

1978 - Before many of you know / hope you never see a case but #1 priority kind
 to question the most important/dramatic thing
 1st and only human disease to have been eradicated - < 35 yrs.
 Major reason - > half the steps < 30 yrs - many past setbacks, recent M&B grade

Wendy Richardson - 35 yrs. ago - wish I could say that never again but this was #1 (the) priority at the time
 (report) strain
 More important = erad. of spx has represented a real turning point in ph, why it is so delicate

Death of a Disease ...and the birth of a new era

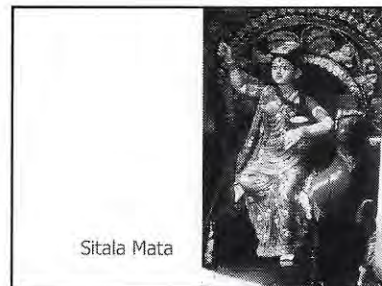
D.A. Henderson, MD, MPH
 Johns Hopkins University Distinguished Service Professor
 Dean Emeritus, Bloomberg School of Public Health
 Professor of Medicine and Public Health, University of Pittsburgh
 Georgetown - Medical Grand Rounds
 February 5, 2014

"There has been no greater medical - or humanitarian -
 miracle in modern times than the eradication of
 smallpox... (It is the saga of a) day-to-day struggle for
 international cooperation in a divided world; it offers
 a winning blue print for the great medical challenges
 to come."

David Oshinsky - Winner of the 2005 Pulitzer Prize in History

Smallpox, the disease

- Virus disease
 Spread by face-to-face contact during rash phase
- No treatment; death rate = 30%
- Permanent immunity after recovery
- Man is the only host
 A chain of infection going back 3500+ years
 Only disease for which there are deities



Sitala Mata

Omissions from the history books

- The welcoming of the pilgrims -- 1620
*"Thus farre hath the good hand Of God favored our
 beginnings... In sweeping away great multitudes of the
 natives... that he might make room for us"*
- Massive epidemics among Indians of the Americas
 Death rates of 50 to 70%
- Abraham Lincoln at Gettysburg - 1863
 A brief speech by an ill president

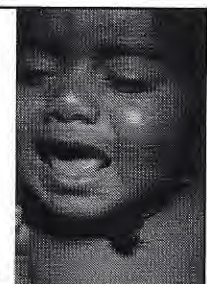
World's 5 most important historic sites (from BBC World History Series, Oct. 2012)

- Yellow River, China
- Great African Rift Valley
- Athens, Greece
- Los Alamos, New Mexico
- ?

Summary

- To portray the principal clinical features of smallpox,
 a disease last seen in 1978 but a continuing threat
- To identify the principal landmarks of the eradication
 campaign and research contributing to its success
- To highlight the program's legacy

Day 3



Death of a Disease

...and the birth of a new era

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Tou-Shen Niang-Niang



Pan-chen

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World's 5 most important historic sites

