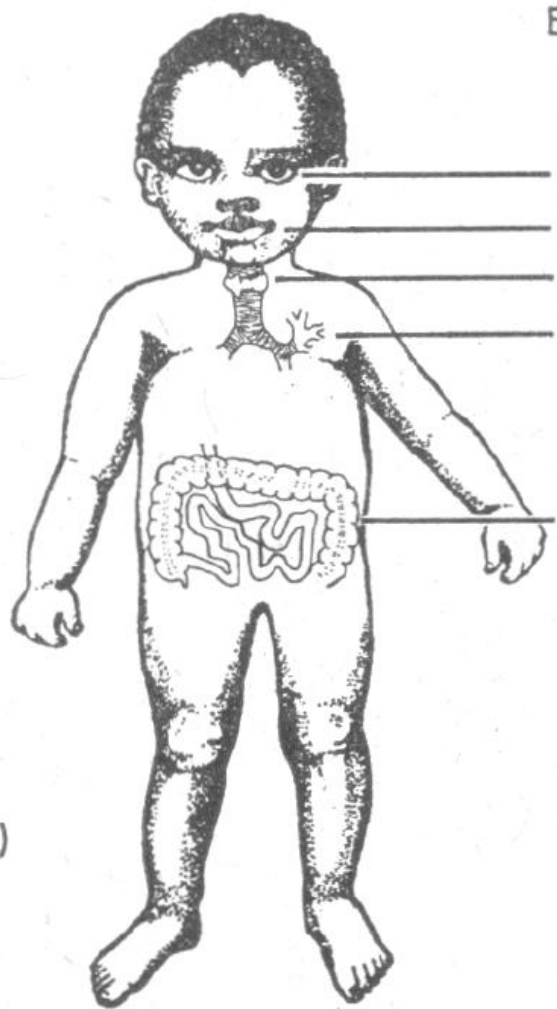
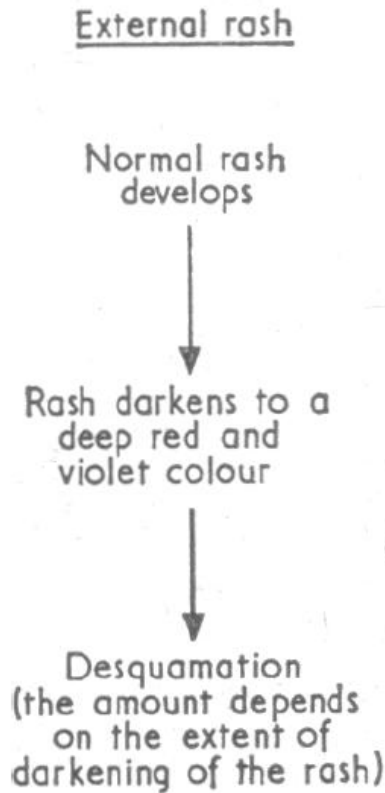


Severe Measles in Developing Countries



David Morley

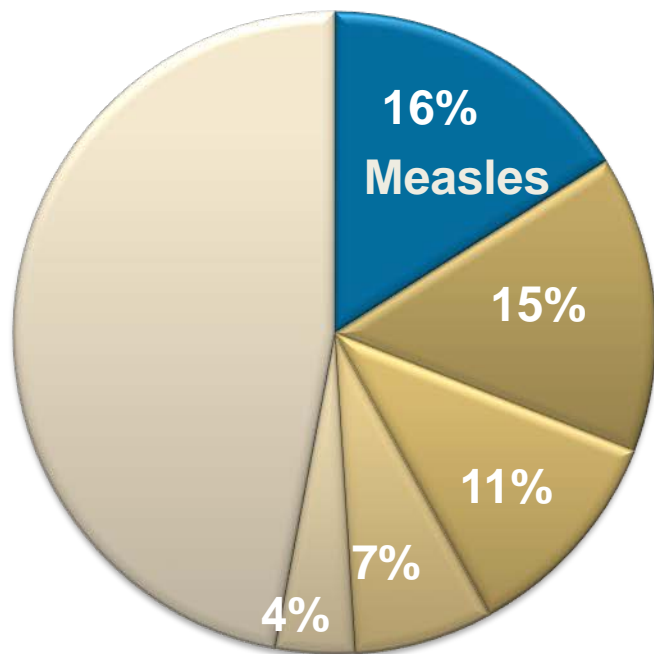
SEVERE MEASLES



- Equivalent of the rash on other epithelial surfaces produced:
- Conjunctivitis
 - 'Sore' mouth
 - Laryngitis
 - Bronchopneumonia
 - Enteritis, Diarrhoea

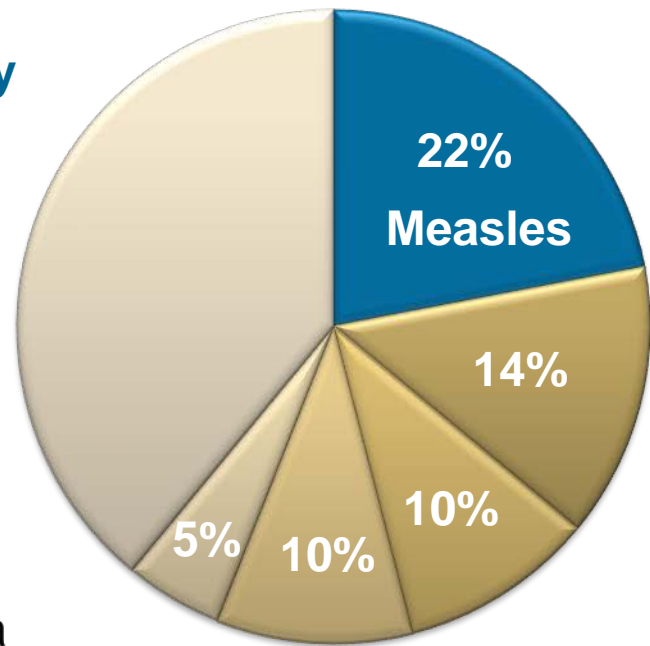
Diseases Responsible for Admission and Death of Children 1959-61

