

Impact of Vaccines on Alaska Native Health

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Vaccine-Preventable Disease in Alaska Native children

■ BEFORE VACCINES:

- Hib disease – 40 cases/yr <5 y/o
- Pneumo disease – 25 cases/yr < 2 y/o
- Hep A – epidemics with 4,000 cases
- Hep B – 10% carriers
- 5% of infants died from Measles/
pertussis

■ BECAUSE OF VACCINES:

- ~ 1 case of Hib per year!
- Vaccine-type pneumo down 95%
- No Hep A epidemics since vaccine!
- No Hep B carriers in children!



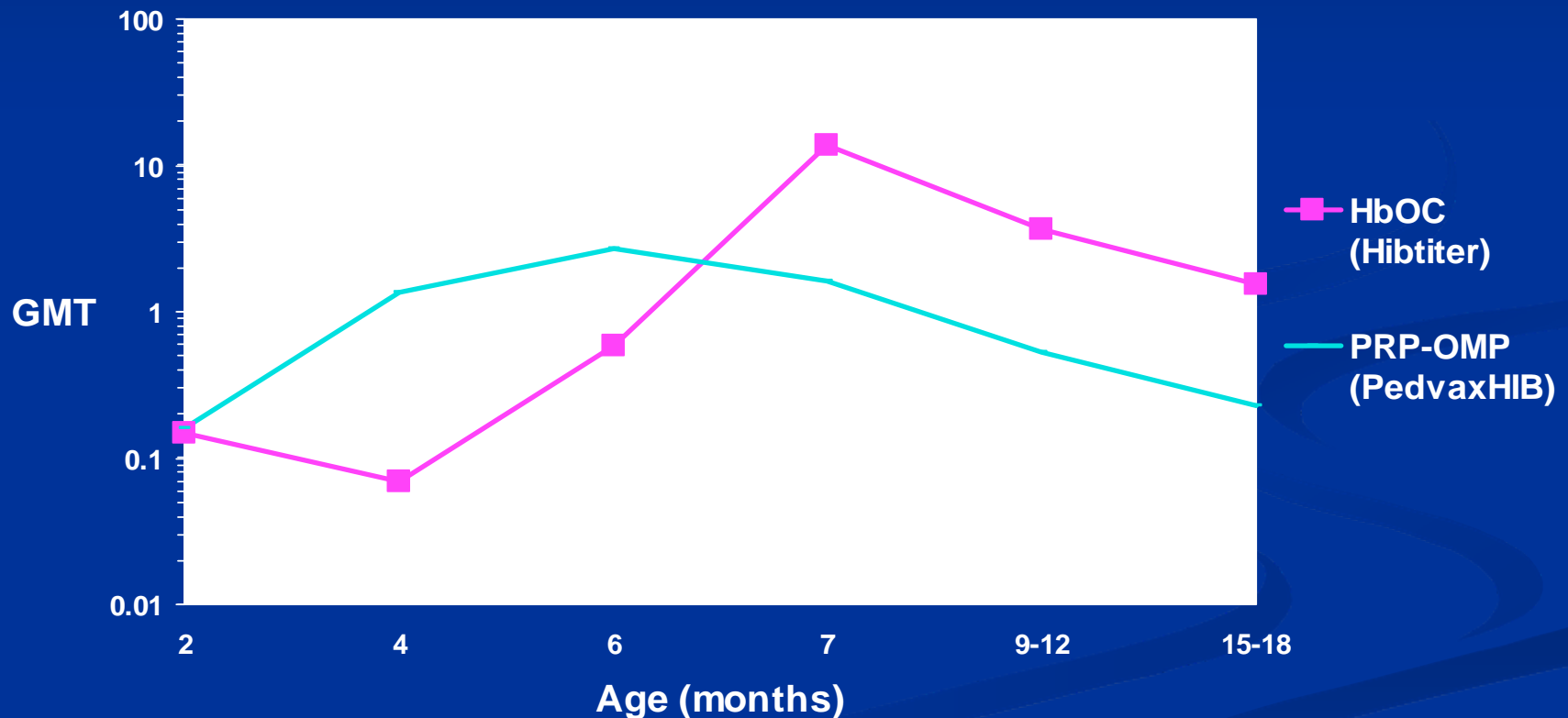
Hib disease



- **Unique Aspects in AI/AN**
 - 5-10 times higher rate of disease in SW and AK
 - Younger peak age (4-6 months)
- **Unique Recommendations**
 - Prefer PRP-OMP (PedvaxHIB®) because of its ability to produce protective antibodies after 1 dose.
 - American Indian/Alaska Native children have been prioritized to receive PedvaxHIB in the current Hib vaccine shortage

Comparative Immunogenicity of Hib Conjugate Vaccines in Alaska Native Infants

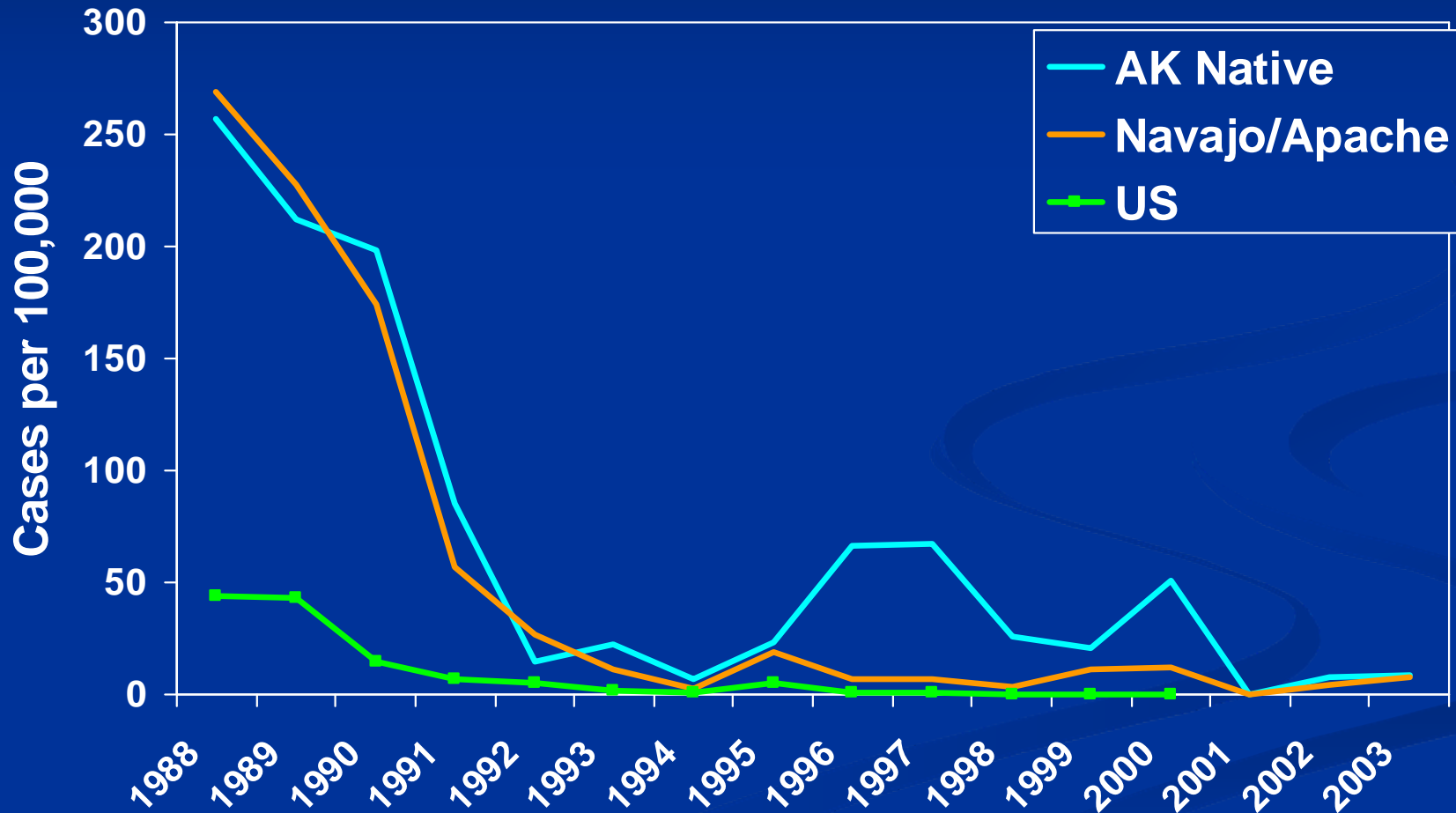
Vaccines administered at 2, 4, and 6 months, except PRP-OMP at 2 and 4



