

## ABSTRACT

### Introduction

CAP is the leading cause of infectious diseases-related death in the USA. Data on the incidence of hospitalized patients with CAP from population-based studies indicate an incidence of 267 cases per 100,000 persons. These data were obtained almost 20 years ago. In the USA, recent population-based incidence studies are lacking. The objective of this study was to define the incidence of CAP requiring hospitalization in Jefferson County, KY and in the USA.

### Methods

This was an interim data analysis of the Hospitalized Adult Patients with Pneumococcal Pneumonia (HAPPI) Study database. All hospitalized patients with CAP seeking care between June 1st, 2014 through May 31st, 2015 at one of the nine adult hospitals in Jefferson County, KY were included in the study. The incidence was calculated as the number of cases of CAP requiring hospitalizations divided by the adult population of Jefferson County multiplied by 100,000. These data were then extrapolated to the USA population.

### Results

The incidence of CAP requiring hospitalization in our study was 894 cases per 100,000 persons in Jefferson County, KY. This results in 2,060,041 cases of CAP requiring hospitalization in the USA each year.

### Conclusions

This study indicates that CAP requiring hospitalization is substantially more frequent than previously estimated. More recent studies using administrative data have documented an increased incidence of CAP in the USA. Our study supports the concept that the incidence of CAP requiring hospitalization is increasing, likely due to an increase in the elderly population in the USA.

## INTRODUCTION

Community-acquired pneumonia (CAP) is the leading cause of infectious diseases-related death in the USA. [1] Despite of advancements in modern microbiology and development in antimicrobial agents, pneumonia remains one of the major causes of mortality. Though the trend of rising numbers of hospital admissions for pneumonia seem to have decreased by introduction of pneumococcal conjugate vaccines, the real scenario is that the incidence is still increasing due to the aging population and higher prevalence of concomitant clinical conditions (e.g.: COPD, DM). [1, 2] Studies on the Incidence of hospitalization with CAP in different countries showed increase in hospitalization.

COUNTRY	YEAR OF STUDY	INCIDENCE	PER POPULATION
PORTUGAL <sup>3</sup>	2000 to 2009	3.61	1,000
GERMANY <sup>4</sup>	2005 & 2006	2.75 & 2.96	1,000
SPAIN <sup>5</sup>	2003 to 2007	6.27	1,000
ENGLAND <sup>6</sup>	2004-2005	22.18	1,000
DENMARK <sup>7</sup>	1994 to 2003	442	100,000
CZECH REPUBLIC <sup>8</sup>	2009	456.6	100,000
HUNGARY <sup>8</sup>	2009	845.3	100,000
POLAND <sup>8</sup>	2009	363.9	100,000
SLOVAKIA <sup>8</sup>	2009	504.6	100,000

## INTRODUCTION

A couple of studies have been performed evaluating the incidence of hospitalization due to CAP in the US. One of the studies was done 18 years ago in approximately 15 hospitals in the state of Ohio and the incidence was 266.8 per 100,000 population. [10] Most recently, another group of researchers published data, which included 5 hospitals in Chicago, IL and Nashville, TN. The reported incidence was 248 cases per 100,000 adults. However, this study was limited to a few hospitals in different cities. [9]

The objective of this study was to define the incidence of CAP requiring hospitalization in all hospitals in Jefferson County, KY and in the US.

## METHODS

### Study Design:

The Hospitalized Adults with Pneumococcal Pneumonia Incidence (HAPPI) Study was initially funded in January of 2014. After administrative work and training, all nine hospitals began participating in the study as of June 2014. This was an interim data analysis of the HAPPI Study database between June 2014 and May 2015.

### Study Population:

All hospitalized patients with CAP seeking care from June 1st, 2014 to May 31st, 2015 at one of the nine adult hospitals in Jefferson County, KY were included in this study. Baptist Hospital East, Norton Healthcare (Brownsboro, Surburban, Downtown and Audubon), VA Rex Robley, Kentucky One (St. Marys, Jewish Hospital and University of Louisville Hospital).

### Study Definition:

**CAP:** Diagnosis of CAP required the presence of criterion A, B, and C: New pulmonary infiltrate on imaging (CT scan or chest x-ray) at the time of admission to the hospital.

Signs and Symptoms of CAP (at least one of the following)

New or increased cough (per the patient)

Fever >37.8°C (100.0°F) or hypothermia <35.6°C (96.0°F).

Changes in WBC (leukocytosis >11,000 cells/mm<sup>3</sup>, left shift > 10% band forms/microliter, or leukopenia < 4,000 cells/mm<sup>3</sup>

Working diagnosis of CAP at the time of hospital admission with antimicrobial therapy given within 24 hours of admission.

### Incidence of CAP

The incidence was calculated as the number of cases of CAP requiring hospitalizations divided by the adult population of Jefferson County multiplied by 100,000. These data were then extrapolated to the USA population.

## RESULTS

- A total of 5,091 hospitalized patients with community-acquired pneumonia were enrolled in the study and included in the extrapolation calculations.
- The incidence of CAP requiring hospitalization in our study was 894 cases per 100,000 population in Jefferson County, KY. This resulted in 2,060,041 cases of CAP requiring hospitalization in the US each year.
- The number of CAP cases by age group in Jefferson County and USA from June 1st, 2014 to May 31st, 2015 is depicted in table 1.
- The incidence of CAP per 100,000 population according to age groups is depicted in Figure 1.