During a 2-year period
at Ilesha Hospital, Nigeria

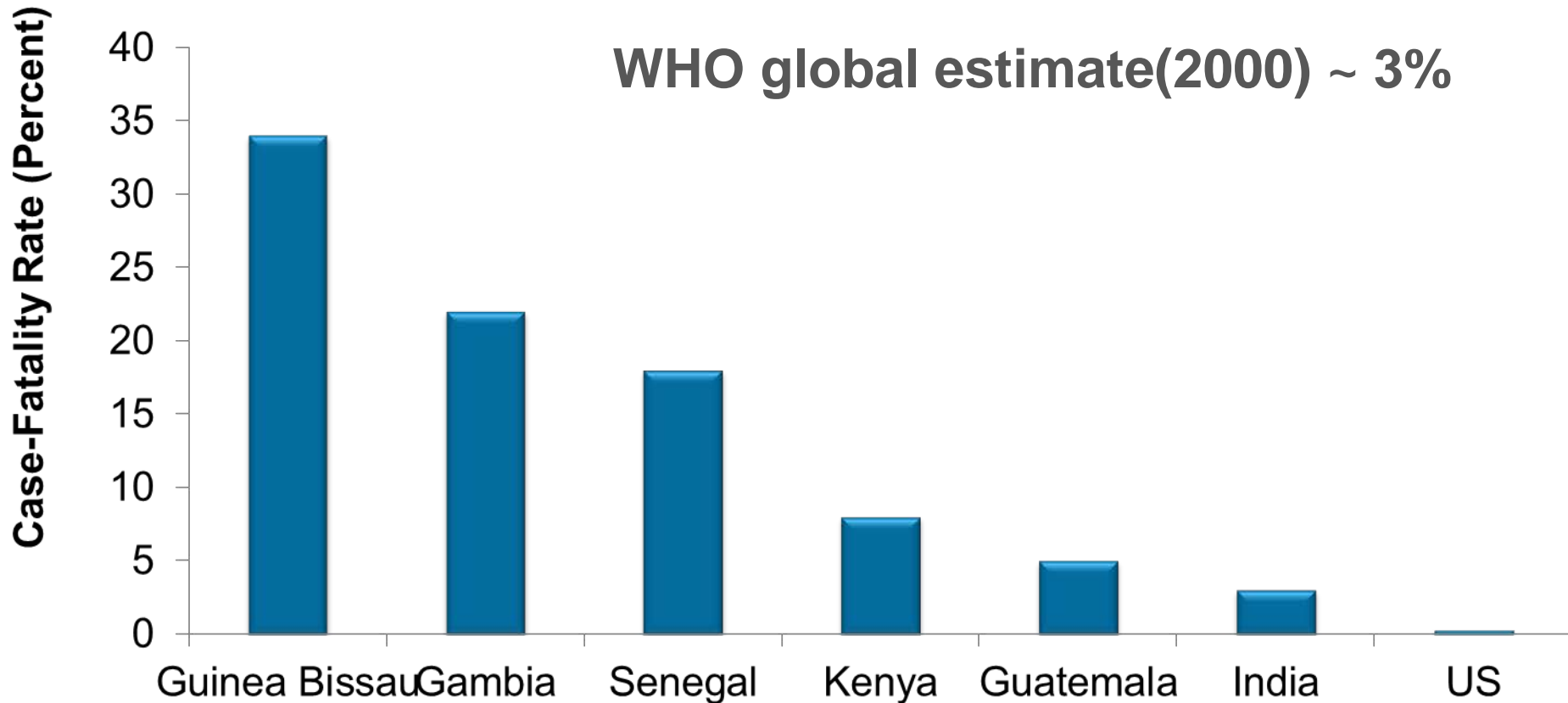


Measles
Case-fatality
Rate = 25%

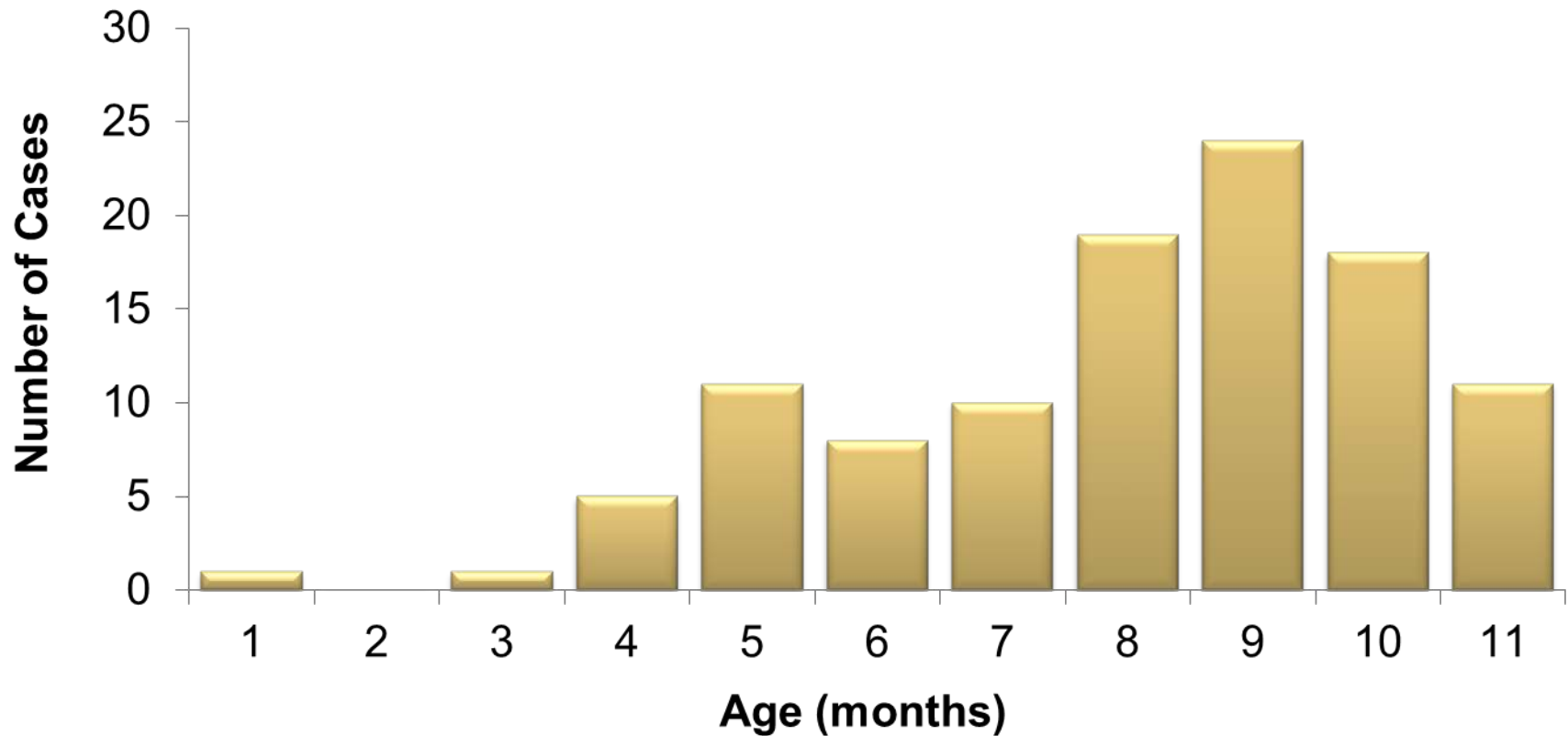
- Measles
- Diarrhoea