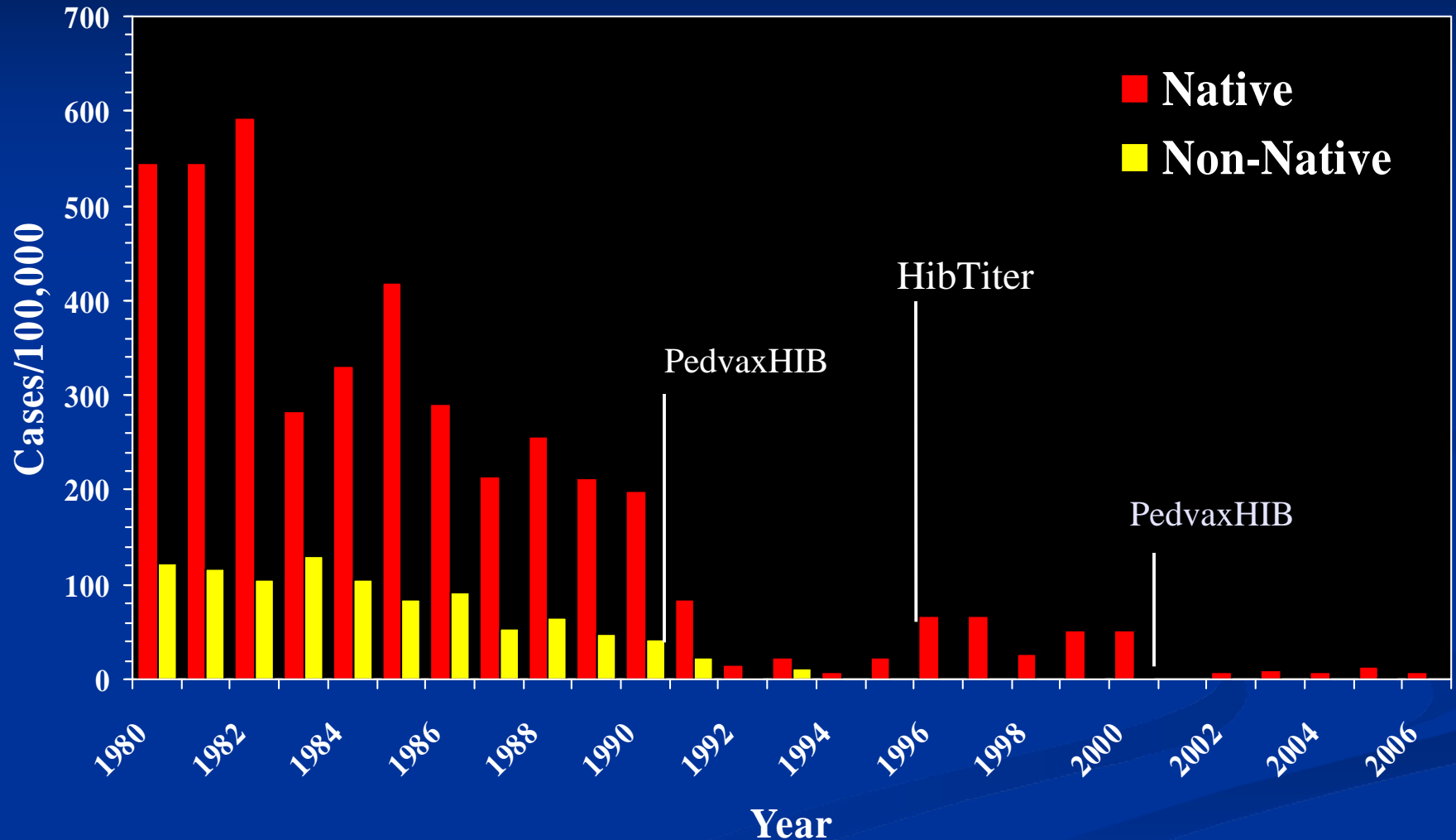
Bulkow et al, *Pediatr Infect Dis J* 1993; 12:484-92



Decline in Hib Disease: US, Navajo/ Apache, AK Native, 1988-2003



Invasive Hib Disease Children <5 Years, Alaska, 1980-2006



Singleton, et al. J Pediatr 2000; 137:313-20
Singleton, et al. Pediatrics 2006;118:421-429

Warning!

Recent Hib breakthrough cases in unvaccinated children

- 2001-7: 0-2 Hib cases/year, AK children
- 2008: 2 cases of Hib in 6 months!
 - Both children were unvaccinated
 - 2 month old - brain damage from Hib meningitis
 - Parents came in for 6 week shots – vaccine not available, low grade fever
 - 14 month old – Hib pneumonia
 - Parent refused all vaccines.

Pneumococcus (Pneumo)

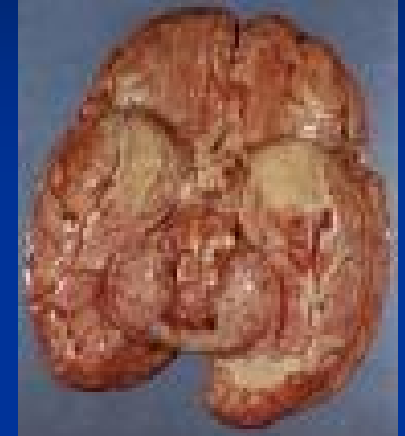
- Main cause of serious infections:

