

Clinical and Economic Burden of Pneumococcal Disease in Adults 19-64 Years With Chronic Conditions in the United States

H. Keri Yang; Dongmu Zhang; Panagiotis Mavros; Tanaz Petigara

Merck & Co., Inc., Kenilworth, NJ, USA

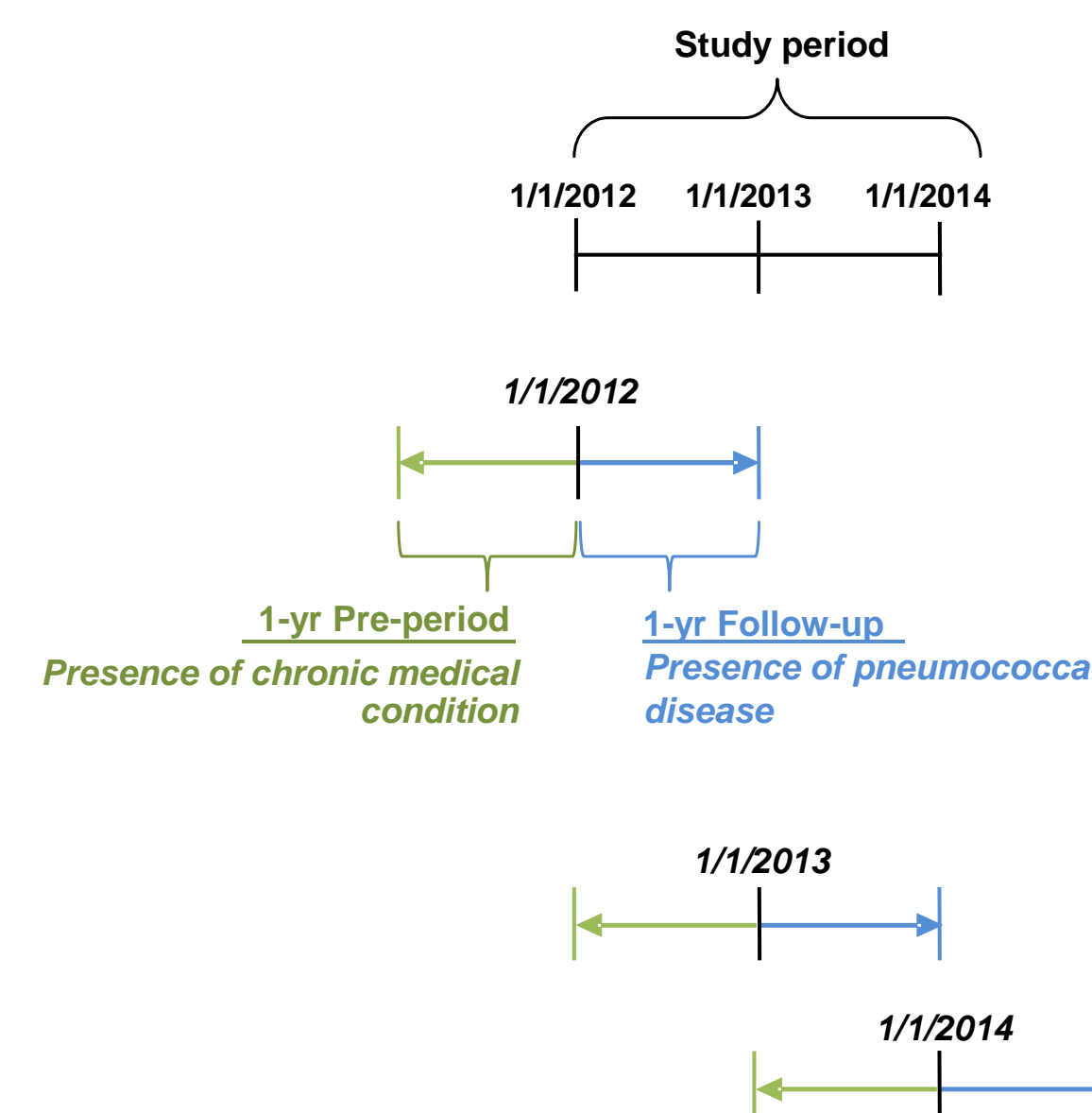
Background and Aims

- Streptococcus pneumoniae* is a gram-positive organism that causes invasive and noninvasive pneumococcal disease. The most common invasive syndromes are bacteremic pneumonia and meningitis. Acute otitis media and nonbacteremic pneumonia are common noninvasive syndromes
- Children less than 1 year of age and older adults are at increased risk for pneumococcal disease, as are adults with certain chronic conditions
- ACIP recommends that adults 19-64 years of age with chronic conditions receive pneumococcal vaccination. However, limited studies have examined the clinical and economic burden of pneumococcal disease in this population. We assessed pneumococcal disease rates, resource utilization, and costs in US adults 19-64 years of age with diabetes, chronic heart disease, chronic liver disease, chronic lung disease, and asthma

Methods

- A retrospective observational cohort study was conducted using medical and pharmacy claims from the Truven Health MarketScan® Commercial Claims and Encounters database. The database represents approximately 100 employer-sponsored private health plans covering approximately 45 million members
- Adults were included in the study if they were 19-64 years old between January 1, 2012, and December 31, 2014, and had continuous enrollment (no gap of >45 days) for at least 1 year before and at least 1 day after January 1, 2012, 2013, and/or 2014 (Figure 1)
- Adults were classified as healthy or having a chronic condition based on whether they had chronic conditions of interest during the 1 year preceding January 1 of each calendar year. Conditions of interest were diabetes, chronic heart, liver, or lung disease; and asthma. Two ICD-9 diagnosis codes were required to identify an individual as having a particular chronic condition. If a patient had multiple conditions of interest in the 1-year pre-period, the patient was assigned to all diagnosed conditions. Persons without evidence of these conditions were classified as healthy
- Pneumococcal diseases (invasive pneumococcal disease (IPD) and all-cause pneumonia (ACP)) were identified through ICD-9 codes, CPT4 codes, and antibiotic use
- Outcomes included:
 - Pneumococcal disease rates:** Invasive pneumococcal disease and all-cause pneumonia
