

PERTUSSIS

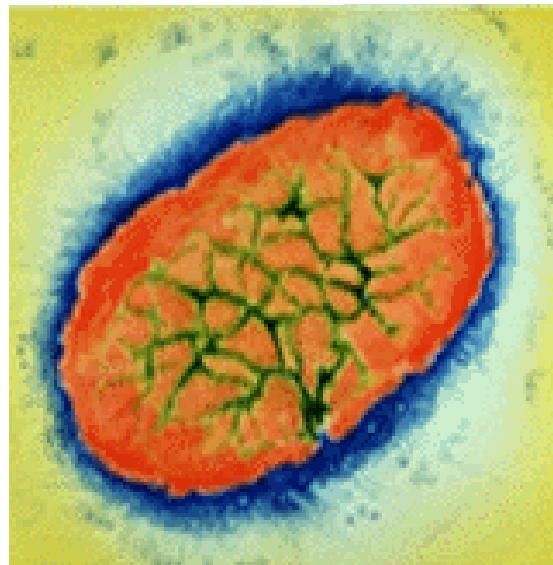
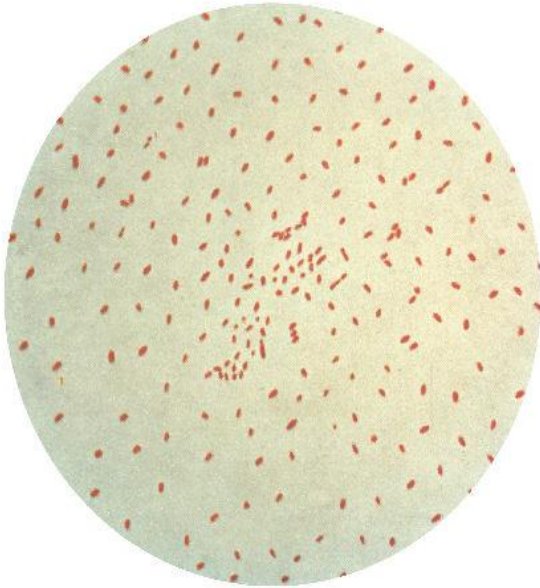
The Unpredictable Burden of Disease

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AAP/Novartis Grand Rounds Webinar

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Pertussis Agent



- *Bordetella pertussis*
 - Nonmotile, **fastidious**, gram-negative, pleomorphic bacillus
 - **Sole cause of epidemic pertussis**
 - **Usual cause of sporadic pertussis**
- *Bordetella parapertussis*
 - occasional cause of pertussis
 - ~5% of isolates in US
 - Less protracted illness

Pertussis

Epidemiology

- Humans are only known hosts of *B. pertussis*
- Endemic in most populations
 - **Since the 1980's, despite high levels of vaccine coverage in children, outbreaks have occurred every 3 to 5 years, with an increase in peak incidence with each successive outbreak***

*ACIP. MMWR Recomm Rep 2006;55(RR-3):1-34.