- Bacterial meningitis
- Blood infections
- Pneumonia

- Main cause of Ear Infections



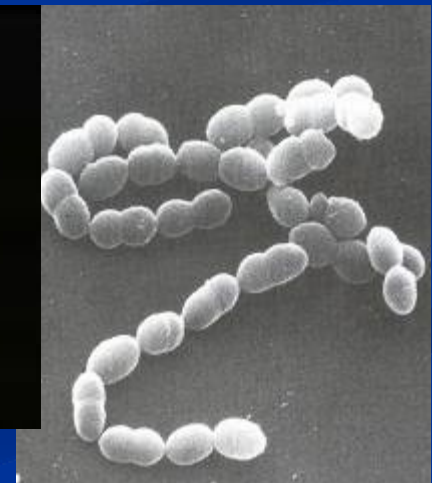
Pneumonia



Brain: meningitis

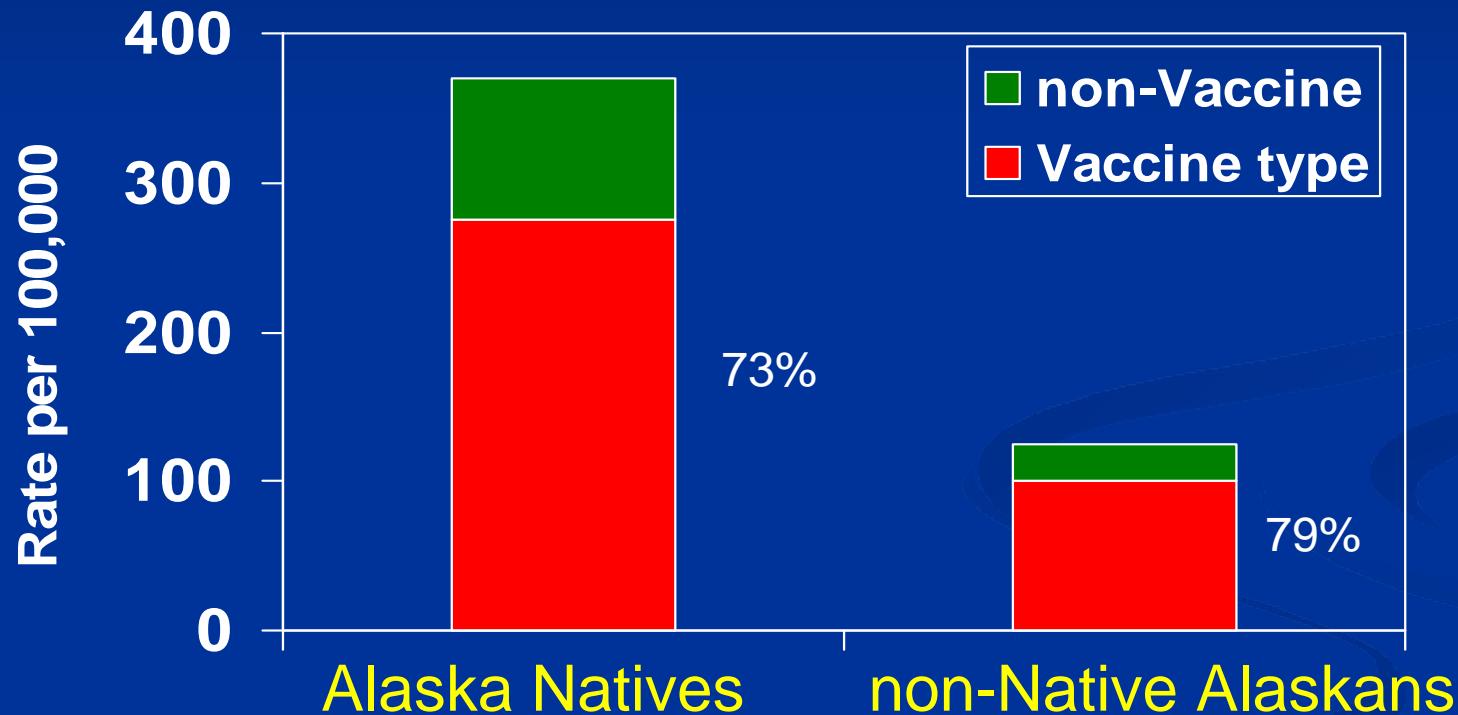


Ear infection



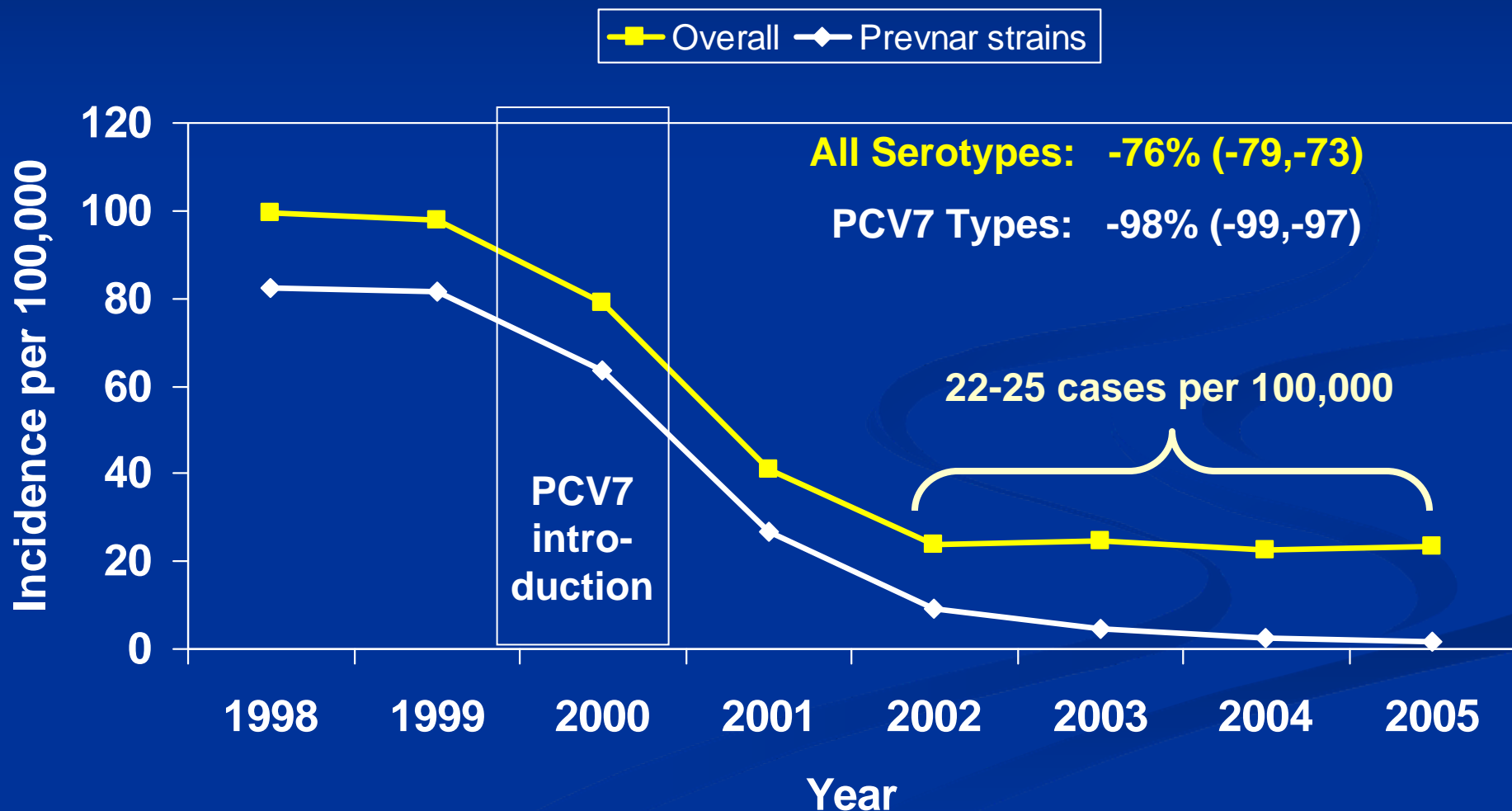
Pneumo bacteria

Invasive Pneumococcal Disease Alaskan children <2 year olds, Pre-Vaccine, 1995–2000