 - Rate ratios:** Comparing rates in adults 19-64 years of age with chronic conditions to rates in healthy adults
 - Resource utilization:** Mean number of doctor's office visits, outpatient hospital visits, emergency department visits, inpatient hospitalizations, and duration of inpatient hospitalizations
 - Healthcare costs:** Mean total cost per episode was calculated based on claims submitted for pneumococcal disease and adjusted to 2014 dollars based on the medical care component of the Consumer Price Index (CPI)

Figure 1. Study design and study period



Characteristics

- 57 million person-years were included in the analysis; 83.0% had no condition, 7.2% had diabetes, 3.0% chronic heart disease, 3.0% asthma, 2.1% chronic lung disease, and 1.3% chronic liver disease (Table 1)
- Among adults with chronic conditions, 85.5% had only 1 condition, while 12.6%, 1.7%, and 0.2% of adults had 2, 3, and 4+ chronic conditions, respectively (Table 1)

Table 1. Characteristics of study population

Variable	Value	Person-Years	%
Age	Mean ± SD	57,108,316	42.3 ± 13.2
Gender	Female	27,290,491	47.8
	Male	29,817,825	52.2
Chronic conditions	Healthy	47,370,549	83.0
	Asthma	1,717,725	3.0
	Chronic heart disease	1,700,329	3.0
	Chronic liver disease	738,325	1.3
	Chronic lung disease	1,187,173	2.1
	Diabetes mellitus	4,103,296	7.2
Number of chronic conditions	1	6,089,016	85.5
	2	895,384	12.6
	3	119,335	1.2
	4+	15,391	0.2
Follow-up years	Mean (SD)	0.93	0.20

- Adults with chronic conditions had approximately 5 times the rate of IPD and 4 times the rate of all-cause pneumonia compared to healthy adults (Table 2)
- Adults with 1 chronic condition had approximately 4 times the rate of IPD and 3 times the rate of all-cause pneumonia compared to healthy adults (Table 2)
- Adults with 2, 3, and 4 or more chronic conditions had approximately 9, 18, and 31 times the rate of IPD and 7, 15, and 24 times the rate of all-cause pneumonia, respectively, compared to their healthy counterparts (Table 2)
- Compared to healthy adults, the risk of IPD was highest in chronic lung disease patients (RR=10.5), followed by chronic liver disease (RR=7.2), chronic heart disease (RR=5.9), diabetes mellitus (RR=4.7), and asthma (RR=4.0) patients (Table 2)
- Compared to healthy adults, the risk of all-cause pneumonia was highest in chronic lung disease patients (RR=8.2), followed by chronic heart disease (RR=5.5), asthma (RR=4.2), chronic liver disease (RR=3.7), and diabetes mellitus (RR=3.3) patients (Table 2)