*Cherry JD. Pediatrics. 2005;115(5):1422-27

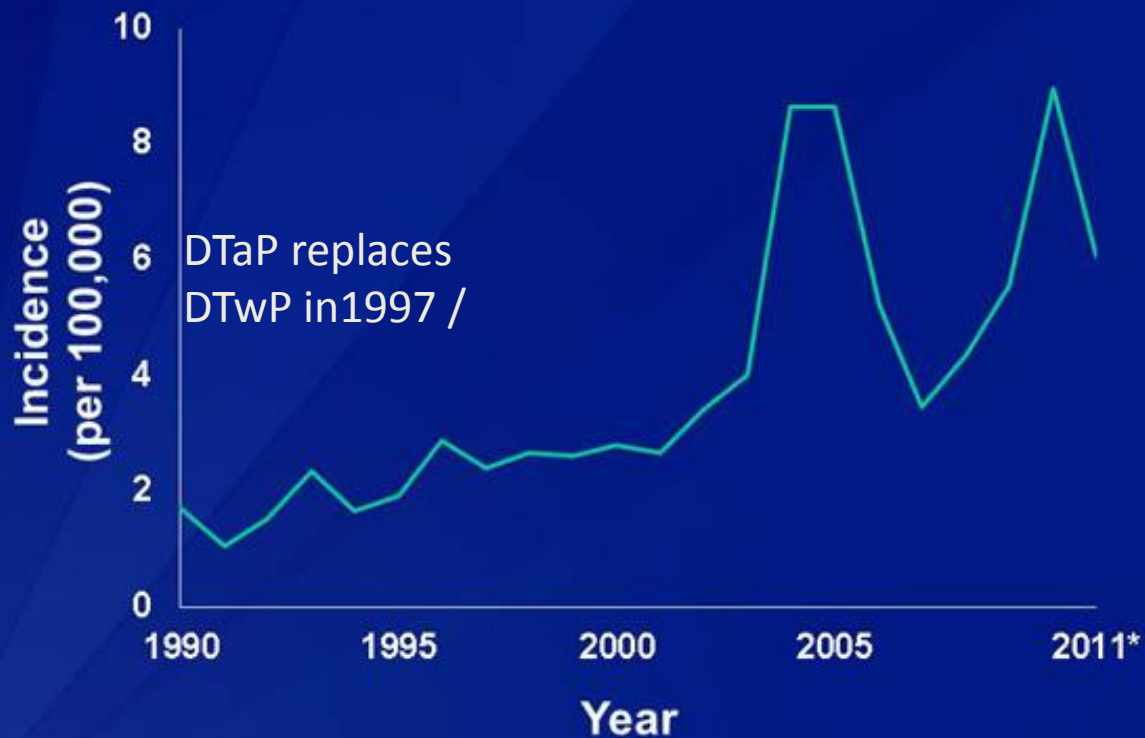
Total Reported Cases of Pertussis

United States, 2000-2011

Year	Reported Cases	% Change
2000	7,867	-
2001	7,580	- 3.7%
2002	9,771	+ 28.9%
2003	11,647	+ 19.2%
2004	25,827	+ 121.8%
2005	25,616	- 0.8%
2006	15,632	- 39.0%
2007	10,454	- 33.1%
2008	13,278	+ 27.0%
2009	16,858	+ 27.0%
2010	27,550	+ 63.4%
2011	18,719	- 32.1%

<http://www.cdc.gov/pertussis/surv-reporting.html>

U.S. reported pertussis incidence 1990-2011*



*2011 data are not yet finalized and subject to change. 2011 data were accessed July 5, 2012.

SOURCE: CDC, National Notifiable Diseases Surveillance System, 2010

<http://www.cdc.gov/pertussis/surv-reporting.html>

Pertussis

Epidemiology

- Transmission
 - Contaminated aerosolized droplets
 - Close contact
 - Does not survive for prolonged periods in the environment
 - High attack rate
 - 80%-100% in susceptible persons in close contact (household contacts)

Pertussis

Epidemiology

- Incubation period
 - Usually 7 to 10 days (range: 6 to 21 days)
- Contagious period
 - Catarrhal stage through the 1st 2 weeks after cough onset
 - ~3 weeks
- United States
 - Peak season – July through October

Pertussis

- Classic presentation
 - Three stages
 - Catarrhal stage: 1-2 weeks
 - Cold-type symptoms
 - Highly infectious
 - The stage where antimicrobial therapy can affect disease course
 - Paroxysmal Stage: 2-6 weeks
 - Paroxysmal severe cough/whoop
 - Post-tussive emesis/cyanosis
 - Convalescent Stage: weeks to months
 - Decreasing frequency severity of cough
 - Fever often minimal or absent through entire course of the disease

Pertussis

- Disease course and presentation dependent on:
 - Age
 - Infants
 - Apnea/no or minimal cough
 - Adolescents and adults
 - Prolonged chronic cough: “the hundred day cough”
 - Immune status
 - Previous immunization