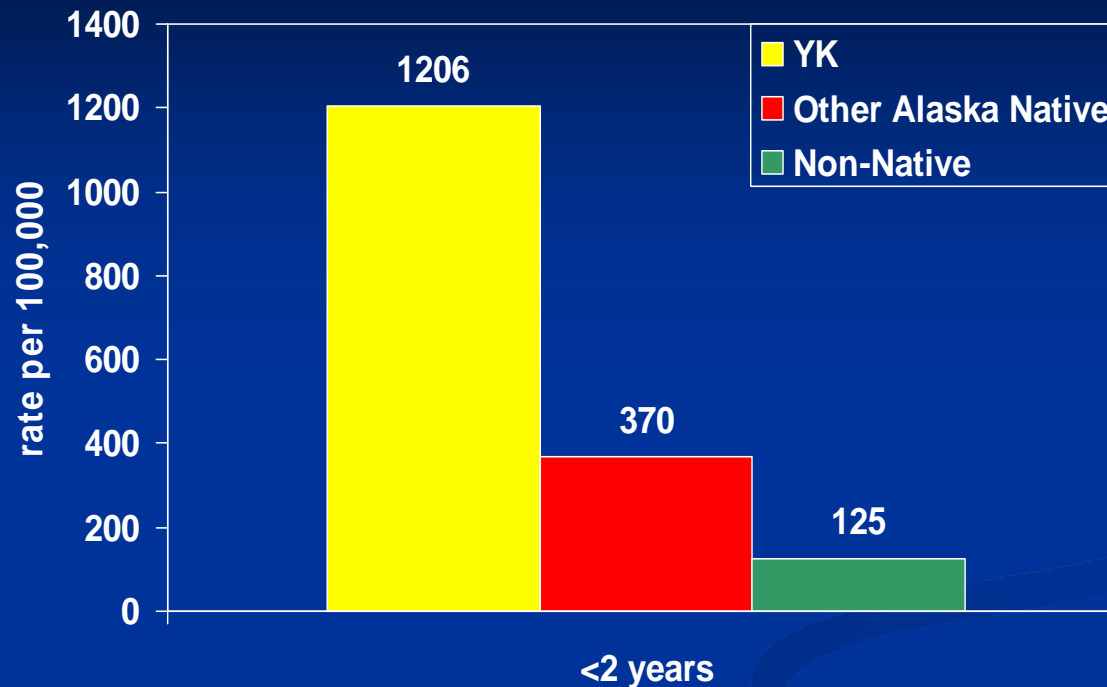


Before Prevnar vaccine, Alaska Native children had a rate of invasive Pneumococcal disease 3 times that of non-Native Alaskan children. Navajo/Apache children experienced similarly higher rates.

Prevnar Vaccine Impact: Decrease in Pneumo Disease in US children



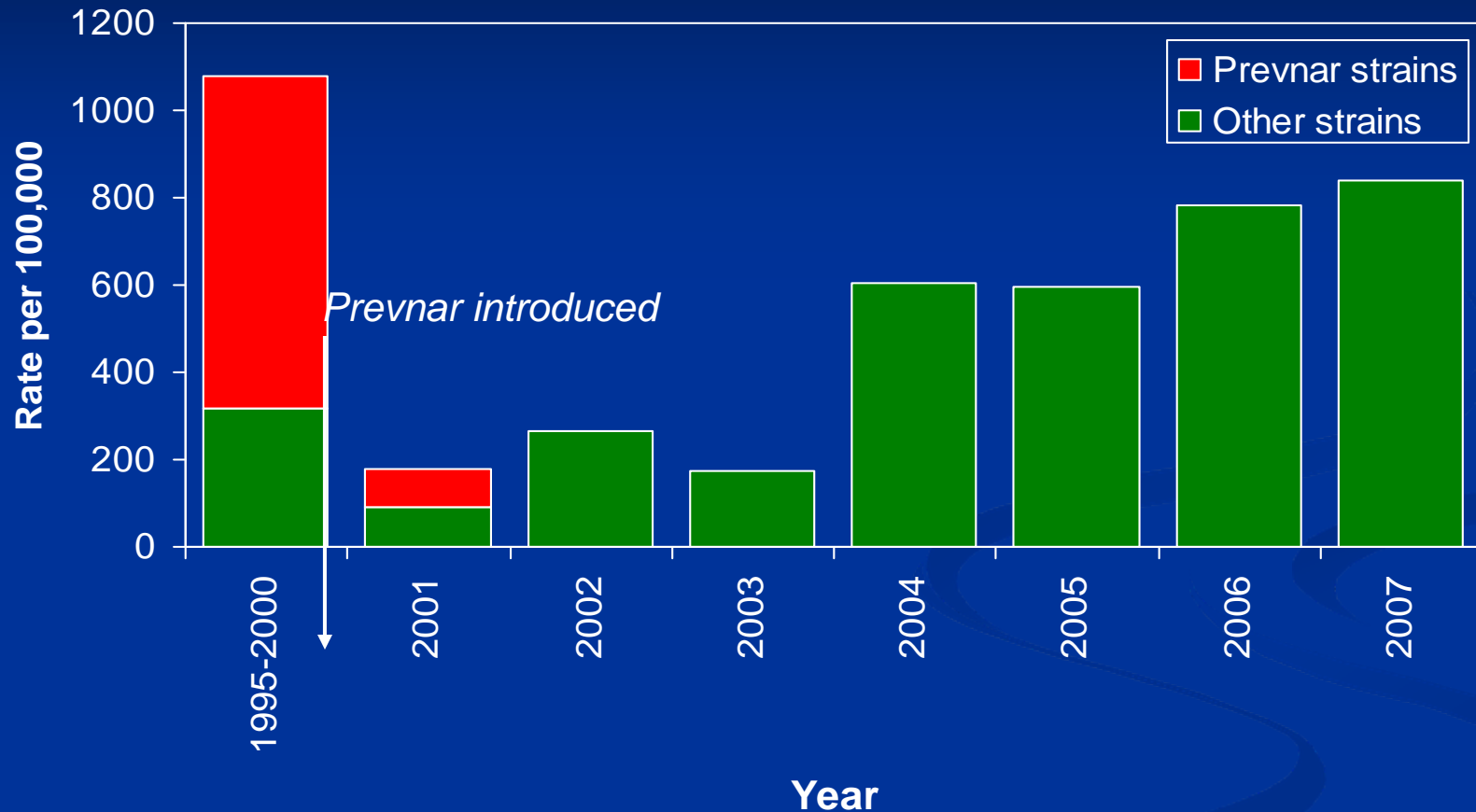
Why focus on YK Delta?



- Pneumo infections in YK children before Pevnar:
 - 5-fold higher than other Alaska Native children
 - 10-fold higher than non-Native Alaskan children
- After routine Pevnar vaccination in 2001:
 - Overall Pneumo infections decreased 80% in 2001-3
 - But since 2004, Pneumo infections from non-Pevnar strains have increased