Table 2. Rate ratios for invasive pneumococcal disease and all-cause pneumonia, comparing adults 19-64 years of age with chronic conditions to healthy adults

Risk Group	IPD Rate (per 100,000 Person-Years)	Rate Ratio	All-Cause Pneumonia Rate (per 100,000 Person-Years)	Rate Ratio
Healthy	1.9	—	429.7	—
At-risk	8.9	4.7	1573.4	3.7
Asthma	7.7	4.0	1783.1	4.2
Chronic heart disease	11.4	5.9	2343.8	5.5
Chronic lung disease	20.2	10.5	3530.8	8.2
Chronic liver disease	13.8	7.2	1603.8	3.7
Diabetes	9.0	4.7	1396.7	3.3
Number of chronic medical conditions				
1	7.0	3.7	1251.8	2.9
2	17.8	9.4	2994.0	7.0
3	34.4	18.1	6217.0	14.5
4+	58.5	30.8	10149.0	23.6

Results

- Resource utilization per IPD episode was similar for adults with chronic conditions compared to their healthy counterparts (0.3 vs 0.4 office visits, 1.0 vs 1.0 inpatient visits, and 7.7 vs 7.6 days). Among adults with chronic conditions, those with chronic heart disease had the highest average length of stay per IPD episode (8.3 days) (Table 3)
- Per ACP episode, the average number of office visits was similar for adults with chronic conditions compared to their healthy counterparts (0.6 vs 0.6 visits). However, the average number of inpatient visits and the average length of hospital stay were slightly higher in adults with chronic conditions compared to healthy adults (0.6 vs 0.4 visits and 2.6 vs 1.6 days, respectively) (Table 4)
- Among adults with chronic conditions, those with chronic heart disease had the highest average number of inpatient visits per ACP episode (0.7 visits) and length of stay (3.4 days), followed by adults with chronic liver disease (0.6 visits and 3.3 days)

Table 3. Resource utilization per episode of invasive pneumococcal disease in adults 19-64 years of age

Risk Group	Doctor's Office Visits		Inpatient Hospital Visits		Length of Hospital Stay	
	Mean	SD	Mean	SD	Mean	SD
Healthy	0.4	1.3	1.0	0.3	7.6	8.2
All chronic conditions	0.3	0.7	1.0	0.2	7.7	8.0
Asthma	0.2	0.7	1.0	0.2	7.2	7.7
Chronic heart disease	0.2	0.7	1.0	0.3	8.3	8.8
Chronic lung disease	0.2	0.8	1.0	0.3	7.1	6.9
Chronic liver disease	0.4	1.3	1.0	0.2	7.2	7.6
Diabetes mellitus	0.3	0.7	1.0	0.3	7.9	8.4

Table 4. Resource utilization per episode of all-cause pneumonia in adults 19-64 years of age

Risk Group	Doctor's Office Visits		Inpatient Hospital Visits		Length of Hospital Stay	
	Mean	SD	Mean	SD	Mean	SD
Healthy	0.6	1	0.4	0.5	1.6	4.7
All chronic conditions	0.6	1.2	0.6	0.6	2.7	6.2
Asthma	0.6	1.2	0.5	0.6	2.2	5.3
Chronic heart disease	0.5	1.4	0.7	0.6	3.4	7.1
Chronic lung disease	0.6	1.4	0.6	0.7	3.2	6.8
Chronic liver disease	0.6	1.3	0.6	0.6	3.3	7.8
Diabetes mellitus	0.6	1.2	0.6	0.6	2.8	6.6