Measles Case-Fatality Rates By Country 1980s



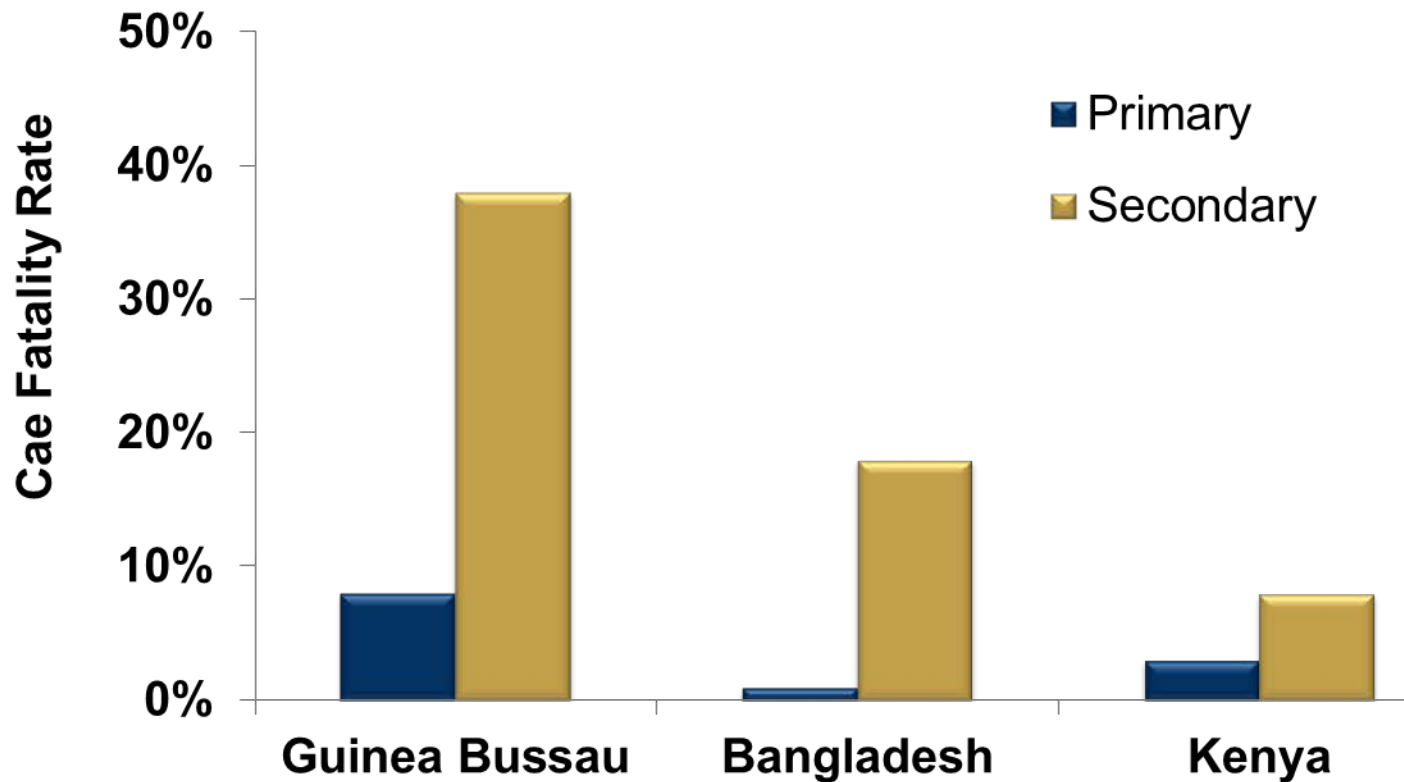
Young Age of Measles Measles Cases in Infants: Malawi





Increased Case Fatality Rates for Secondary Measles in Household Contacts 1-4 Years of Age

