

*Delighted to be here with no common ailments which I am aware
 Why polio - prob spent as much time in 1910 as now was spent after 1985
 1935
 1949
 1960-65 - Surv. / 100V 1989-90 China 1st tropical eradication
 1985-2008 China - 1st tropical eradication
 → polio eradication - launch in
 to the EPI program & so this program for
 9/4*

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Polio Eradication

a reconsideration of strategy

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Expenditures – to date and projected

(from WHO web site)

- Global polio eradication is 19 years old
- Expenditures to date
 - International assistance \$5,200,000,000
 - National budget costs \$5,200,000,000+
 - >50 times the total cost of smallpox eradication
- Needed through 2009 (if all goes well)
 - At least \$1,500,000,000 in international assistance plus equivalent or more in national expenditures
- Needed for 2009-2012 (confirmation phase) ?

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Global Eradication Campaigns

*Hookworm	Sanitary treatment	1909-22	13
*Yellow Fever	Vector control	1915-32	17
*Yaws	Penicillin	1948-66	18
*Malaria	DDT treatment	1955-73	18
Smallpox	Vaccine	1967-80	13
Guinea Worm	Water: Rx	1986-	21+
Poliomyelitis	Vaccine	1988-	18*
*Failed			

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Landmarks in polio eradication

- Program began in the Americas –1985
- Global program launched – 1988
- Last cases
 - 1991 Americas
 - 1995 Europe
 - 1998 Western Pacific
- Expected occurrence of last case - 2009
- Certification of eradication - 2012

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Polio, the disease – a perspective

- Clinical cases
 - Late 19th C. – a few scattered outbreaks described
 - 194151 (U.S.) – 5000-15,000 paralytic cases/yr.
 - 1952 (peak, U.S.) – 21,269 paralytic cases
- Developing countries
 - 1970 Not seen as a major problem*
 - 1988 350,000 cases (estimated)

*Compared to such as AIDs, measles, malaria, tuberculosis, diarrheal and respiratory problems

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Why the special status of polio?

- From the 1930s, a special program in the U.S.
 - President Roosevelt, the March of Dimes, NFIP
 - Polio, of increasing relevance as other infectious diseases declined
- A dream of global eradication
 - Roles of Albert Sabin, Rotary, CDC, WHO
 - Principle: Industrialized countries to pay; developing countries benefit by strengthened EPI

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Development of Polio Vaccines

- 1948 Tissue cell culture of poliovirus
- 1955 Inactivated poliovaccine -- IPV (Salk)
- 1962 Live oral poliovaccine -- OPV (Sabin)

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Characteristics – IPV and OPV

	IPV	OPV
Admin.	Needle	Oral
Cost	\$ 3.30	~15 cents
95% protection	2 (3+)	3 (4-6)
Oral immunity	++++	++++
Intest immunity	+	++++
Household spread	0	++++
Use in epidemic	No	Yes

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- Smallpox was eradicated in 1980
- So why not polio? After all, there is a preventive vaccine for both and neither has an animal reservoir

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Smallpox—much easier to eradicate

Smallpox

• Surveillance-Containment

- Visible rash – all cases
- Readily diagnosed
- Minimal demand for lab
- Targeted containment

Polio

- 1/200 with paralysis
- Flaccid paralysis problem
- Heavy lab demand
- Area-wide campaigns

• Epidemiology

- Transmission only by Cases
- Moderately contagious
- Primarily by asymptomatic
- Very contagious

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Smallpox and Polio Vaccines compared

Smallpox

- Heat stable
- Production in endemic countries
- One dose
- One antigenic strain
- Storage -at least 45 years