The Very Young are Very Vulnerable to Complications of Pertussis

Pertussis complications, hospitalizations, and deaths¹

Age	No. with pertussis ^a	Hospitalization	Pneumonia	Seizures	Encephalopathy	Death
<6 months	7203	4543 (63%)	847 (12%)	103 (1.4%)	15	56
6-11 months	1073	301 (28%)	92 (9%)	7 (0.6%)	1	1
1-4 years	3137	324 (10%)	168 (5%)	36 (1.1%)	3	1

^a Individuals with pertussis may have had 1 or more of the listed complications. Data are for 1997-2000.

“Unvaccinated or incompletely vaccinated infants aged <12 months have the highest risk for severe and life-threatening complications and death.”²

Pertussis

CDC Recommended Laboratory Studies

- Culture and PCR recommended within the first 4 weeks after onset of any symptoms
 - Nasopharyngeal specimens
- PCR and serology when cough has been present for 3 to 4 weeks
- Serology if cough present > 4 weeks

Pertussis

Antimicrobial Therapy

- May be ameliorative if given in catarrhal stage
- Once cough is established
 - May not alter disease course Nor Limit transmission
- Macrolides are the antimicrobial of choice
 - Azithromycin first choice in all age groups
 - 5 day course
 - For those who cannot tolerate macrolide antimicrobials
 - Trimethoprim-sulfamethoxazole
 - Not to be used in infants ≤ 2 months of age
- Resistance to macrolide antimicrobials has been reported