- Due to higher disease rates, the cost of IPD and all-cause pneumonia per 100,000 person-years was 4 and 6 times the cost in healthy adults, respectively (Figures 2 and 3)
- The cost of IPD per 100,000 person-years was highest for persons with chronic lung disease (\$800,102), followed by those with chronic liver disease (\$744,688) and chronic heart disease (\$509,244) (Figure 2)
- The cost of all-cause pneumonia per 100,000 person-years was highest for persons with chronic lung disease (\$56.2 mm), followed by those with chronic heart disease (\$45.6 mm) and chronic liver disease (\$31.4 mm) (Figure 3)

Figure 2. Cost of invasive pneumococcal disease per 100,000 person-years of healthy and at-risk adults 19-64 years of

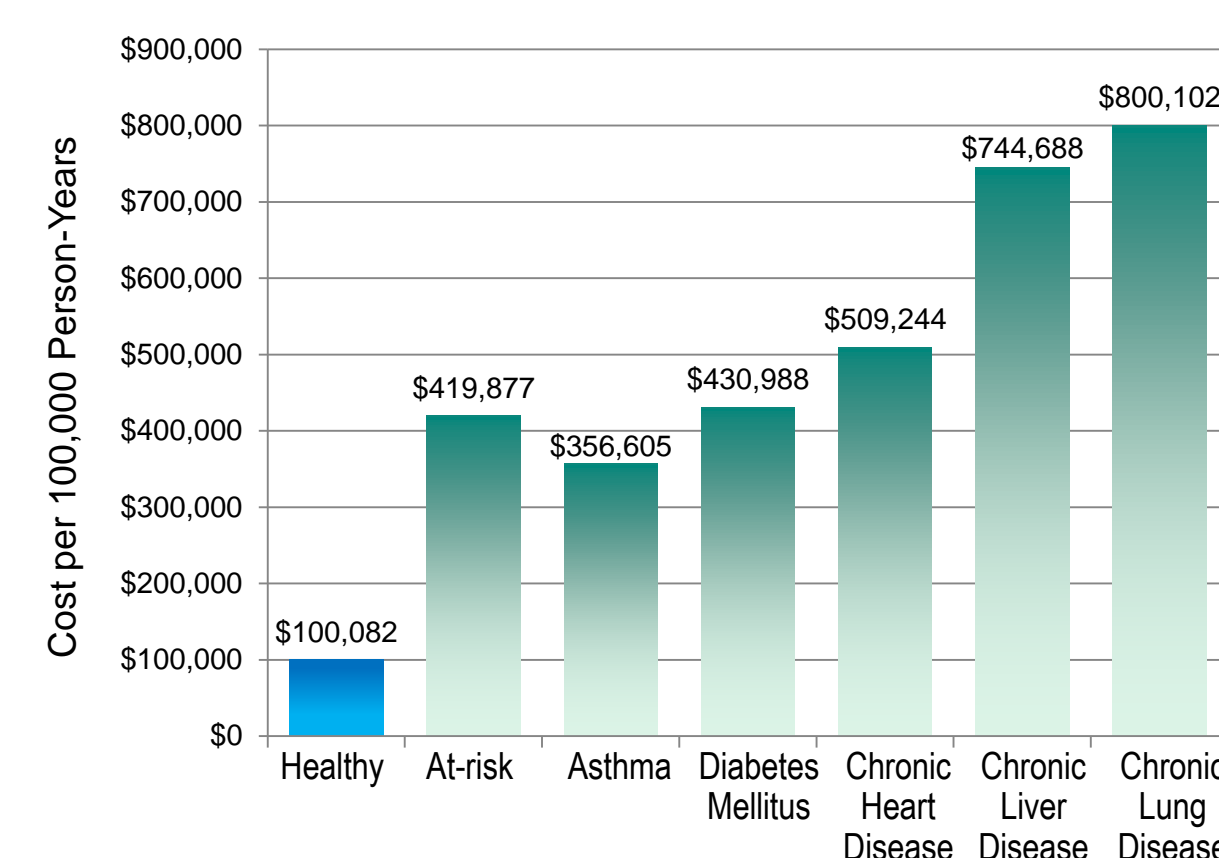
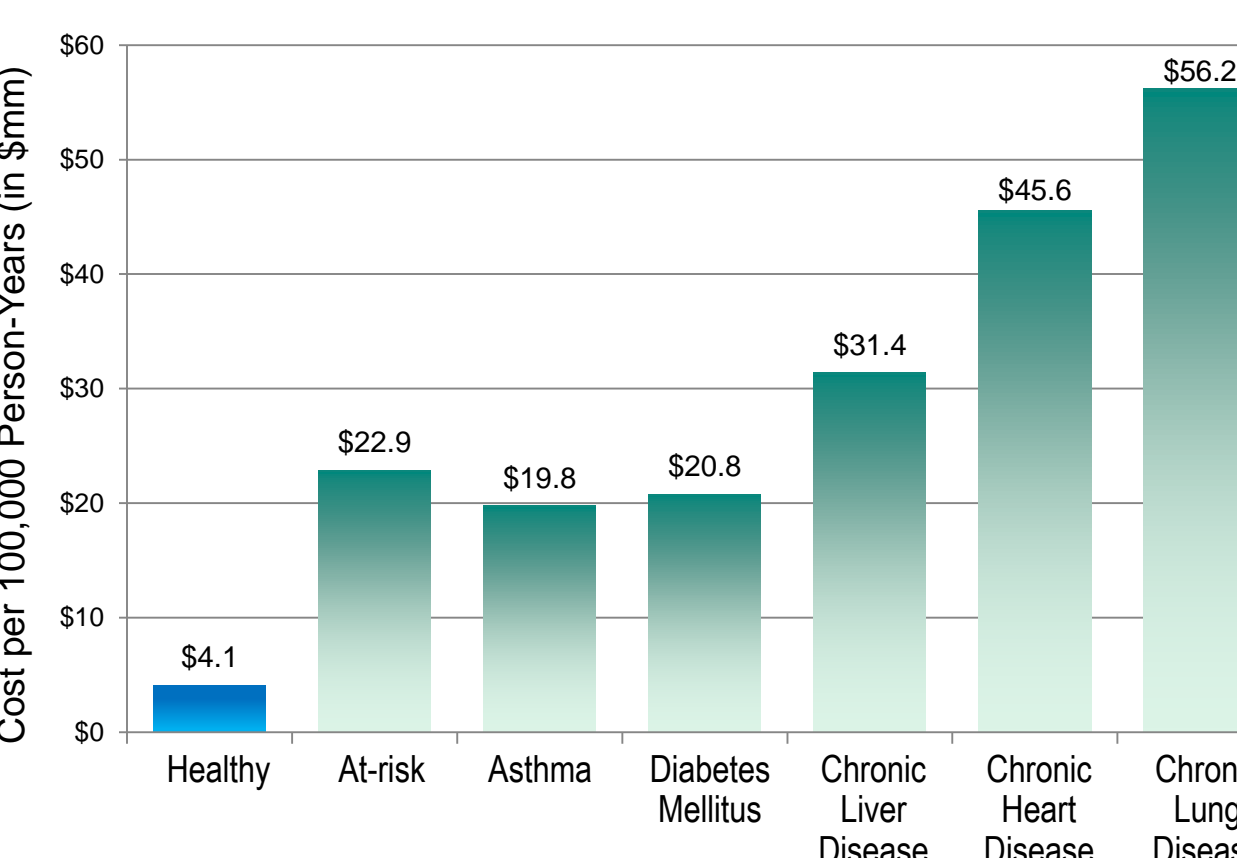


Figure 3. Cost of all-cause pneumonia per 100,000 person-years of healthy and at-risk adults 19-64 years of age



Limitations

The study has several limitations:

- Pneumococcal disease and chronic conditions were identified using diagnosis/procedure codes, which may lead to misclassification
- Pneumococcal diseases are typically undercoded in claims, which may lead to an underestimate of the disease burden
- The study included US managed-care enrollees; therefore, results may not be generalizable beyond this population

Conclusions

- Limited data are available on the clinical and economic burden of pneumococcal disease in older adults with specific chronic conditions
- We assessed pneumococcal disease rates, resource utilization, and costs in US adults 19-64 years of age with diabetes, chronic heart disease, chronic liver disease, chronic lung disease, and asthma
- Adults with chronic conditions are at greater risk of pneumococcal disease compared to their healthy counterparts and incur greater costs



http://tinyurl.com/zpqg57x