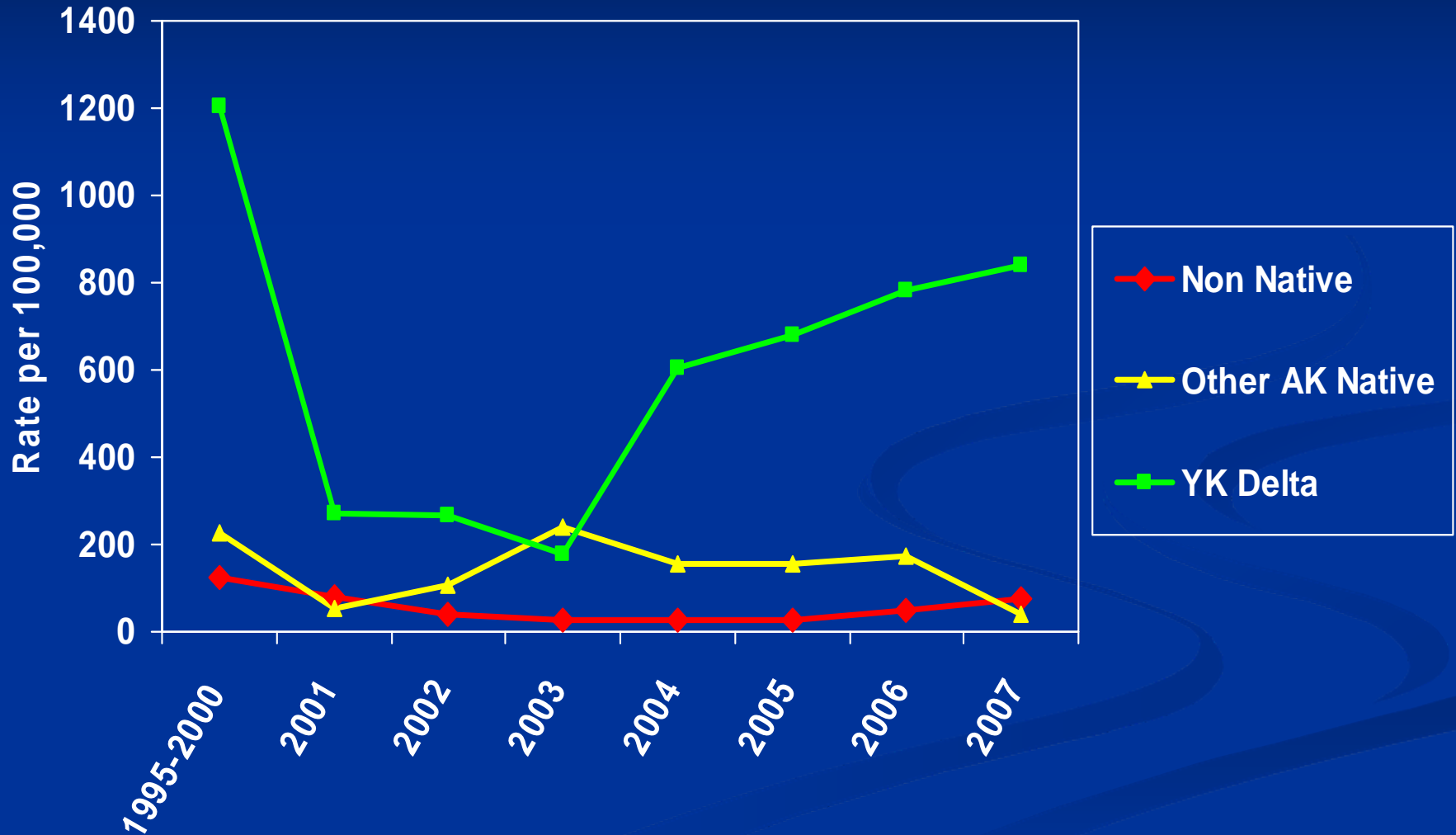
Invasive Pneumococcal Disease Rate

YK Delta Children less than 2 yrs old, by year



Although no vaccine-type disease is occurring, there have been increases in non-vaccine serotype disease since 2004.

Invasive Pneumococcal Disease Rates, YK vs. AK Native vs. non-Native Children,



Why is invasive pneumococcal disease higher in YK?

Water supply, household size income and invasive pneumococcal disease (IPD) rates by region

Service Unit	Water Service Level	Household Factors		Rates of IPD
		HH Size	Per Capita Income	All Ages
Anchorage (municipality)	Assume 100%	3.2	20.0	18.1
Other Rural	75-99%	3.1 - 4.4	9.8 - 17.8	10.9 - 55.1
YK Delta	61%	4.7	6.5	61.4

Rates of IPD, YK Delta children <5 years, 2001-7 by water service

Pop.	<10% Water	10-80% Water	\geq 80% Water	P value for trend
N cases	26	12	9	P= 0.008
Rate per 100,000	390.9	262.9	146.7	

The effect of lack of water service on IPD rates was significant even when controlling for household size and income level

A new Vaccine is anticipated to replace Prevnar in 2010

Prevnar (PCV7)	Prevnar 13 (PCV13)
7 strains	13 strains

A new Prevnar Vaccine that protects against 13 Pneumo serotypes should be licensed in 2009 or 2010

Most Pneumo infections in YK Children are covered by this PCV13 vaccine

Warning!

Vaccine-preventable Pneumococcal Disease emerges in unvaccinated child!

- Prevnar has nearly eliminated vaccine-serotype invasive pneumococcal disease
- No vaccine-serotype cases have occurred in Alaska Native children since 2002
- But, in 2008, an unvaccinated 11 month old from Anchorage developed pneumococcal meningitis due to 19F – a vaccine serotype

Not being vaccinated is key risk factor for Hib and pneumococcal disease.

Hepatitis A in American Indian/Alaska Native people

- **Pre-Vaccine Incidence –**
 - highest among US ethnicities
 - Large outbreaks – Aberdeen, AK, Navajo
 - Lifetime risk on reservations/villages ~90%
- **Hepatitis A Vaccine (1996)**
 - Universal vaccine in states with high rates
 - **Rates have declined 20-fold –**
 - Incidence is similar to US all races.
 - No epidemics! – 0 cases in some reservations

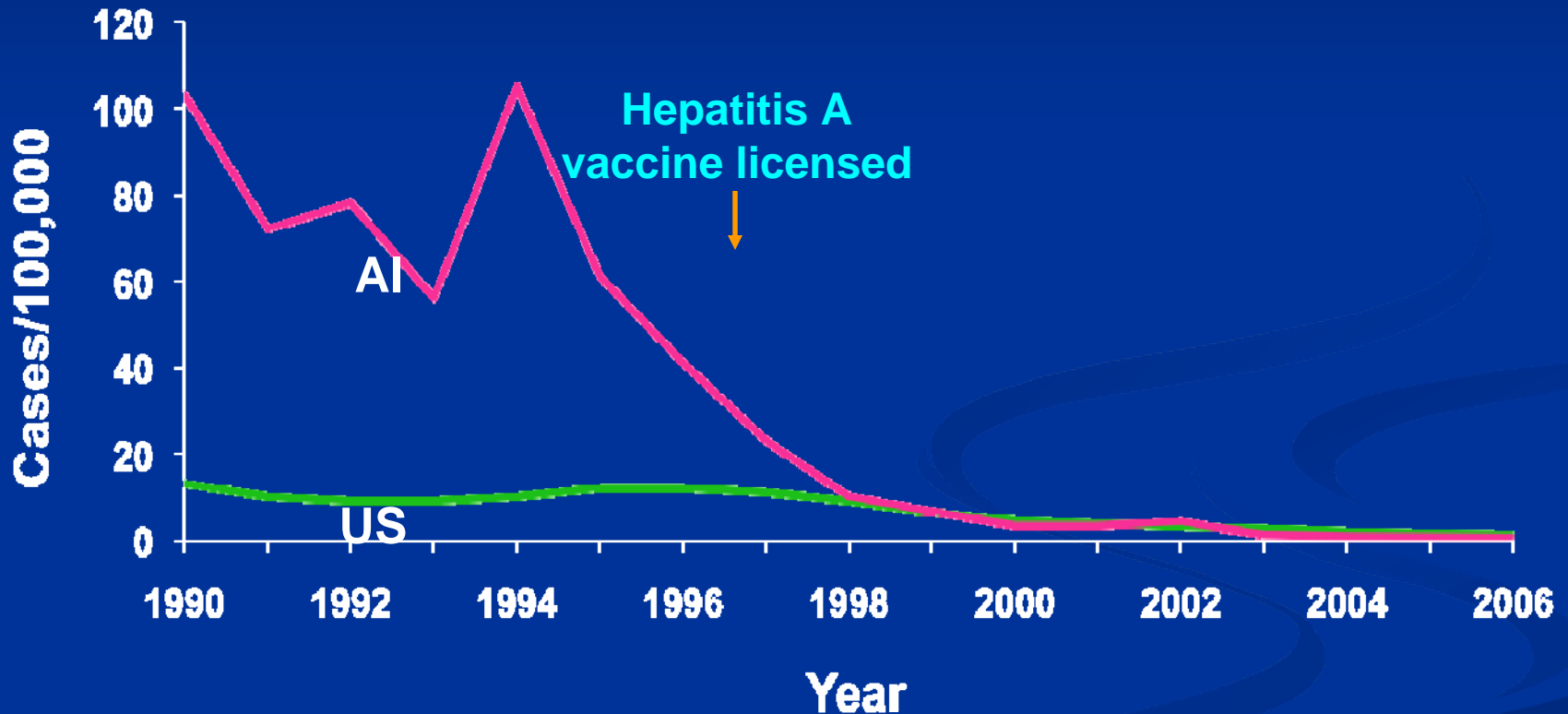


For reproduction of slides, acknowledgement of the editors and their clinical departments is appreciated.

