Hospital-Centered, Population-Based Surveillance for Pneumonia in New Haven, Connecticut April 2004-March 2005

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BACKGROUND

- Pneumonia/Influenza ranks as the 7th leading cause of death in the U.S.
- Population-based surveillance for severe pneumonia is rare, if present, in the U.S.
- Population-based surveillance can provide baseline rates and trends in pneumonia incidence over time.
- However, challenges to population-based surveillance for severe pneumonia include: high burden of disease, uncharacterized etiology, and non-specific clinical case definitions, capturing a broad range of infections.
- We established hospital-centered, population-based surveillance of hospitalized pneumonia (HPn) to determine rates and further describe its epidemiology.

METHODS

Catchment area

- Due to the high burden of disease, we limited surveillance to a 7-town catchment area (295,750) in New Haven County where >90% of persons hospitalized for respiratory conditions were admitted to one of the surveillance hospitals.

Case Finding

- Hospital admission data were screened to identify potential HPn between April 2004 and March 2005.
- Epidemiologic and clinical data were abstracted from medical charts of cases.
- Crude and specific rates of HPn were calculated.
- Severity, outcome, and etiology of HPn were examined.

CASE DEFINITION

A case of hospitalized severe pneumonia was defined as:

- A resident of the 7-town catchment area (Branford, East Haven, Guilford, Hamden, New Haven, North Branford, North Haven);
- Admitted to Yale New Haven Hospital (YNHH) or Hospital of Saint Raphael (HSR) with radiographic evidence of pneumonia (i.e. lobar infiltrate, interstitial infiltrate, pleural effusion);
- Having two or more of the following signs/symptoms within 48 hours of hospital admission: (1) fever >38.0°C (100.4° F), (2) hypothermia <35.5°C (96°F), (3) cough, (4) difficulty breathing, or (5) hypoxia <90% O2 sat on room air

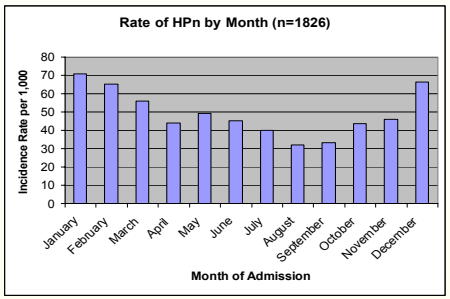
RESULTS

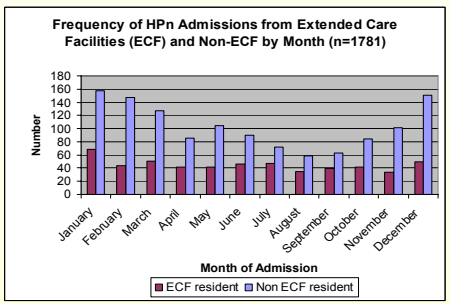
Hospital Admissions and HPn Cases, April 2004-March 2005

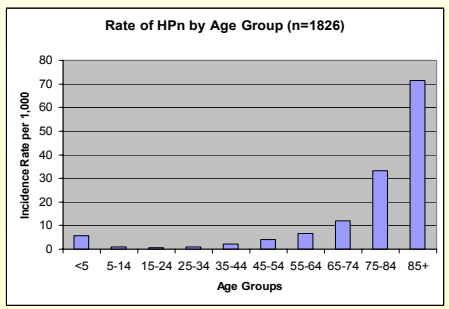
	YNHH n (%)	HSR n (%)	Total n (%)
Total Admissions from catchment area	23,422 (100)	13,435 (100)	36,857 (100)
Potential HPn Cases	1,418 (6)	1,533 (11)	2,951 (8)
HPn Cases	864 (4)	962 (7)	1,826 (5)

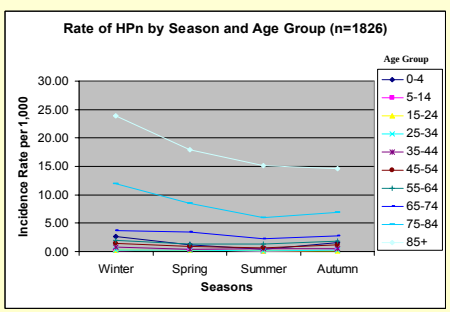
Crude and Specific HPn Rates

		HPn rate per 1,000 population	95% CI
Crude		6.2	5.89-6.46
Gender	Male	5.9	5.54-6.34
	Female	6.4	5.99-6.78
Race	White	6.6	6.25-6.97
	Black	6.4	5.76-7.01
	Hispanic	4.7	3.94-5.44
	Asian	2.6	1.53-3.57
	Other	0.5	0.16-0.89









Outcome and Severity of HPn Admissions by ECF status and Age Group

Characteristic	ECF n (%)*			Age Group n (%)*			Total n (%)*
	Yes (n=541)	No (n=1,240)	p-value	≥ 65 (n=1,186)	<65 (n=640)	p-value	
Outcome of Hospitalization			<0.001			<0.001	
Died	75 (14)	55 (4)		123 (10)	14 (2)		137 (8)
Discharged to chronic care/rehab facility	437 (81)	207 (17)		575 (49)	86 (14)		661 (36)
Discharged home	23 (4)	940 (76)		473 (40)	503 (79)		976 (54)
Other discharge†	4 (1)	35 (3)		9 (1)	33 (5)		42 (2)
Admitted to ICU	82 (18)	157 (14)	0.071	163 (16)	86 (15)	0.567	249 (15)
On Supplemental oxygen	514 (95)	944 (76)	<0.001	1,075 (91)	421 (66)	<0.001	1,502 (82)
On Mechanical ventilation	70 (13)	113 (9)	0.014	136 (12)	56 (9)	0.072	192 (11)

* Numbers may not sum to 1,826 due to missing data, and percentages may not sum to 100% due to rounding.
† Includes homeless shelters and jails

Potential Pathogens Identified from HPn Cases

	Cases*† n (%) (n=508)	ECF* n (%)		Age Group* n (%)	
		Yes (n=160)	No (n=334)	≥65 (n=303)	<65 (n=205)
Bacteria	369 (73)	137 (37)	222 (60)	248 (67)	121 (33)
Virus	137 (27)	25 (18)	110 (80)	59 (43)	78 (57)
Fungus	18 (4)	5 (28)	11 (61)	8 (44)	10 (56)

* Numbers may not sum to 508 due to missing data, and percentages may not sum to 100% due to rounding.
† Includes 68 co-infections

CONCLUSIONS

- The overall percentage of hospitalizations due to pneumonia is 5%.
- Highest rates were observed in fall and winter months, and among those ≥65 years of age.
- Similar rates were observed among males and females, and among Whites and Blacks. Hispanics and Asians had lower rates of HPn.
- Risk of hospital admission for pneumonia among non-ECF residents varied by season while risk for ECF residents was similar regardless of season.
- ECF residents and those ≥ 65 years of age were significantly more likely to die of their HPn than non-ECF residents.
- A potential pathogen was identified in only 28% of HPn cases. Bacterial organisms were more commonly identified among older (≥ 65 years) HPn cases while viruses were more common among younger cases.
- Continued surveillance is warranted to document trends over time.
- Efforts to improve pathogen detection among HPn cases are needed to better understand HPn epidemiology.

LIMITATIONS

- One year of surveillance data does not allow for examination of trends over time.
- Limited catchment area may not be representative of state or county.