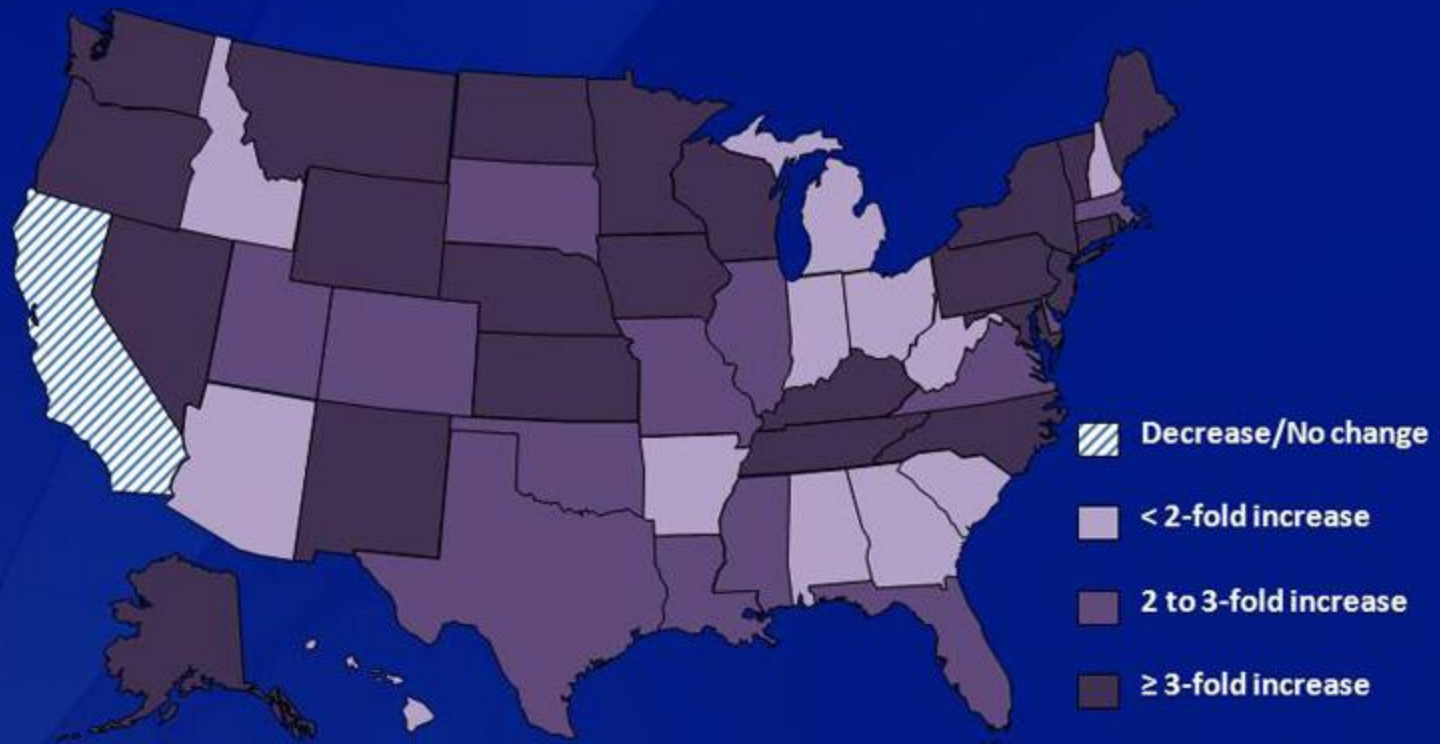
Reported Provisional Cases of Pertussis

United States, 2012

- >41,000 provisional cases of pertussis were reported to the CDC in 2012
 - 18 pertussis related deaths in 2012 reported as of 01/05/13
 - The majority in infants >3 months of age
 - The incidence rate in infants exceeds that in all other age groups
 - The second highest rates was seen among children, 7 through 10 years of age
 - Rates increased in adolescents, 13 and 14 years of age
 - 49 states and Washington, DC reported increases in pertussis compared with the same time in 2011

<http://www.cdc.gov/pertussis/outbreaks.html>

Changes in Pertussis Reporting by State from 2011 to 2012* †



*Data for 2012 are provisional and subject to change.

†Cases reported through Week 46 in 2011 were compared with cases reported through Week 46 in 2012; fold-changes were calculated for each state.



Number and Confirmed Cases of Pertussis in New Jersey Reported to the NJ Department of Health 2008-2012*