CDC MMWR 1992;41:6

Bialek. Hepatitis A in AI/AN. Am J Pub Hlth 2004;94 996-1001

Hepatitis A Incidence, American Indian/Alaska Natives and US, 1990 - 2006



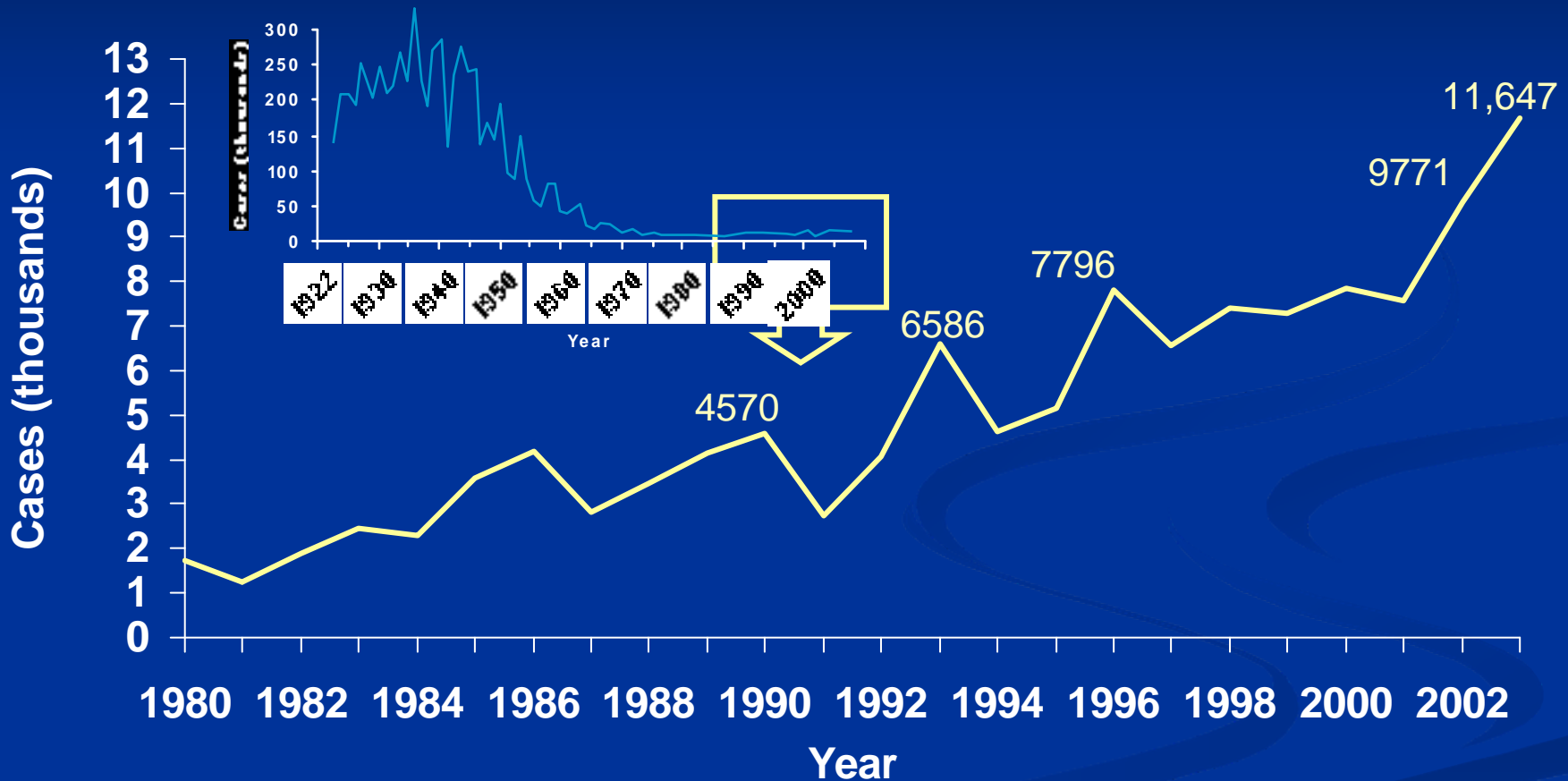
Bordetella pertussis



Photograph courtesy of the WHO

- Pertussis bacteria causes “whooping cough”. The bacteria causes forceful coughs with a “whoop”
- Before vaccine over 200,000 pertussis cases occurred in the US annually
- Now most cases originate from adolescents and adults whose immunity has waned.
- In 2006 an adult Tdap vaccine replaced Td to provide pertussis protection

Reported Pertussis Cases in the United States, 1922-2003



Centers for Disease Control and Prevention. Pertussis—United States, 1997–2000. *MMWR*. 2002;51:73-76.
 [Centers for Disease Control and Prevention. *MMWR*. 2004;53:687.]

Rationale for Vaccinating Adolescents and Adults: *Pertussis* Reservoirs

Adolescents and Adults Are Primary Sources for Infant Transmission



Health Care Providers

Most hospital outbreaks involve transmission from health care workers to pediatric patients¹



Adults/Parents

The mother is the source for 1/3 of infants with pertussis.



Grandparents

In 15% of families, an adult patient was source of infection for other household members. 15% of these were grandparents.³