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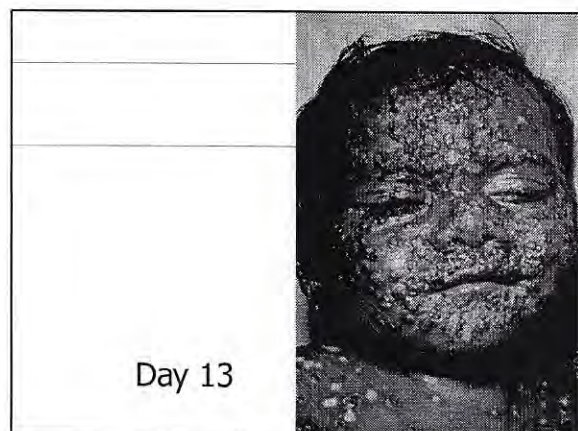
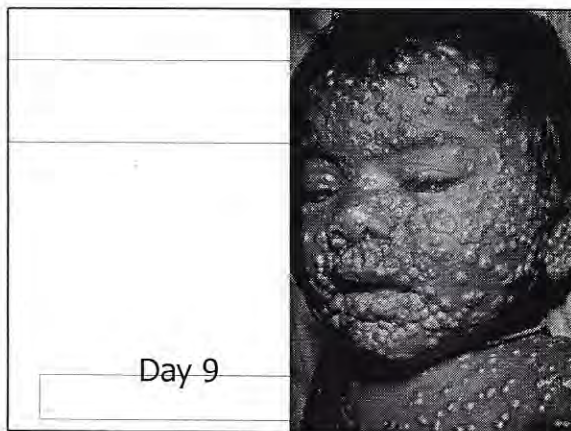
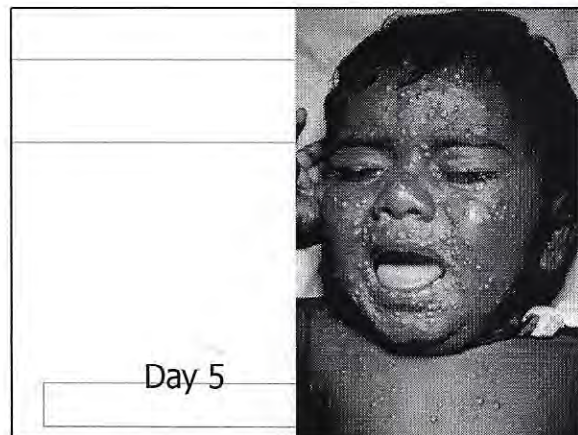
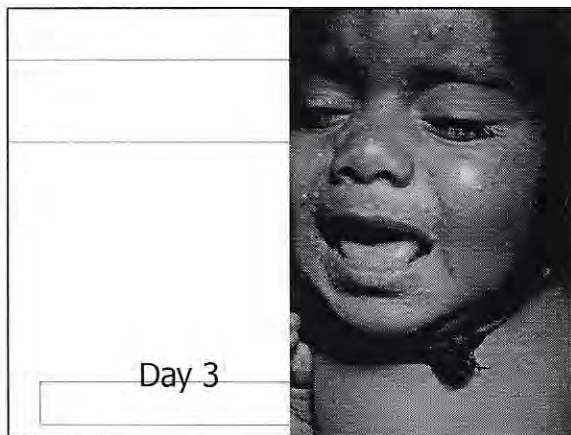
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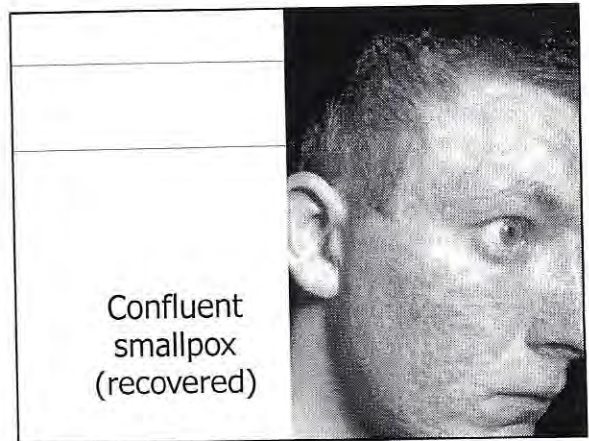
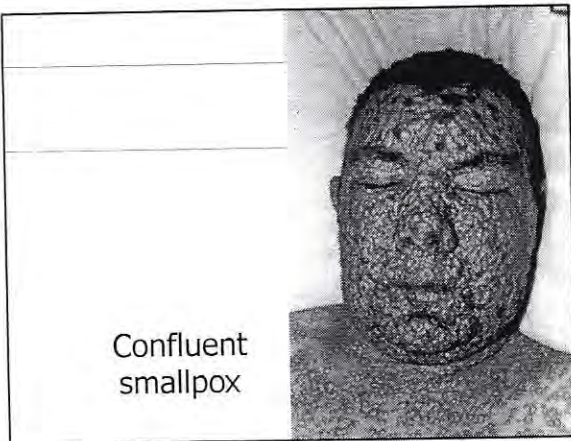
UPMC CENTER FOR HEALTH SECURITY

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Global efforts to eradicate a disease

- | | | |
|---------------------|---------|------------|
| • Hookworm | 1909-23 | 14 years |
| • Yellow fever | 1915-32 | 17 years |
| • Yaws | 1948-66 | 18 years |
| • Malaria | 1955-73 | 18 years |
| • Smallpox | 1967-80 | 14 years |
| • G. worm infection | 1986- ? | 27 years + |
| • Poliomyelitis | 1988- ? | 25 years + |

Global smallpox eradication

- World Health Assembly adopts 1959 USSR proposal for a global program
- 1959 -1966
 - Strategy: mass vaccination (a few countries complied)
 - Budget of <\$100,000 per year
 - Six staff members