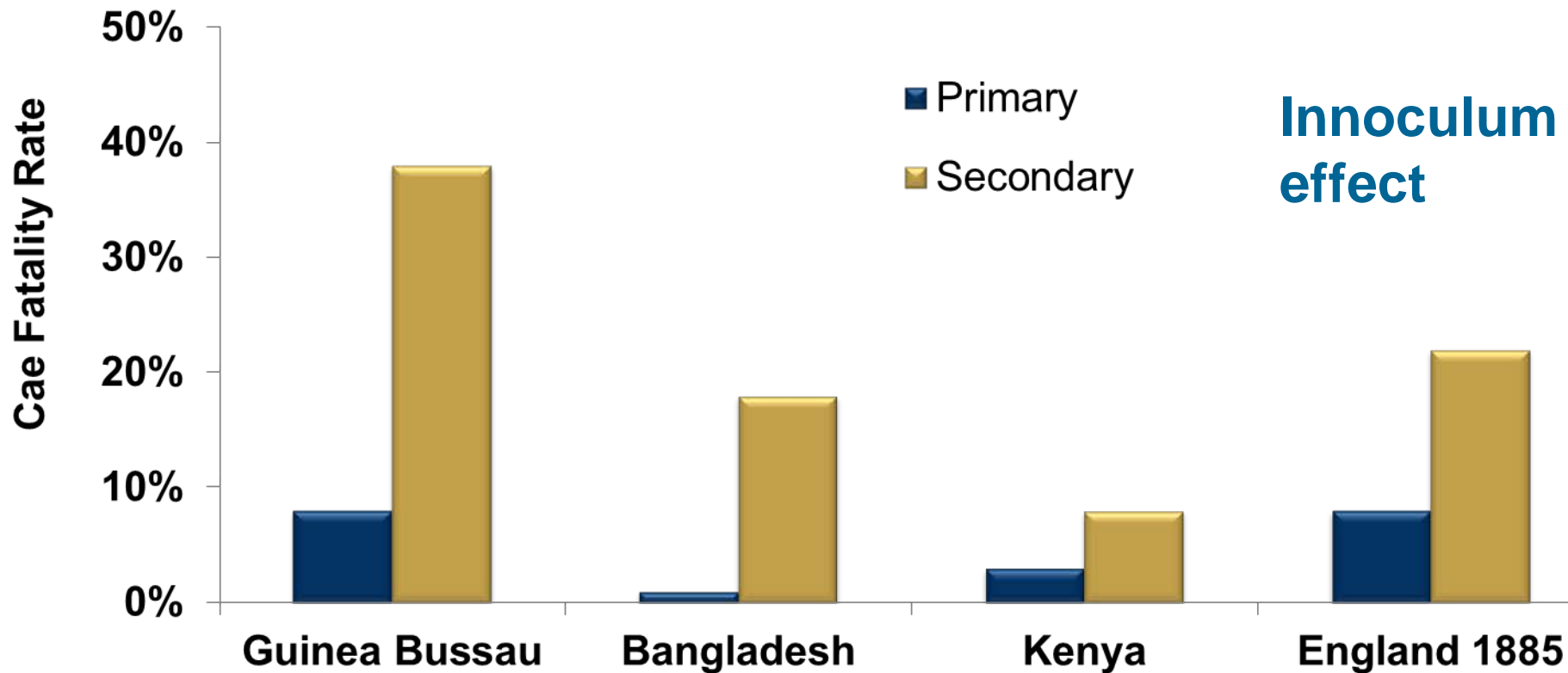
Peter Aaby





Increased Case Fatality Rates for Secondary Measles in Household Contacts 1-4 Years of Age

Peter Aaby



Crowding = early exposure + high Innoculum



Vitamin A Deficiency

Keratitis and Corneal Scarring Following Measles

Al Sommer/WHO





Vitamin A Treatment Impact on Measles Mortality

Al Sommer



Vitamin A Supplementation Recommended for All Children with Measles



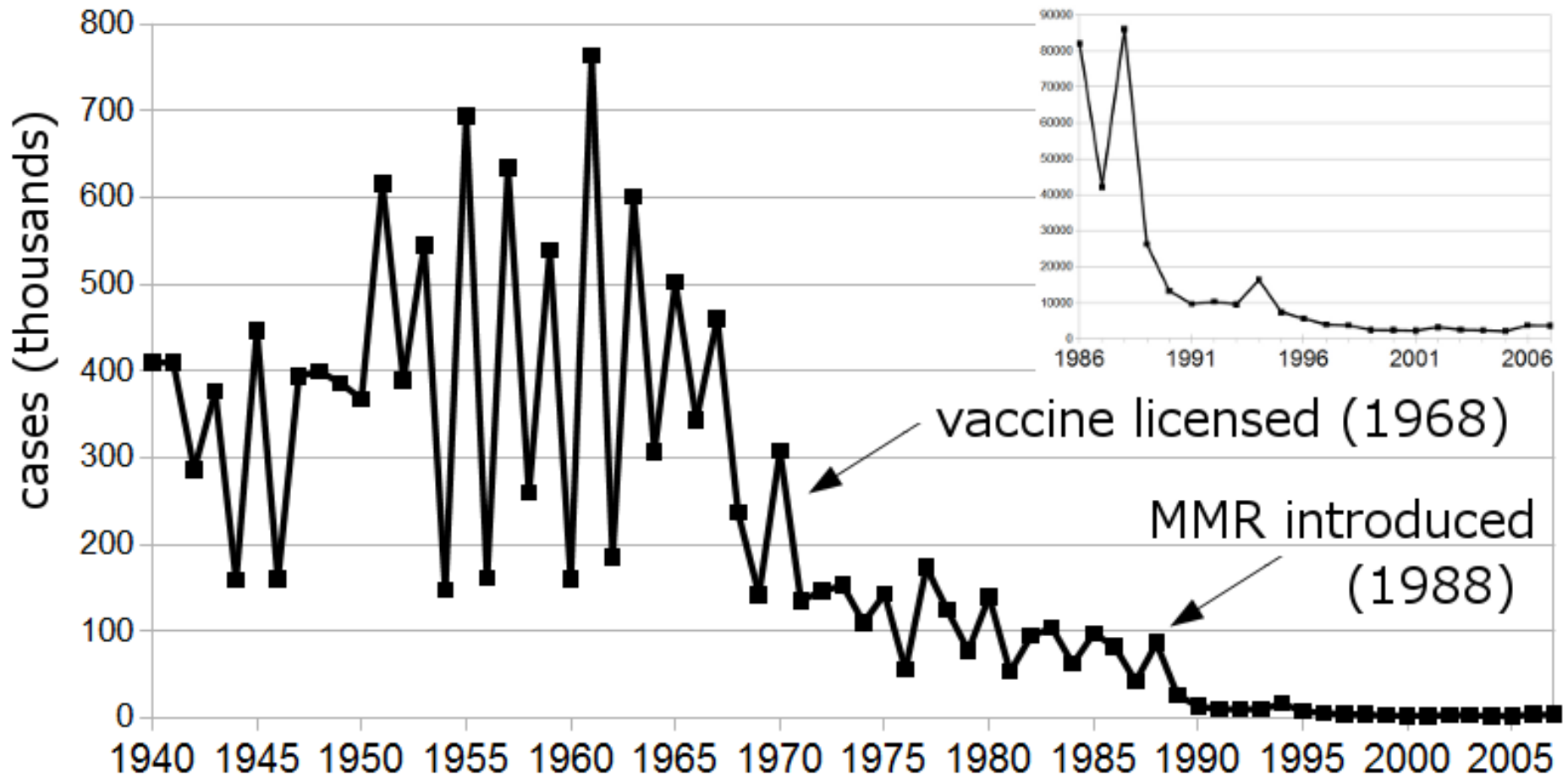
Factors Contributing to Increased Severity of Measles in Developing Countries