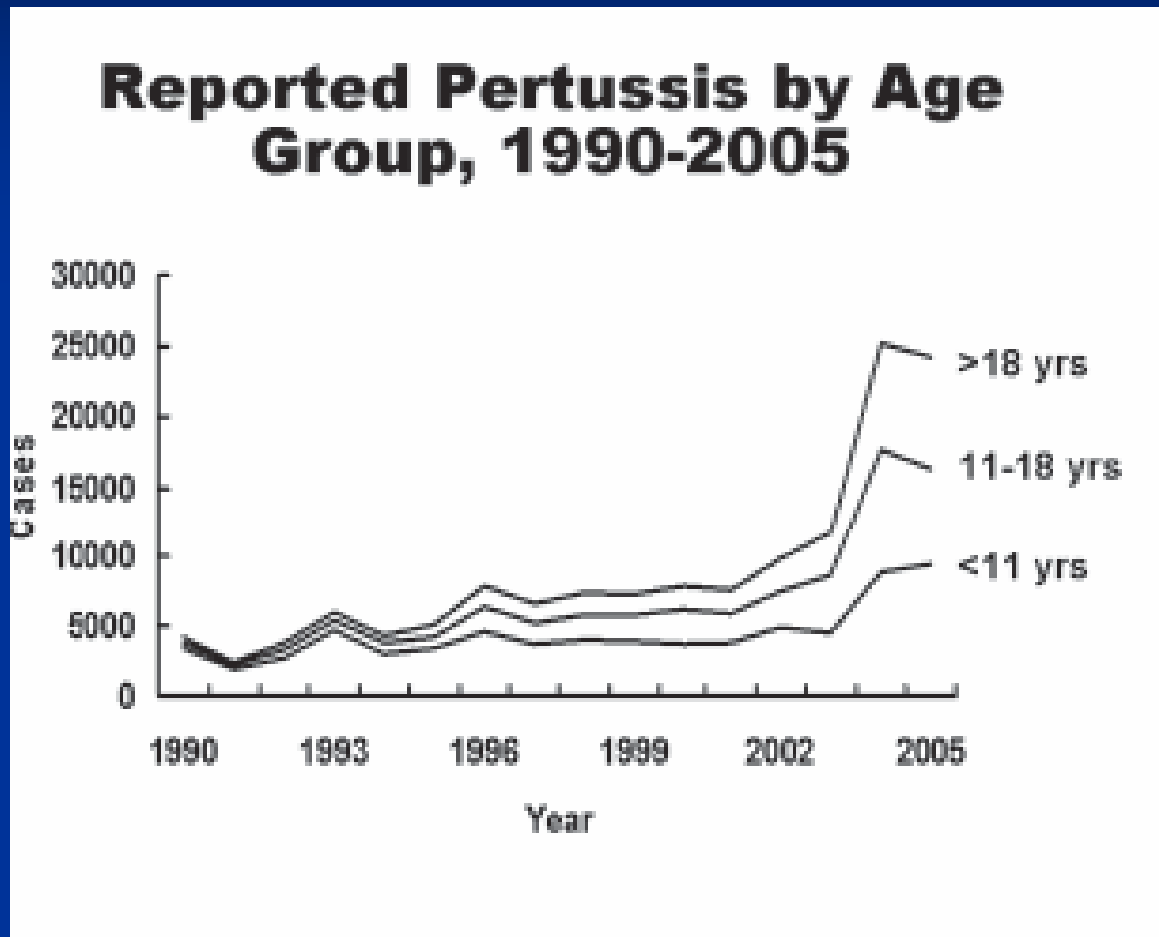


Adolescents/Siblings

For 27% of infants hospitalized with pertussis disease in London an older, sibling was the source of infection⁴

1. Sheretz et al. *Emerg Infect Dis.* 2001;7:241-244.
2. Izurieta et al. *Clin Infect Dis.* 1996;22:503-507.
3. Postels-Multani et al. *Infection.* 1995;23:139-142.
4. Crowcroft et al. *Arch Dis Child.* 2003;88:802-806.

Is Tdap making a difference?



In 2006 there were only 15,500 pertussis cases reported. Too early to tell Tdap effect, but trends for the US are encouraging.

Pertussis Cases by Region, Alaska, January-August 15, 2007 and 2008.

Region	Jan-Aug 15, 2007	Jan-Aug 15 2008
Southeast	0	9
Southwest	3	1
Gulf Coast	7	40
Interior	13	0
Anch/Mat-Su	17	28
Northern	0	12

Still outbreaks of pertussis especially among communities with low vaccine rates

Measles



- In 1960-62, nearly 50% of postneonatal deaths in YK Delta were caused by measles or pertussis. The postneonatal death rate was 5.6%.
- The postneonatal death rate decreased 10-fold between 1960-62 and 1980-81. Much of the decrease was control of measles and pertussis.

Diphtheria

- In 1925 a diphtheria epidemic threatened icebound Nome. The nearest serum was in Anchorage..
- A Pony Express-type relay of dog teams rushed the vaccine from Nenana to Nome.
- Gunnar Kaasen drove the final two legs into Nome behind his lead dog Balto, through a blizzard hurling 80 mph winds.
- The serum arrived in time to prevent the epidemic and save hundreds of lives.



Herd Immunity Thresholds for certain Vaccine Preventable Diseases

Disease	R_0	Herd Immunity
Diphtheria	6-7	85%*
Measles	12-18	83-94%
Mumps	4-7	75-86%
Pertussis	12-17	92-94%
Polio	5-7	80-86%
Rubella	6-7	83-85%
Smallpox	5-7	80-85%

† Modified from *Epid Rev* 1993;15: 265-302, *Am J Prev Med* 2001; 20 (4S): 88-153, *MMWR* 2000; 49 (SS-9); 27-38

We need high vaccine coverage rates to protect from outbreaks.

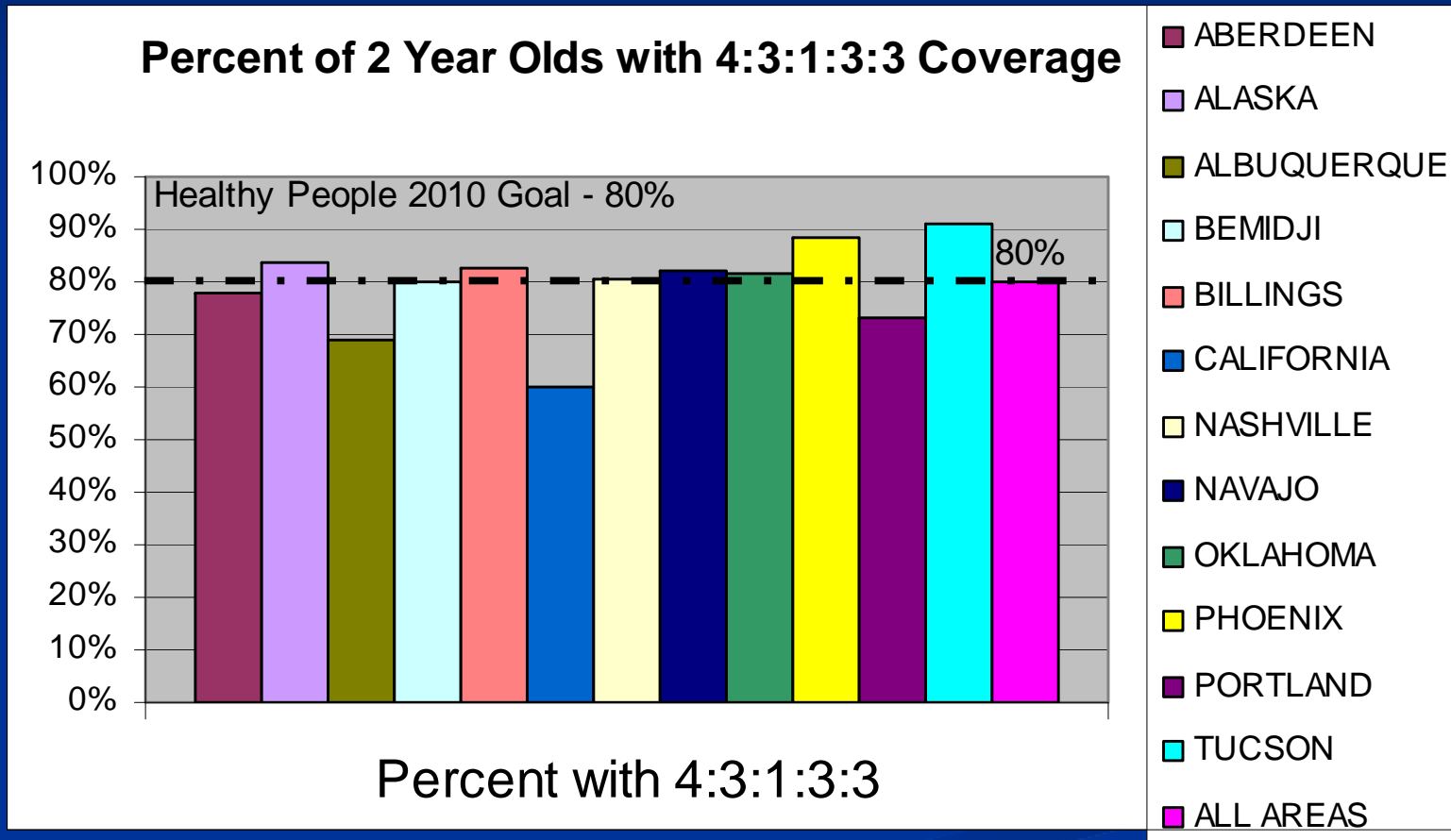
It's a Small World, and That's a Big Reason to Get Vaccinated.