Polio

- Labile
- No
- 4+ OPV; 3+ IPV
- 3 virus strains
- c. 5 years

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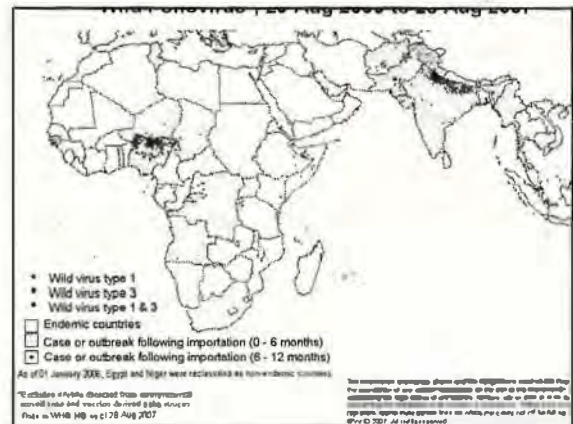
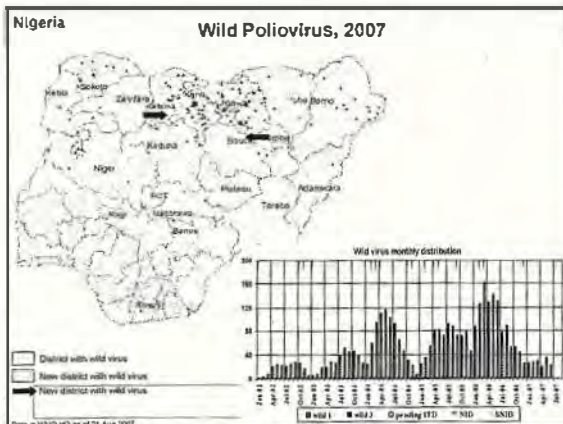
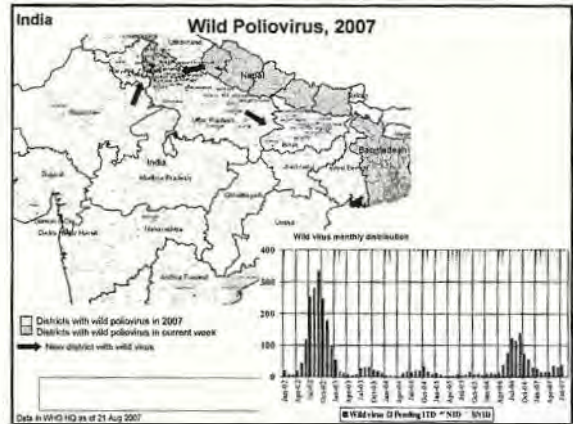
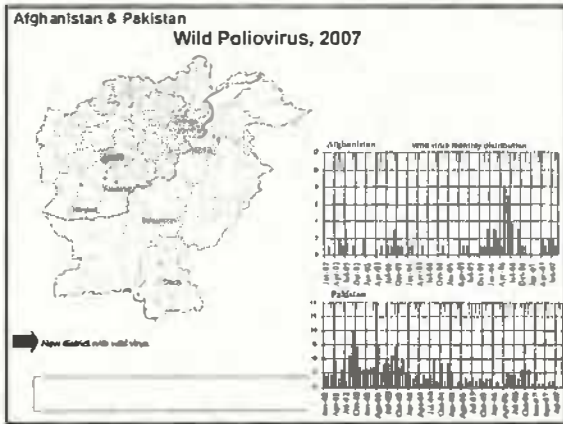
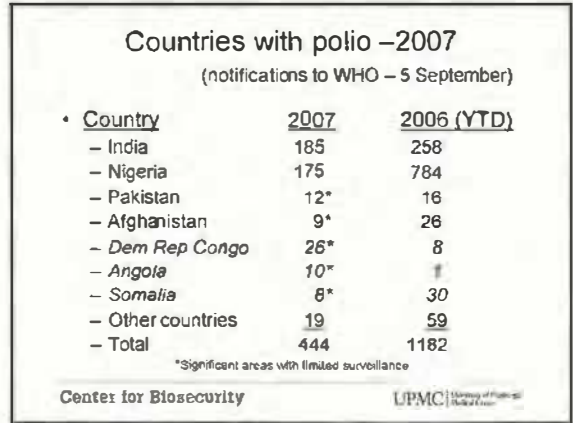
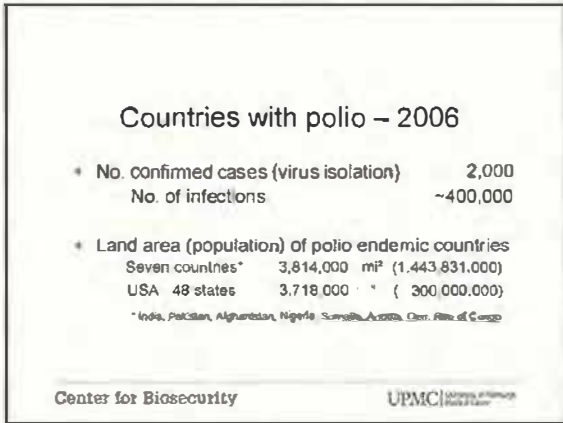
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Polio eradication strategy