1. Young age of infection
2. Crowding
3. Vitamin A deficiency
4. HIV infection
5. Suboptimal therapy for complications

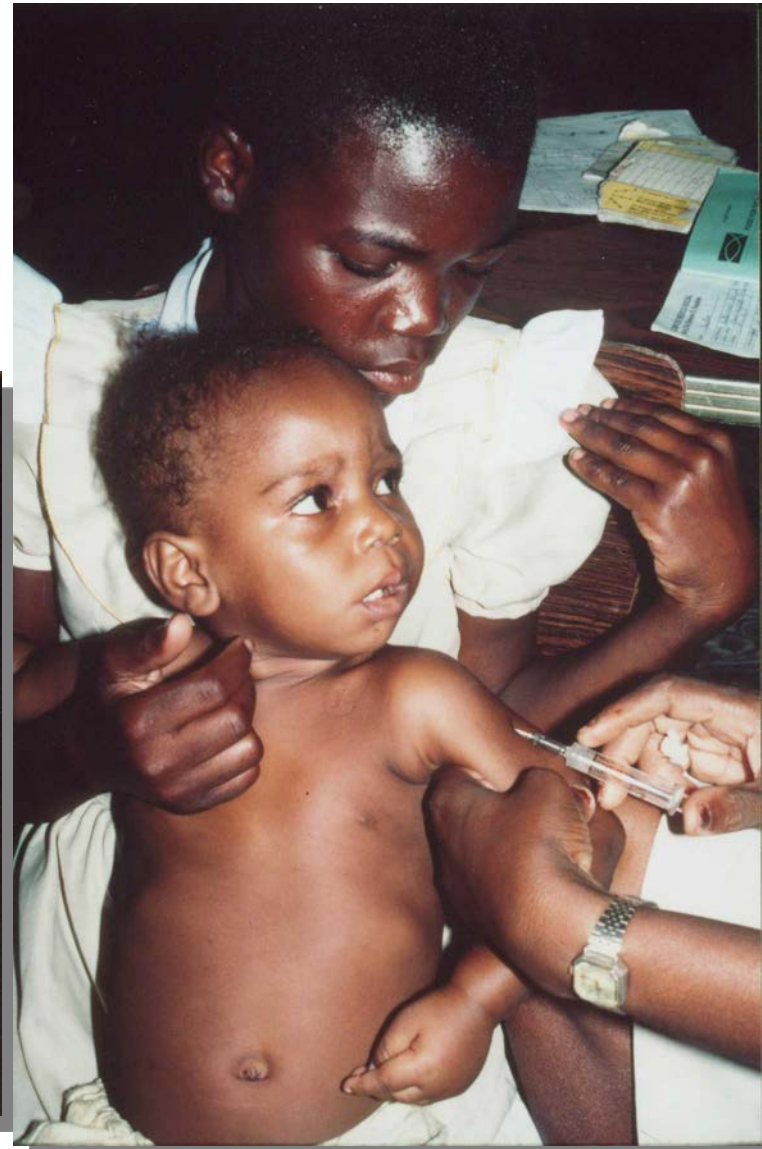
Edmonston B (Attenuated) Measles Vaccine

- 1954: Measles virus isolated by Enders and Peebles
- Source: David Edmonston: 8 y.o boy
- Now house painter in Rockville MD

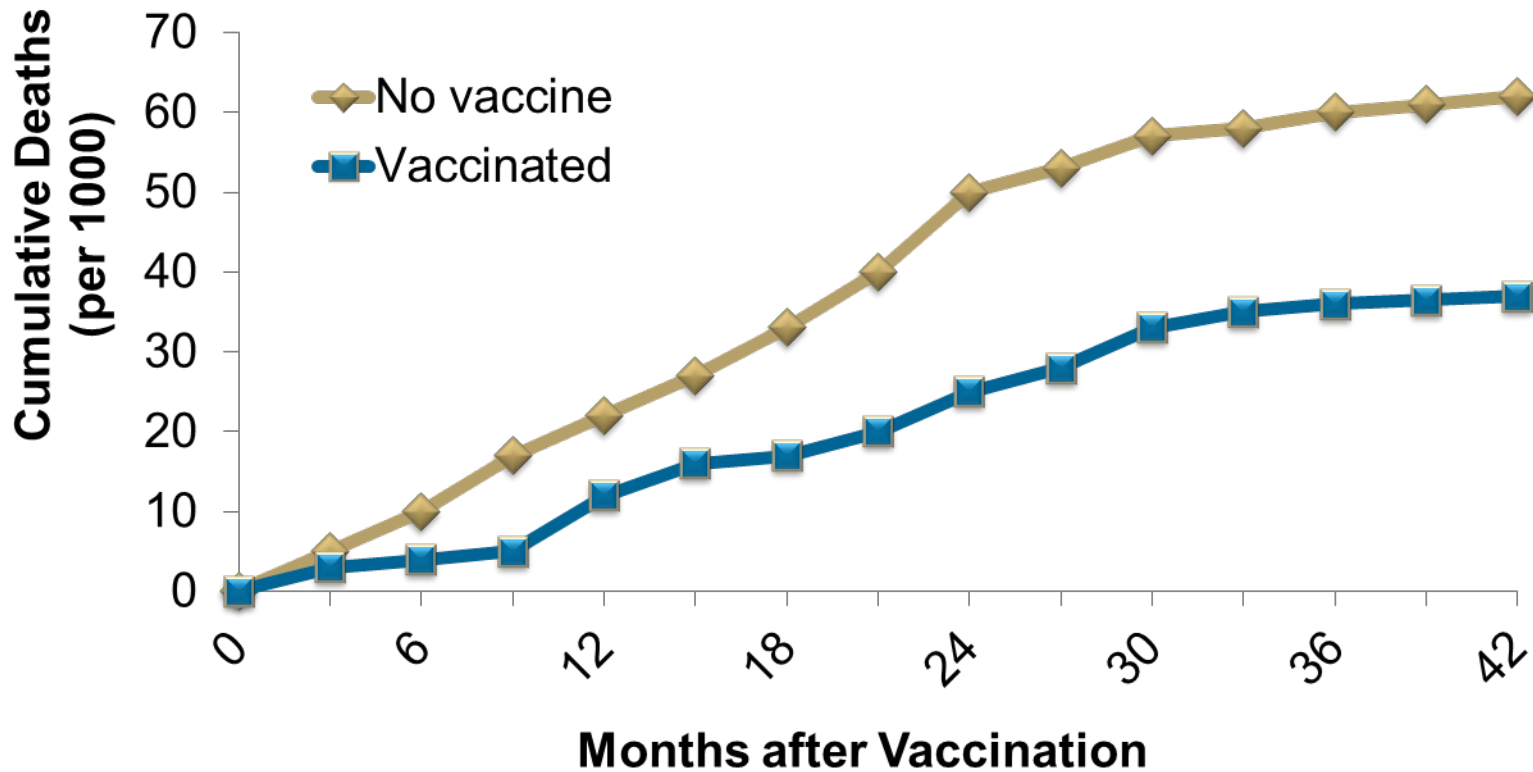
Measles cases in England and Wales, 1940-2007