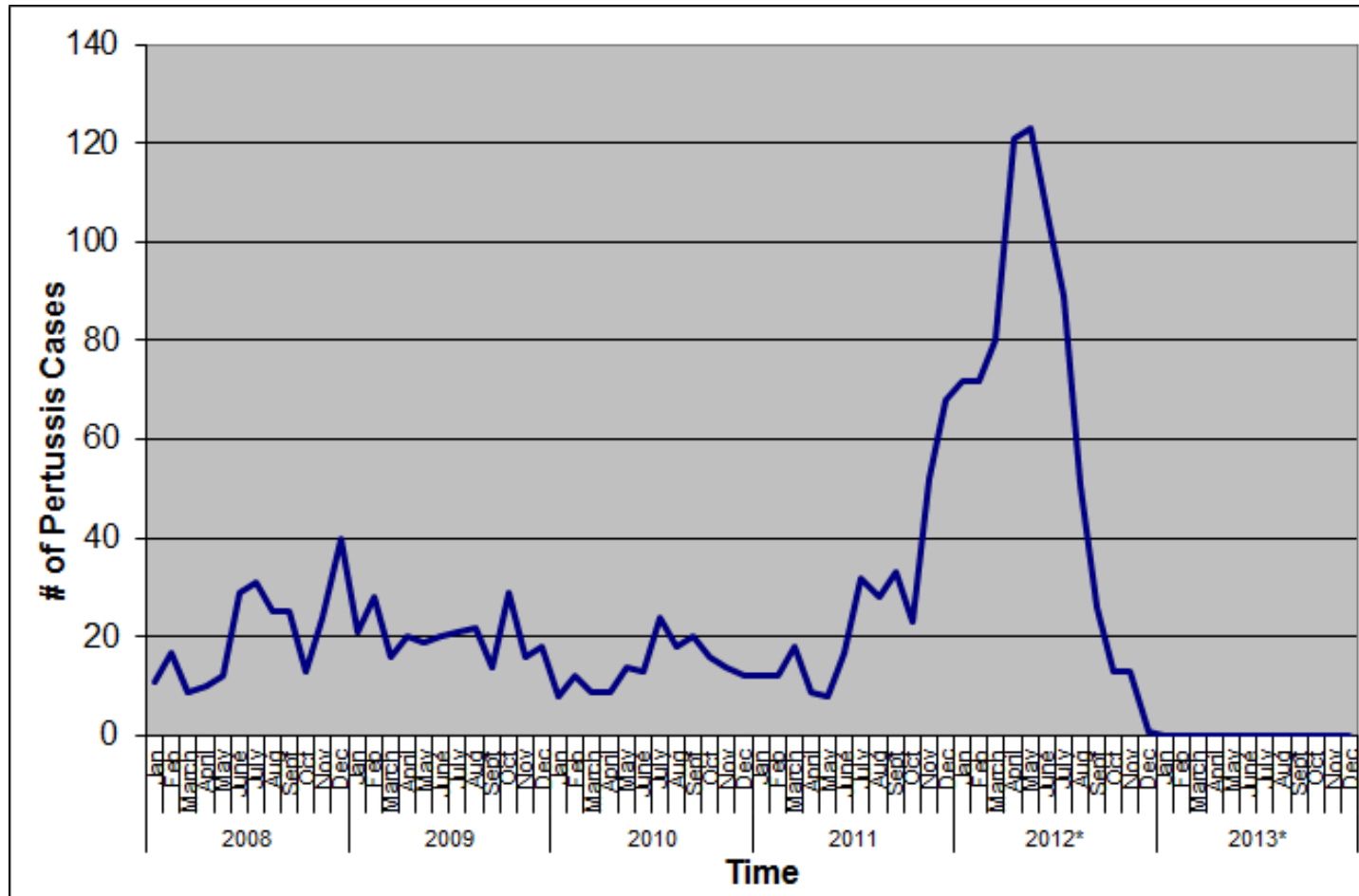
	2008	2009	2010	2011	2012**	
Reported	408	503	429	646	2217	
Confirmed/ Probable	71/175	109/135	38/131	96/216	503/264	

In 2012, there has been 1 suspected pertussis-associated death in NJ

- an infant, <1 year of age, with severe underlying preconditions

*Personal communication to Dr. Wenger from Vaccine-Preventable Diseases Program. NJDH

Distribution of Cases of Pertussis Over Time Reported in NJ 2008 - 2013* ¶



* Provisional; as of 01/22/12

¶ Graph obtained through personal communication to Dr. Wenger from Vaccine Preventable Disease Program, NJDH

Provisional Number of Confirmed and Probable Cases of Pertussis by County*

New Jersey, 2012 (as of 01/22/13)

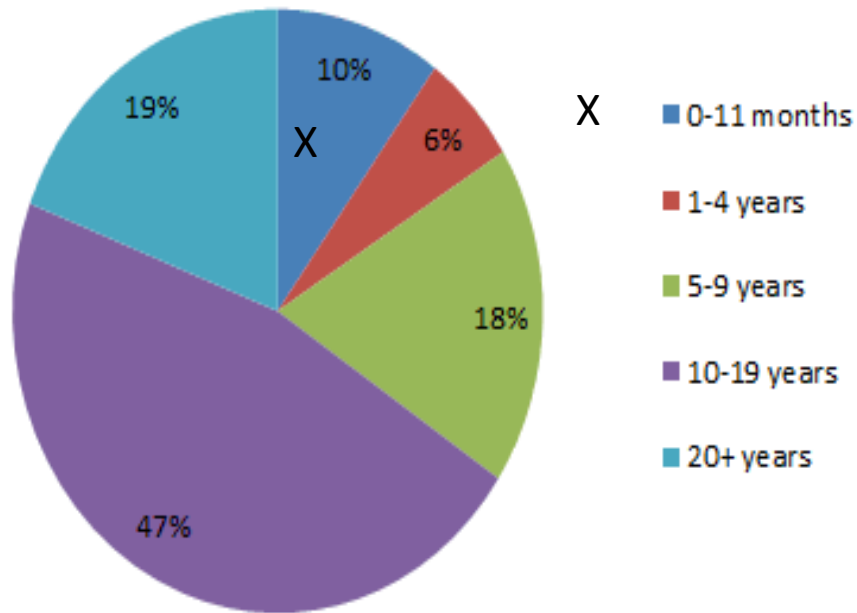
County	# of Cases
Atlantic	58
Bergen	153
Burlington	31
Camden	18
Cape May	2
Cumberland	29
Essex	19
Gloucester	27
Hudson	5
Hunterdon	77
Mercer	79