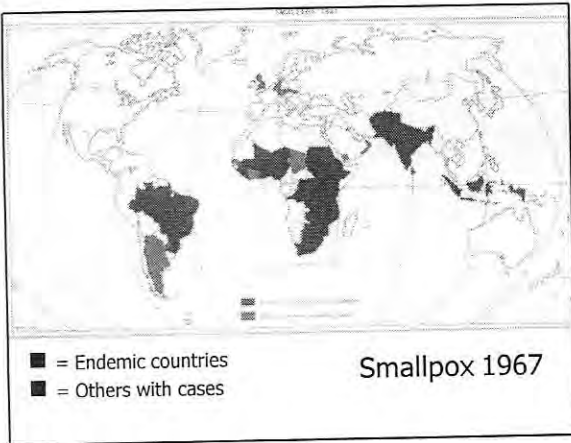
The WHO Eradication Program

Assembly requires DG to submit a plan --1966

- Strategy
 - Mass vaccination to reach 80%
 - Surveillance and containment
- 10 year program --budget of \$ 2.4 million/year
- Objections by delegates
 - Not feasible
 - Demand for no further increases in WHO budget
- 58 votes needed for approval; 60 voted in favor

Program leadership

- Director General believed program would fail (malaria eradication was collapsing)
- Demanded an American serve as Director
 - The candidate declined:
 - Lack of unanimity among countries
 - Limited resources -- ~\$50,000 each for 50 countries
 - Not enough even to buy the vaccine required



The Challenge

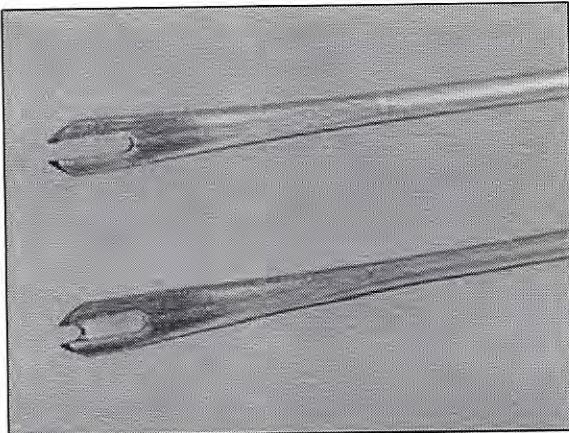
- Status of smallpox— 1967
 - >10,000,000 cases
 - 2,000,000 deaths
 - 43 countries reported cases
- Program staff
 - Headquarters – 5 medical + 5 support staff
 - International staff – never more than 150

Vaccine supply

- Heat-stable, potent vaccine is essential
 - 300 million doses needed annually
 - 59 labs producing vaccine
 - Labs in Netherlands and Canada test vaccine
 - Only 10% meets international standards
- National capacity has to be developed
 - Production manual
 - Research: vaccine strains, production methods, stability testing, tissue culture vaccines