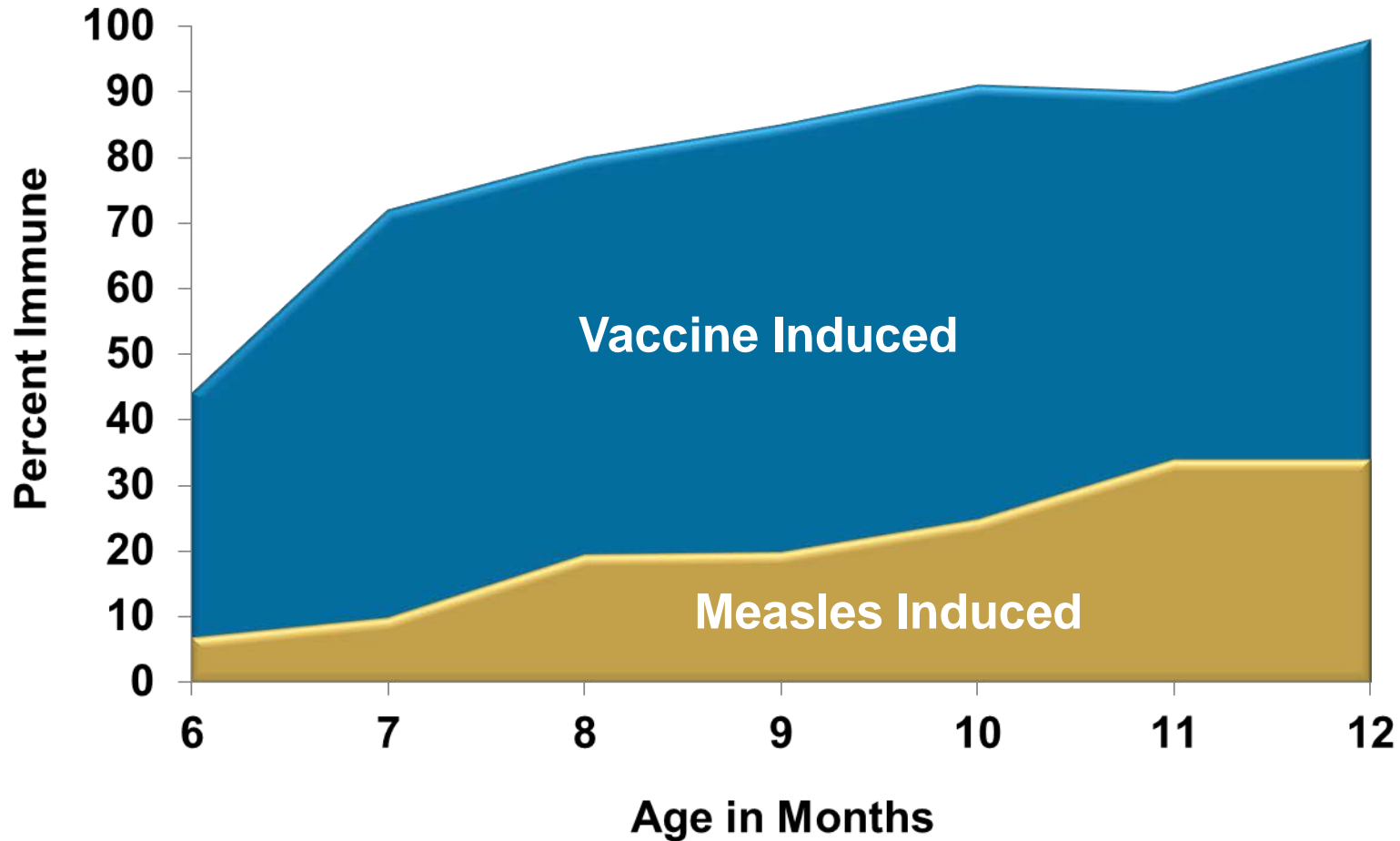
Measles Vaccination



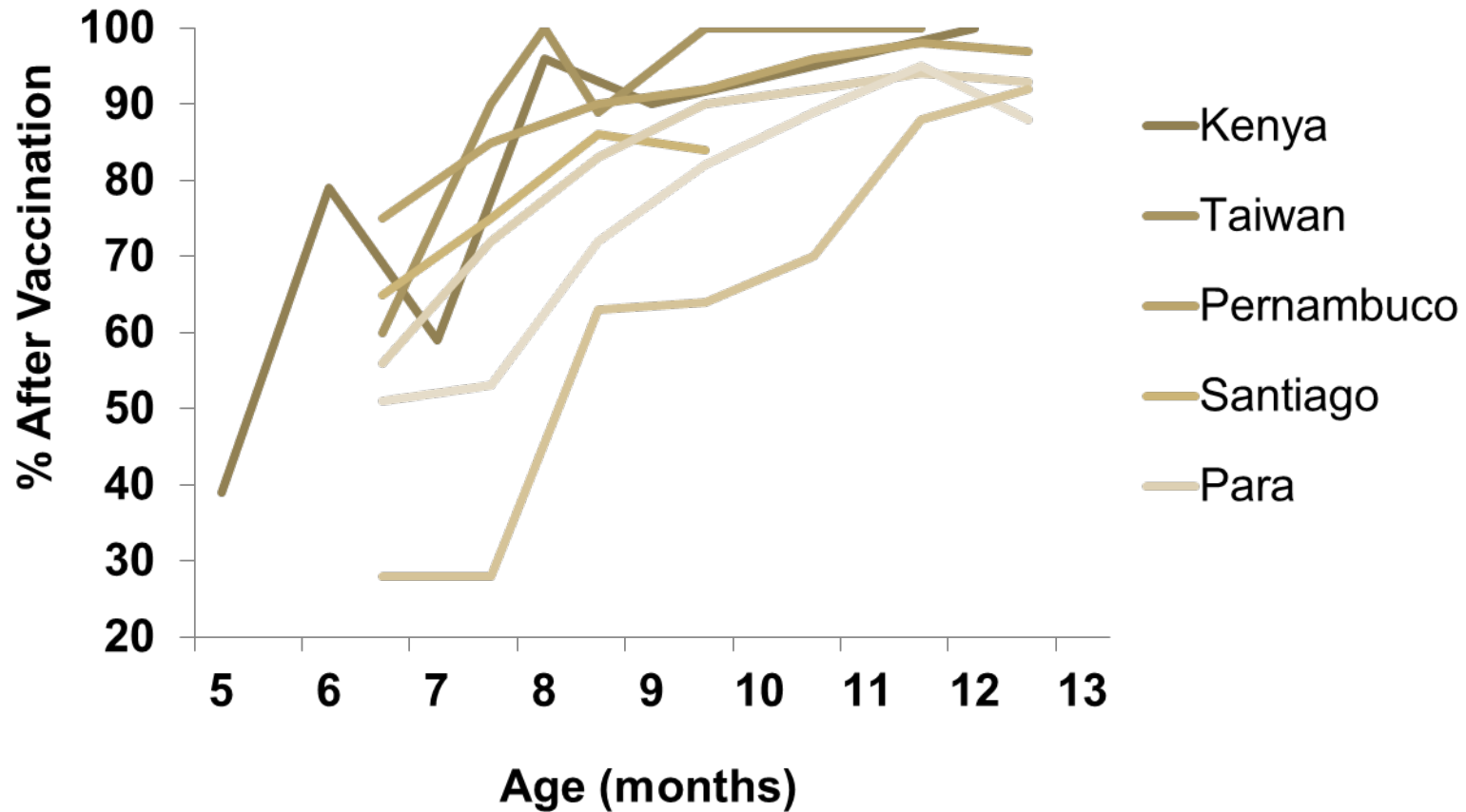
Cumulative Risk of Death by Vaccination Status, Matlab Intervention Area 1982-85



Percent of Infants Immune by Age Before and After Measles Vaccine: Haiti 1982



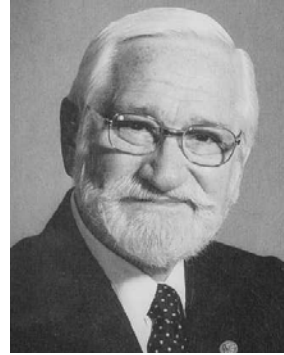
Proportion of Children Who Developed Measles Hemagglutinin-inhibiting Antibody after Vaccination



