Epidemiology of Pertussis in Adults 65 Years and Older

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Overview of Pertussis Disease in Adults 65 Years and Older

- **Surveillance and literature sparse**
- **Under-recognition of adult disease**
- **Clinical presentation and disease severity**
  - National Notifiable Disease Surveillance System (NNDSS)
  - Current literature
- **Incidence and disease burden**
  - National Notifiable Disease Surveillance System (NNDSS)
  - Current literature

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Factors for Under-recognition of Pertussis

- Atypical symptoms
- Low index of suspicion among providers
- Nonspecific clinical presentation
- Challenges of diagnostic testing

Hoffait M et al. Human Vaccines 2011; 7(2):197-201.
Cornia PB et al. JAMA 2010; 304(8):890-896.
Rendi-Wagner P et al. Vaccine 2010; 28: 3285-3290.

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CSTE* Pertussis Case Definitions

- **Clinical Case Definition**
  - Cough illness lasting ≥2 weeks AND
  - paroxysms, inspiratory whoop, or post-tussive vomiting

Case Classification

Probable	Confirmed
• Meets clinical case definition	• Culture positive • Clinical case definition and +PCR • Clinical case definition and epi-linked

* Council of State and Territorial Epidemiologists

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CLINICAL PRESENTATION

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Demographics of Reported Pertussis Cases in Adults, 2000-2010

	18-39 years n=25,436	40-64 years n=21,873	≥65 years n=3499
Sex - Male	33%	34%	37%
Race – White	71%	73%	75%
Hispanic	12%	6%	5%

* Source: CDC, National Notifiable Diseases Surveillance System

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Symptoms of Reported Pertussis Cases in Adults, 2000-2010

Symptoms	1-6 years n=26,012	18-39 years n=25,436	40-64 years n=21,873	≥65 years n=3499
Cough	87%	87%	87%	86%
Paroxysm	74%	77%	78%	75%
Whoop	32%	29%	29%	26%
Apnea	19%	24%	26%	24%
Post-tussive emesis	50%	41%	34%	22%
Cyanosis	0.12%	0.07%	0.06%	0.06%

* Source: CDC, National Notifiable Diseases Surveillance System

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Characteristic Pertussis Symptoms in Adults

Author	Country	Age Range	Inclusion Criteria	Cough Duration (median)	Paroxysm	Whoop	Post-tussive Vomiting
Lasserre 2011	France	14-89	Cough >7d + symptom	22	96%	22%	17%
Strebel 2001	USA	10-49	Acute paroxy-smal cough or persistent cough	42	100%	26%	56%
de Serres 2000	Canada	12- ≥50	Cases in out-break setting	--	99%	69%	65%
Schmitt-Grohe 1995	Germany	18-79	Cough >14d in family member of vaccinee	--	70%	38%	17%
Wirsing von Konig 1995	Germany	19-83	Cough in family member of vaccinee	--	--	11%	44%

Lasserre A et al. Euro Surveill 2011;16(5):1-5.
Strebel P et al. JID 2001;183:1353–9.
de Serres G et al. JID 2000;182:174–9.
Schmitt-Grohe S et al. CID 1995;21:860-6.
Wirsing von Konig CH et al. Lancet 1995; 1326-29.

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Disease Severity of Reported Pertussis Cases in Adults, 2000-2010

Sequelae of Disease	18-39 years n=25,436	40-64 years n=21,873	≥65 years n=3499
Encephalopathy	0.2%	0.2%	0.2%
Seizure	0.3%	0.4%	0.2%
Pneumonia	2%	3.5%	5.8%
Hospitalization	2%	4%	10%
Death	0.01%	0.01%	0.23%

* Source: CDC, National Notifiable Diseases Surveillance System

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Summary – Clinical Presentation and Severity

- **Adult presentation**
  - Fewer typical symptoms
- **Severity**
  - Increasing rate of hospitalization and pneumonia with age