- Defined as "0" cases or isolates of wild poliovirus*
- An addition to the EPI
 - Industrialized countries to bear increment costs
- National immunization days -- 0 to 4 years
- Surveillance for acute flaccid paralysis
 - Isolation of virus from stool specimen
- Vaccination in area of a case
- "Mop-up" vaccination in high-risk areas
 - *Later redefined to include all vaccine-derived polioviruses

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Two Critical Poliovaccine Problems

Unknown In 1988

- OPV-derived strains can be excreted for years
 - 20 cases excreted >6 months; 8 cases, >3 years
 - One case with 27 years excretion:
 - High titer and virulent in monkeys
 - No secondary cases due to contact
- OPV-derived strains can spread silently for years although rarely causing paralytic disease
 - Recombinant OPV caused 4 or 5 small outbreaks
 - Scattered reports of one to a few paralytic cases

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WHO End Game Strategy

- Continuing polio vaccination with NIDs in all developing countries through 2012
 - IPV to be used in some industrialized countries
 - OPV to be used in most developing countries
- Stop global transmission by December 2009
- Surveillance for Certification – 2010-2012
- December 2012 – stop all OPV vaccination:
IPV to continue in some industrialized countries

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Three critical questions

- Is wild poliovirus eradication possible?
- Can eradication be adequately certified so as to permit vaccination to stop?
 - Wild poliovirus
 - Vaccine-derived poliovaccine viruses
- What is "Plan B" if the answer to either question is "no"?

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Is wild poliovirus eradication possible?

- Yes – in theory
 - No animal reservoir and no chronic carriers
 - Practical demonstrations over large areas
 - Wild poliovirus 2 transmission has apparently been stopped

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Can eradication be confirmed?

- How certain can one be that transmission of wild poliovirus has stopped?
 - Five endemic countries with large areas having limited health services and/or civil war
 - Afghanistan, Pakistan, Somalia, Angola, DRC
 - Sudan, with "good" surveillance indicators, discovered wild polioviruses in 2005
 - Type 1 strains from 3 years previously
 - Type 3 strains from 4+ years previously
- Possibility of confirming that vaccine-derived OPV strains have been stopped – zero

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Vaccine for the post-eradication era if routine OPV use is stopped

- IPV is not an option for developing countries
 - Cost
 - No household spread to help protect slum areas
 - Little intestinal immunity to stop fecal-oral spread
- Reliance on OPV for emergency only is impractical
 - Very large quantities needed for NIDs
 - Cost of maintaining standby production capacity
 - Annual costs of storage and replenishment of stocks

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- *If, in 2012, WHO announced that polio had been eradicated, would you, Minister of Health, be willing to stop polio vaccination in your country?*

- **Considerations**

- Population immunity, within 4 years, would be the same as before vaccination began
- Poliovirus spreads rapidly
 - Large-scale containment is necessary.
 - Could enough vaccine be obtained quickly enough?
 - How long might it take for the health staff to be mobilized to undertake an NID?

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Summary observations

- Many cases of polio have been prevented
- In many countries, polio eradication efforts have strengthened EPI as was intended
- Global polio eradication would require a far more intensive effort than now
- Even if apparently achieved, eradication could not be confirmed

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A rational future

- Accept now that in the longer-term a continuing program of polio vaccination is essential and must be planned for in all national immunization programs
- Pursue wild poliovirus eradication so long as donors and endemic countries are willing, recognizing the still formidable obstacles and efforts required

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For now, dreams of other eradication programs should be shelved until:

- *Needed technologies are available*
- *Comprehensive plans have been developed*
- *Proposed strategies have been validated*
- *There is a carefully considered international commitment*

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