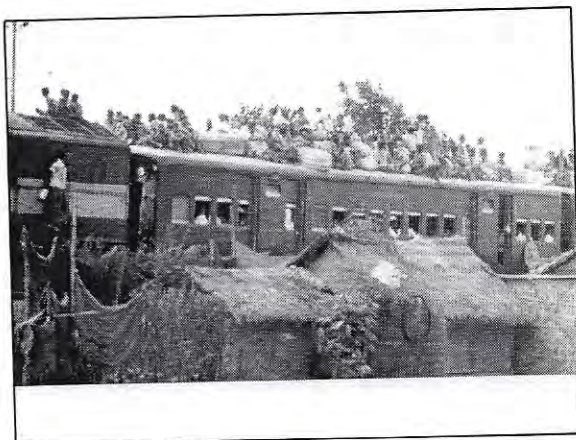
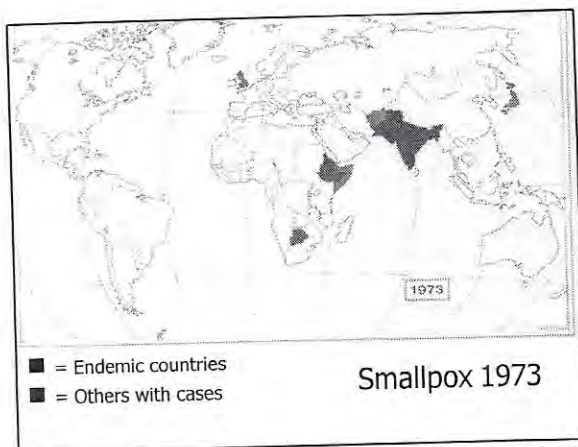
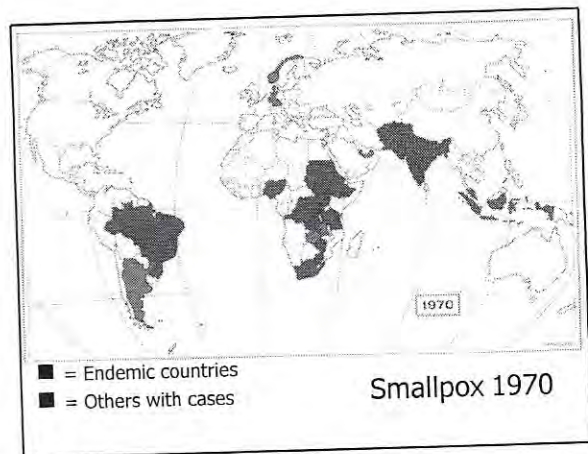
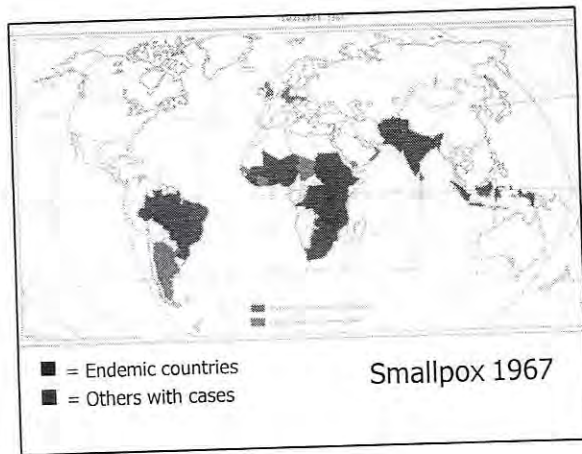
The vaccination program

- Gaining community acceptance
 - Leadership—civil, chiefs, medical, other
 - Coverage -- assessment methods
 - Distribution of weekly/monthly reports
- Need for faster, better methods
 - Bifurcated needle—multiple puncture method
 - One-fourth as much vaccine required
 - Training time -- 15 minutes
 - Easily sterilized and reused
 - Cost -- \$5 per thousand



Surveillance-containment strategy

- Operational plan
 - Surveillance – weekly report from every health unit
 - Teams – to investigate and contain each outbreak
 - Epidemiological research on smallpox
 - The textbooks prove to be wrong
 - "Smallpox spreads like a prairie fire"
 - "Revaccination is needed every 3 to 5 years"



India -- a pivotal challenge

1973-75

- India – the ancestral “home of smallpox”?
 - Population – 550,000,000
 - Surveillance-containment strategy--not working
 - June 1973 – search every village—later, every house
 - 130,000 health staff in 10 days
 - Results of first search – October
 - Spring 1974 – the darkest days
 - Gas crisis + strikes by airlines, railway, floods, famine
 - India explodes a nuclear device
 - Containment methods tightened