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INCIDENCE

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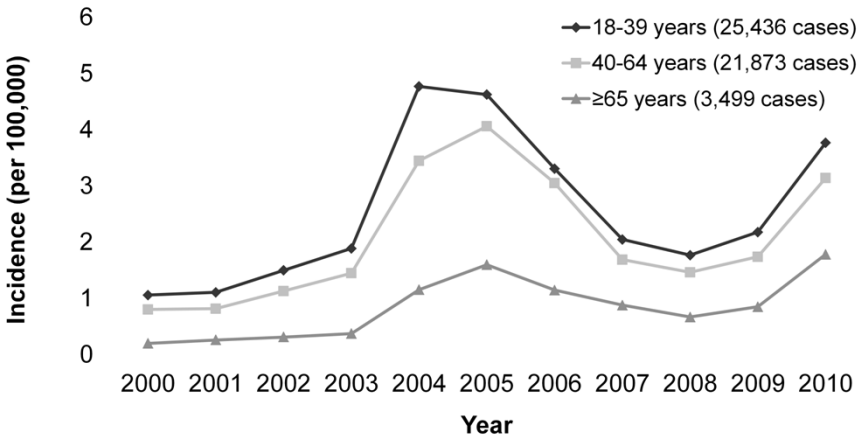
Incidence of Reported Pertussis* in Adults, 2000-2010



*Probable and confirmed cases

Source: CDC, National Notifiable Diseases Surveillance System

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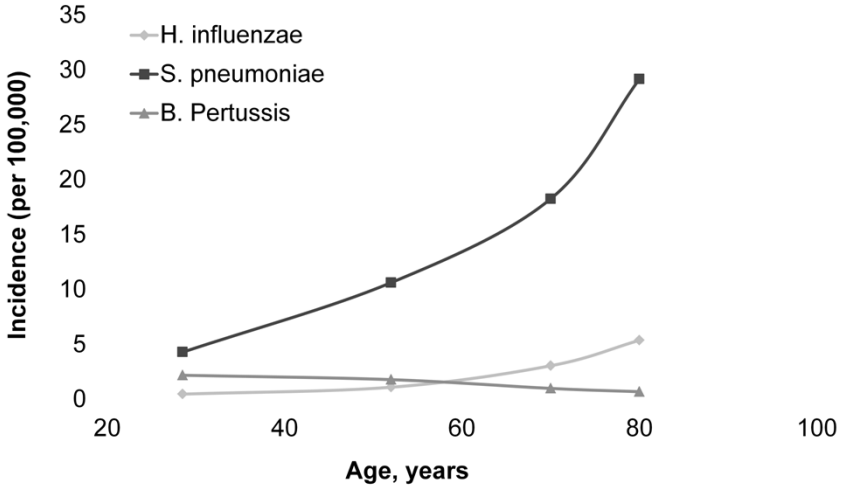
Rates of Bacterial Disease, by Age of Life



Source: CDC, National Notifiable Diseases Surveillance System
CDC, Active Bacterial Core Surveillance

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Older Adult Pertussis Incidence

Age Group (years)	Canadian Incidence* (per 100,000)	US Incidence** (per 100,000)	Australian Incidence** (per 100,000)
65-69	0.85	2.5	146.9
70-74		1.9	146.7
75-79		1.7	110.8
80-84		1.3	95.4
85+		0.8	69.1

*Incidence in 2004, among all adults ≥60 years
**Incidence in 2010

Source: Centre for Infectious Disease Prevention and Control, Public Health Agency of Canada
CDC, National Notifiable Diseases Surveillance System
National Notifiable Diseases Surveillance System, Department of Health and Aging, Australian Government

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Incidence of Adult Pertussis in the Literature

Author	Country	Study Year	No. of Subjects	Age Range	Inclusion Criteria	Diagnostics	Incidence Per 100,000
Lasserre	France	2008-9 10 mo.	204	14-89	Cough >7 days + symptom	PCR, serology	66
Ward (APERT)	USA	1997-99 22 mo.	1390	15-65	Cough ≥5 days	Culture, PCR, serology	370-450
Strebel	USA	1995-96 24 mo.	212	10-49	Acute paroxysmal cough or persistent cough	Culture, PCR, serology	507
Nennig	USA	1994-95 3 mo.	153	24-78	Cough ≥14 days	Serology	176

Lasserre A et al. Euro Surveill 2011;16(5):1-5.
Ward JI et al. NEJM 2005;353:1555-63.
Strebel P et al. JID 2001;183:1353–9.
Nennig ME et al. JAMA 1996;275:1672-167.

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Summary – Disease Incidence and Burden

- **Under-recognized cause of cough illness**
- **Epidemiology of adult pertussis not well understood**
  - Surveillance data indicates range of incidence rates
  - Sparse literature specifically focused on this population
  - Available literature on mixed age populations, including adults:
    - Incidence levels: 66-500/100,000

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Conclusions and WG Interpretation: Pertussis in Adults 65 Years and Older

- **Conclusions**
  - Disease burden higher than reported
- **ACIP Working Group Interpretation**
  - True burden of disease likely at least 100-fold higher than reported

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