County	@ of Cases
Middlesex	16
Monmouth	24
Morris	26
Ocean	82
Passaic	42
Salem	5
Somerset	46
Sussex	13
Union	30
Warren	10

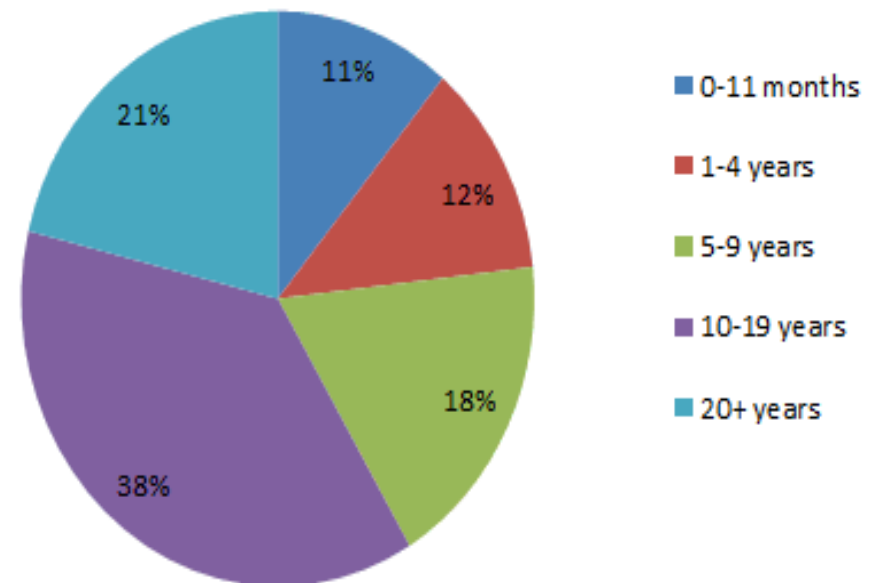
*Personal communication. Vaccine-Preventable Disease Program, NJDH

Age Distribution of Reported Cases of Pertussis: New Jersey and the United States, 2012