Table 1: Number of CAP cases by age groups in Jefferson County and USA from June 1st, 2014 to May 31st, 2015

Age	Population by Age, Jefferson County, KY	HAPPI Cases by Age	Percent of HAPPI Cases by Age, Jefferson County, KY	Population by Age, USA	Extrapolated CAP Cases in USA
18 to 24 years	67,823	66	0.10%	30,672,088	29,848
25 to 34 years	104,283	150	0.14%	41,063,948	59,066
35 to 44 years	95,930	318	0.33%	41,070,606	136,146
45 to 54 years	110,757	627	0.57%	45,006,716	254,785
55 to 59 years	49,937	502	1.01%	19,664,805	197,684
60 to 64 years	41,464	551	1.33%	16,817,924	223,487
65 to 74 years	51,062	1,193	2.34%	21,713,429	507,307
75 to 84 years	33,979	1,005	2.96%	13,061,122	386,310
≥ 85 years	14,054	679	4.83%	5,493,433	265,408
<b>Total</b>	<b>569,289</b>	<b>5,091</b>	<b>13.60%</b>	<b>234,564,071</b>	<b>2,060,041</b>

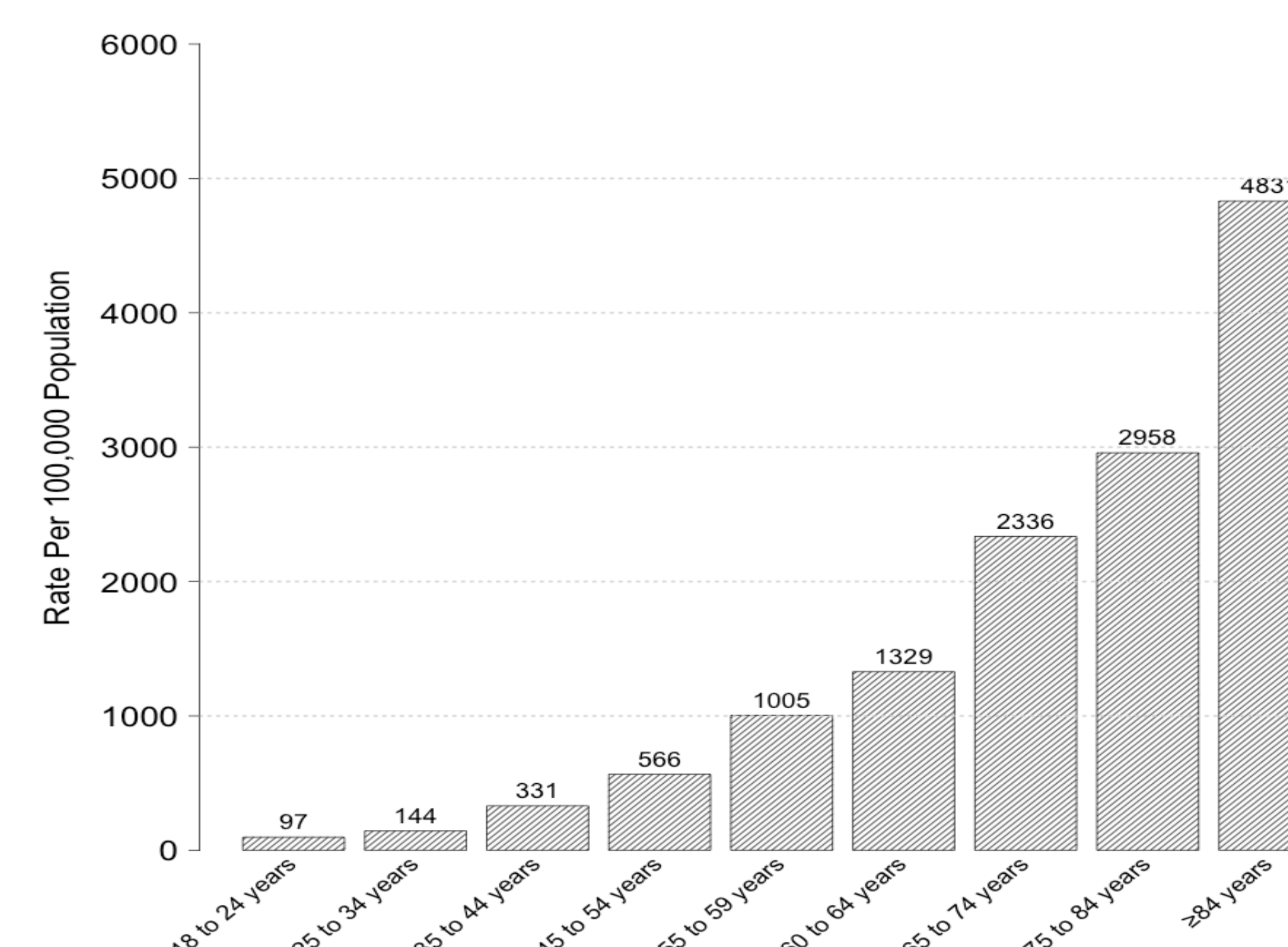


Figure 1: Incidence of CAP per 100,000 population according to age groups

## CONCLUSIONS

- This study indicates that CAP requiring hospitalization is substantially more frequent than previously estimated.
- More recent studies using administrative data have documented an increased incidence of CAP in the USA.
- Our study supports the concept that the rate of CAP requiring hospitalization is increasing, likely due to an increase in the age of the population in the USA. Studies in other countries also reported an increase in hospitalization of CAP especially in the elderly. This may be due to aging and coexisting disease conditions like COPD, CHF, etc. [3, 4, 5, 6, 7, 8]
- The higher rates of admissions due to influenza infections seen in this past winter season are likely due to lack of effectiveness of influenza vaccine. This may also partially explain the increase in incidence of hospitalization due to CAP seen in our study.

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