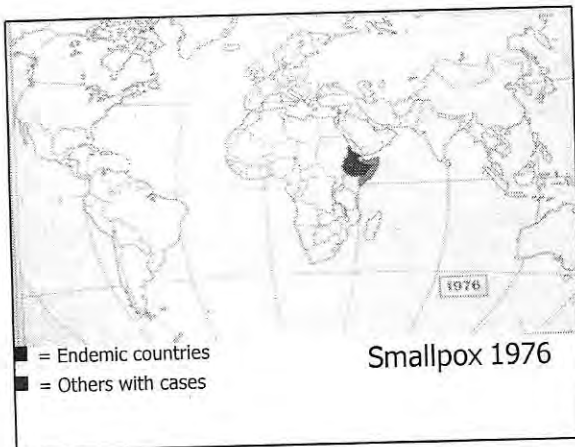


Indian Independence Day

August 15, 1975

Prime Minister Indira Ghandi

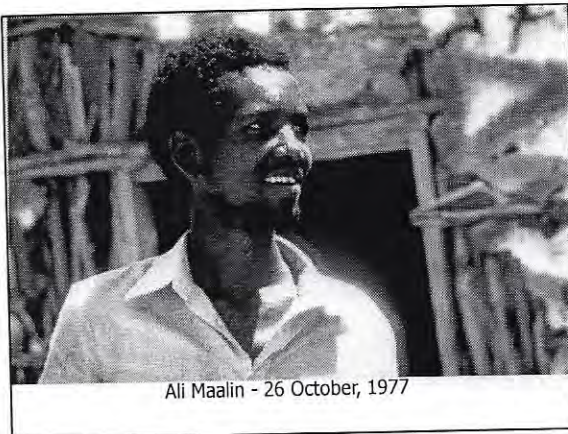
- Salutes India on its 28th Anniversary of Freedom
- Announces India's freedom from smallpox for the first time in its written history



The last strongholds

Ethiopia and Somalia

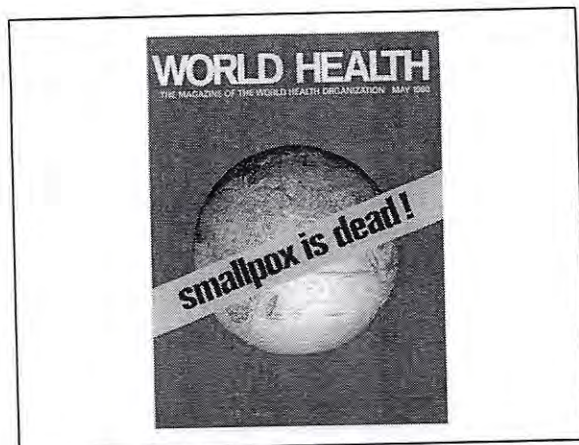
- Ethiopia
 - Country – Compared in size to VA, MD, and PA
 - Largely highland –over 5000 feet
 - Health facilities serve 5% of 30 million people
 - Travel largely by donkey and on foot
 - Emperor is assassinated; Marxist take-over
 - No foreign staff outside of Addis except smallpox teams
 - Civil war, floods, kidnapping, hostages, famine
- Somalia – the final chapter



World Health Assembly --1980

- Declares solemnly that the world and all its peoples have won freedom from smallpox
- Smallpox vaccination should be discontinued in every country

• *Thirty-third World Health Assembly, 8 May 1980*



The legacy –the Vaccine Era, 1970

- The genesis

- African team of 4 – 2000 persons per day cooperative village leadership
One year = 400,000 vaccinations/4 person team
- Smallpox – the only nation-wide vaccination program in developing countries
- Smallpox unit sponsors international meeting to consider a broadened agenda, December 1970

Expanded Program on Immunization -1974

- A global program for vaccination for all children –smallpox, measles, DPT, polio
- Surveillance of vaccine-preventable diseases
- UNICEF and Rotary make this a high priority
- Target: 1990 – 80% coverage

Vaccine coverage (%) -- the Americas

	1980	1990	2000	2008	2010
DTP*	50	74	91	92	93
Measles-rubella	51	80	92	93	92
Polio*	57	75	90	92	92
HepB*	--	--	70	88	92
Hib*	--	--	75	90	93
Rotavirus	--	--	--	?	67

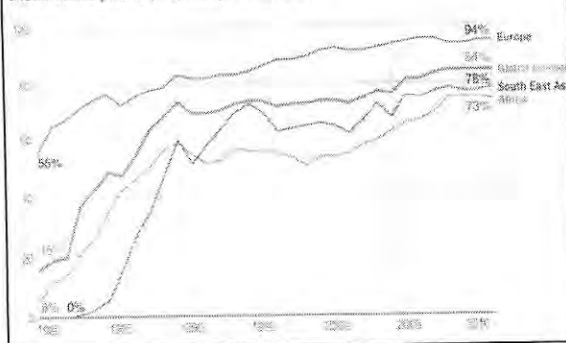
* 3 Doses

Transmission interrupted:

Polio (1991); Measles (2001); Rubella (2009)

Growth in measles vaccination coverage

Measles Containing Vaccine (MCV) coverage, 1960-2012 (%)



Coda

- From *Smallpox: Death of a Disease*:

"We are only beginning to realize the potential of public health...It is a field begging for fresh, resourceful ideas and a new generation of professionals who are not constrained by 'knowing' what can't be done. So it was with so many who contributed so much to making smallpox eradication a possibility."