2012 Age Distribution of NJ Pertussis Cases*



2012 Age Distribution of CDC Pertussis Cases



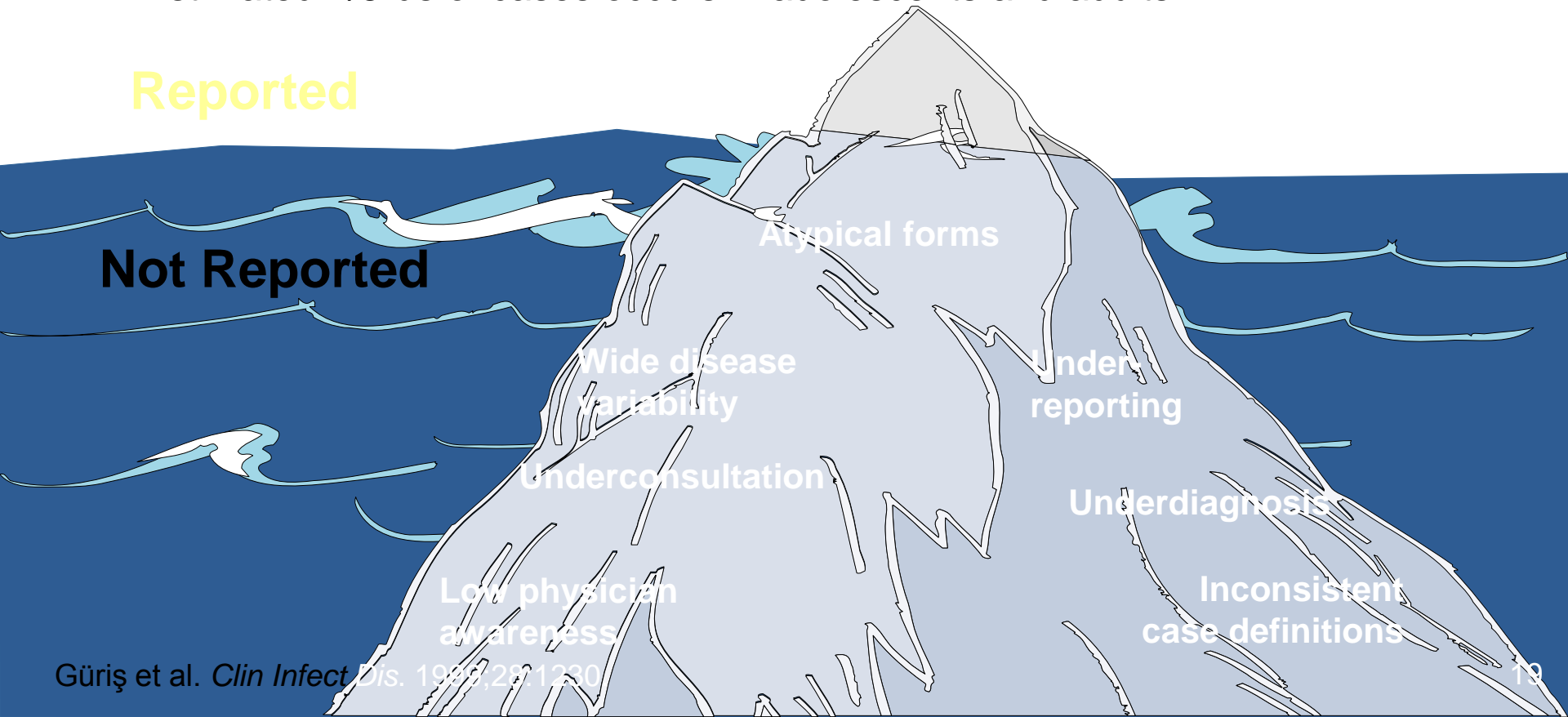
Graphs obtained through personal communication to Dr. Wenger from Vaccine Preventable Disease Program, NJDH

Reported Pertussis Cases Are the Tip of the Iceberg

- Nationwide, an estimated **12%** of pertussis cases are actually reported
- Underreporting may be greatest among adolescents and adults
 - Estimated 2/3rds of cases occurs in adolescents and adults

Reported

Not Reported



2012 Epidemic

- Greatest increases in incidence seen in children aged 7-10 years and young adolescents, aged 13-14 years
 - DTaP replaced DTwP for the complete childhood series in 1997 (***15 years ago***)
 - The effect of increasing susceptibility in both cohorts of children, who exclusively received **DTaP** suggests waning immunity
 - The increase in the 13-14 year old cohort suggests waning immunity after **Tdap** vaccination

Pertussis Vaccination

- Nevertheless, vaccination remains the single, most effective strategy to reduce morbidity and mortality due to pertussis
 - Unvaccinated children have at least an 8-fold greater risk for pertussis disease and serious complications than vaccinated children
 - Vaccinated children who do develop pertussis are less infectious, have milder symptoms and shorter illness duration, and are at reduced risk of serious pertussis-associated complications and hospitalization, than unvaccinated children

Acknowledgements

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