- Today, international travel takes millions of Americans to foreign countries every year—countries where vaccine-preventable diseases like polio or measles may be present.
- Although measles has been eliminated in the US, this year there has been over 100 cases stemming from importations.
- Many outbreaks occurred from unvaccinated children returning with measles and transmitting to others.



IHS 2 Year Old Reports

Second quarter (March) 2008



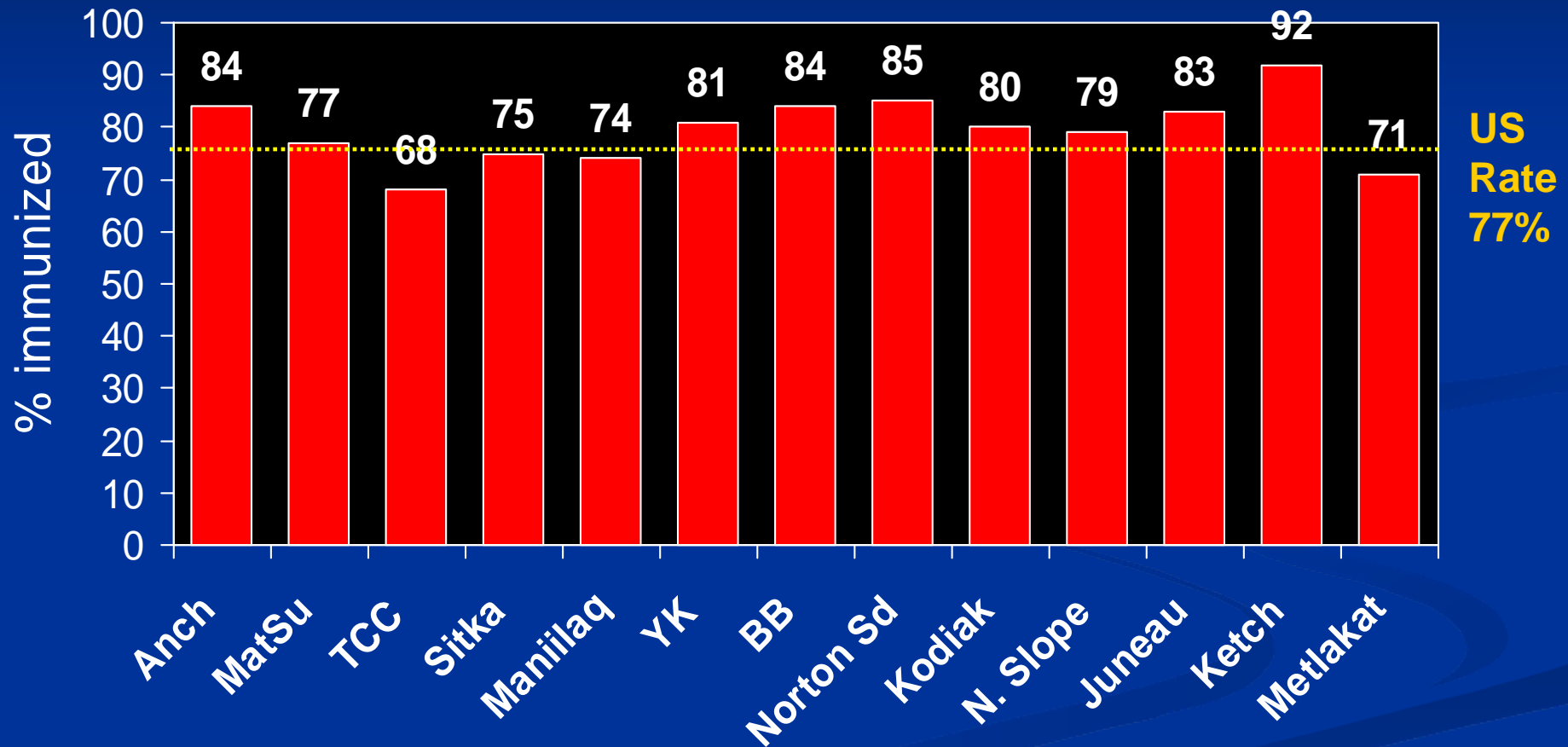
4-3-1-3-3 = 4DTaP 3polio 1MMR 3Hib 3HepB in children 19-35 months old

The 4-3-1-3-3 rate for all IHS population is 80%

The rate in all Alaska Natives is 84%

Alaska Native 2-Year Old Rates by Region

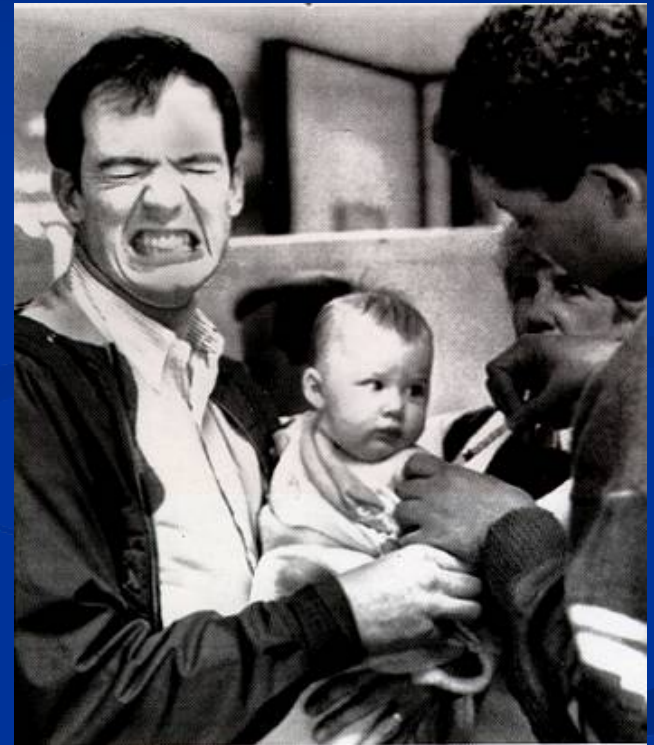
4-3-1-3-3-1 rate, June 30, 2008



4-3-1-3-3-1 = 4DTaP 3polio 1MMR 3Hib 3HepB 1Var in children 19-35 months

Some parents are concerned about vaccines

- True: Vaccines are not without risk
 - All vaccines have possible side effects, most mild, rarely severe
 - The risk of disease far outweighs the risk of vaccine
 - There is no scientific link between vaccines and diseases like Autism
- Avoiding Vaccines isn't "Safer"
 - By choosing not to vaccinate one takes on the risk of disease
 - Unvaccinated children are 35 times more likely to catch measles than vaccinated children



MMR Vaccine: Is It Really a Factor in Autism?

- Autism is a Developmental Disorder with a spectrum of symptoms and etiology.
- Some parents and others have expressed concern about a possible link between the MMR (measles, mumps, rubella) vaccine and the development of autism in children because:
 - MMR vaccine is first given at age 12 to 15 months.
 - The first signs of autism (poor social interaction and speech, repetitive behaviors) often appear between 12 to 18 months of age.



Vaccine Resources

- Resources:

- www.immunize.org

- www.cdc.gov/vaccines/

- www.immunizationinfo.org

- Parent resources

- <http://www.aap.org/healthtopics/Autism.cfm>

- http://www.cispimmunize.org/fam/fam_main.html