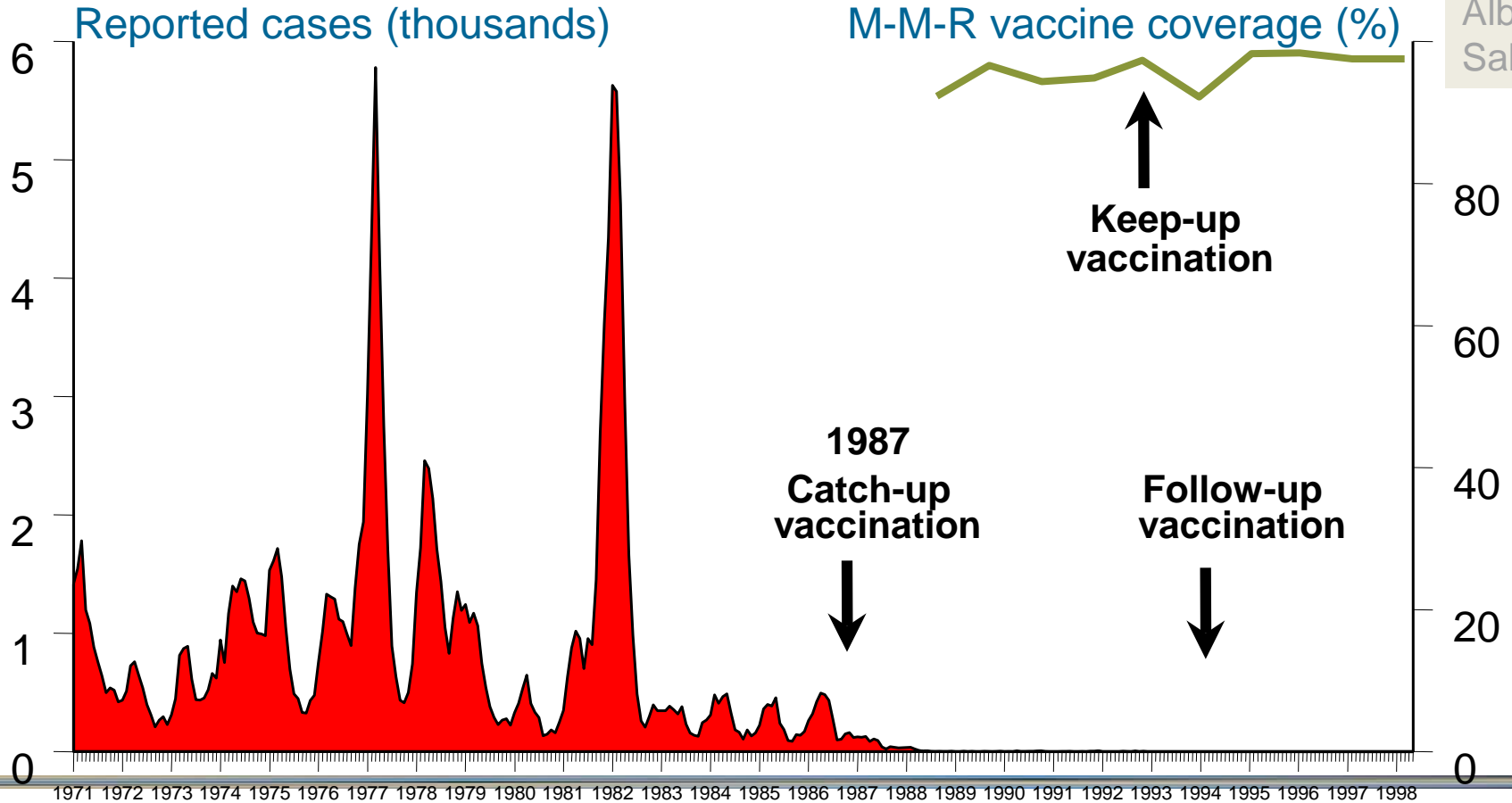


Saul Krugman

Reported measles cases by month Cuba, 1971-1998



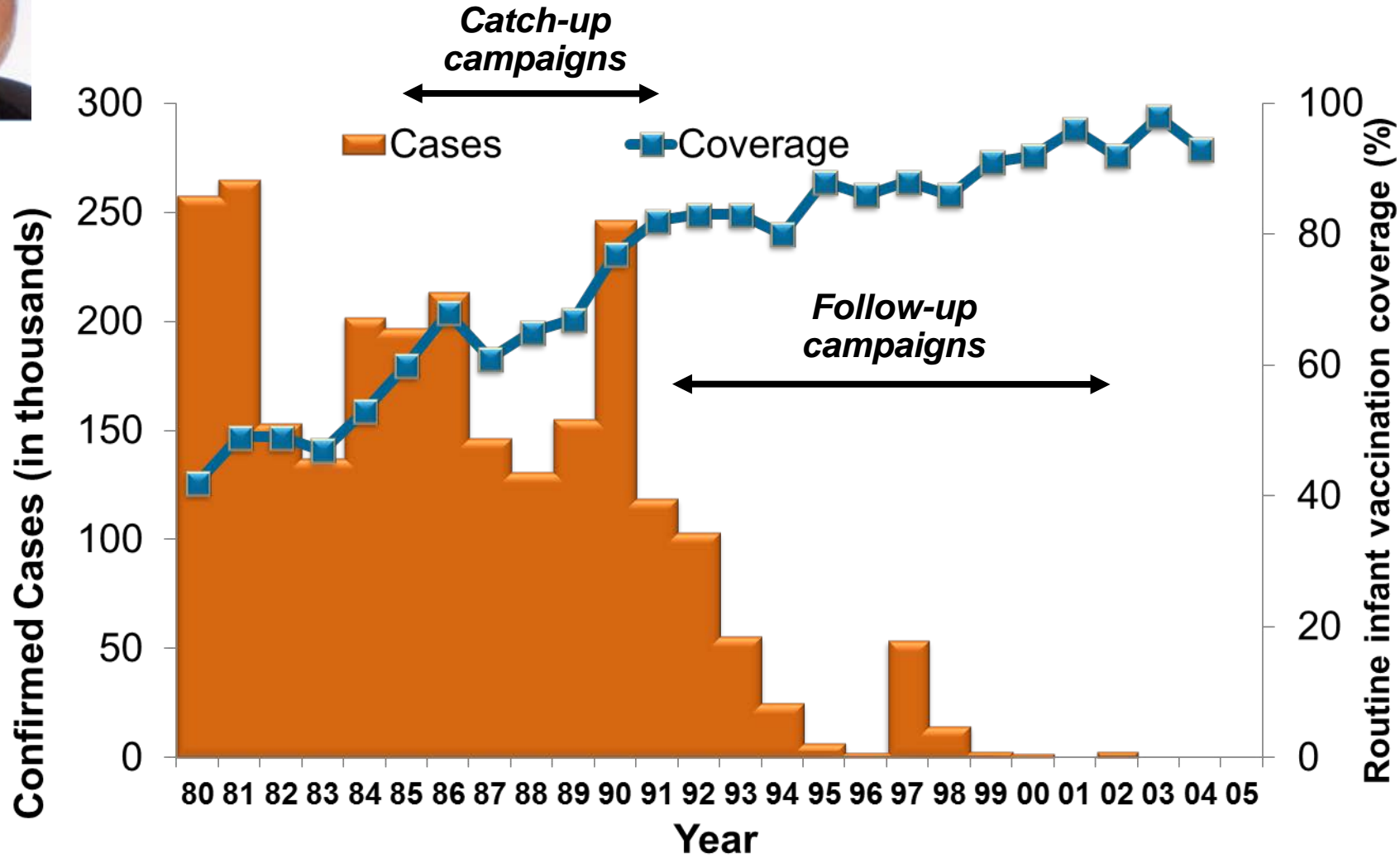
Albert Sabin





Ciro de Quadros

Reported Measles Cases and Routine Vaccination Coverage, Region of the Americas, 1980-2005



Summary

- Measles is a very contagious and severe infectious disease
- Epidemics common in under vaccinated and displaced populations
- Preventive and outbreak vaccination is paramount
- Early treatment of complications reduces morbidity and mortality