



Review

Morbidity and mortality of pneumonia in adults in six Latin American countries



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SUMMARY

Objective: To estimate the morbidity and mortality of pneumonia in adults over 50 years of age in Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela.

Methods: Local data sources were queried to estimate the number of hospitalized and outpatient pneumonia cases and deaths in the year 2009. Pneumonia cases were identified in adults aged ≥ 50 years using ICD-10 codes. The hospital case fatality rate (HCFR) by age corresponds to the percentage of mortality per hospitalization.

Results: Cases of hospitalized pneumonia (incidence per 100 000 inhabitants/year) in adults ≥ 50 years were: Argentina 39 674 (401.1); Brazil 225 341 (611.6); Chile 30 434 (738.5); Colombia 26 955 (326.6); Mexico 82 397 (413.1); Venezuela 31 601 (640.1). The number of hospital deaths (CFR%) were: Argentina 5099 (13%); Brazil 47 287 (21%); Chile 3072 (10%); Colombia 2981 (11%); Mexico 13 312 (16%); Venezuela 11 101 (35%). Cases of outpatient pneumonia (incidence per 100 000 inhabitants/year) were: Argentina 54 093 (546.8); Brazil 260 277 (706.4); Chile 33 173 (804.9); Colombia 27 713 (335.8); Mexico 83 354 (417.9); Venezuela 39 645 (803.0). The percentage of episodes treated as outpatient was 64% (range 57–80%) among those aged 50–64 years and 39% (range 8–56%) among those ≥ 85 years. Across countries, 51% of hospitalizations (range 42–63%) and 69% of deaths (range 65–72%) were in adults ≥ 75 years.

Conclusions: Pneumonia is a common cause of hospitalization and mortality in adults in Latin America. Incidence increases substantially with increasing age, as does the likelihood of hospitalization and mortality.

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1. Introduction

Lower respiratory tract infections, including pneumonia, are the third leading cause of death worldwide, responsible for an estimated 3.8 million deaths in 2008.¹ The incidence of pneumonia is greatest among children aged ≤ 5 years and adults aged ≥ 50 years, with incidence increasing with each decade in adults over 50 years of age.² Incidence is also increased in persons with chronic disease, including chronic obstructive pulmonary disease (COPD), kidney failure, congestive heart failure, coronary artery disease, chronic neurological diseases, alcoholism, neoplastic diseases, and immunosuppressive treatments.^{3–5}

Among the elderly, the burden of pneumonia on healthcare systems is likely to become more significant over time given that

the number of persons over the age of 60 years in the world will triple, from 673 million in 2005 to two billion in 2050. This will be most evident in developed countries, where it is estimated that this age group will increase from 64% (2005) to 80% (2050) of the total population,⁶ representing a significant health problem throughout the world, and an important clinical and economic burden due to the significant use of healthcare resources associated with each case.⁷

It is estimated that approximately two million cases of pneumonia are diagnosed each year in Argentina, Brazil, and Chile.⁷ The mortality related to lower respiratory tract infections (LRTIs) in Latin America is reported to be 6%, compared with 4% in developed regions, and LRTIs were the third most frequent cause of death in adults in 31 Latin American countries in 2001–2003.^{8,9} In Brazil, case fatality rates (CFR) of hospitalized pneumonia increase steadily with advancing age, with CFRs in adults ≥ 80 years of age several fold higher than those of children 5–9 years, making it a top cause of mortality.

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The public health burden of pneumonia in children is significant and is the focus of many global and regional analyses.^{10–12} However, there is little reliable information on the specific incidence and mortality of pneumonia in adults across Latin America, despite recognition of the relative burden it places on healthcare systems. Therefore, the objective of this study was to estimate the morbidity and mortality burden of pneumonia in adults over 50 years of age in Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela in 2009.

2. Methods

2.1. Description

A retrospective analysis of local data sources was conducted to estimate the burden of pneumonia in Argentina, Brazil, Colombia, Chile, Mexico, and Venezuela among adults. Data were stratified by age groups of 50–64, 65–74, 75–84, and ≥ 85 years, to report the incidence rates (inpatient and outpatient), the reported hospital deaths, and the total annual burden of the disease in each country.

2.2. Data sources

To obtain pneumonia cases detected by the different healthcare systems and in-hospital mortality information, specific databases and queries of reported pneumonia cases were used in each country, using as search criteria the cases reported in 2009 by ICD-10 codes J12–J18, ICD-9 codes 480–486, gender, and age group.

Since pneumonia is a reportable disease in Mexico and in Latin American countries, pneumonia cases were obtained from the national epidemiological surveillance bulletins from week 1 through week 52 of the year 2009 for each country. In the case of Brazil, the information was obtained from the Portal da Saúde – Secretariat of Health Surveillance;¹³ for Mexico, pneumonia cases were obtained from the Epidemiological Bulletin Yearbook 2009 of the National Epidemiological Surveillance Center;¹⁴ in the case of Argentina, from the Health Ministry Epidemiological Bulletin 2009 for Acute Respiratory Diseases;¹⁵ for Chile, the information was obtained from the epidemiological surveillance monthly electronic bulletins of 2009 of the Department of Epidemiology, Ministry of Health of Chile;¹⁶ for Venezuela the information was obtained from the Epidemiological Bulletin 2009 of the Ministry of Popular Power for Health;¹⁷ and finally in Colombia the information was obtained through the 2009 Epidemiological Bulletin of the National Institute of Health.¹⁸

Subsequently the following databases were consulted for each specific country in order to obtain inpatient cases of pneumonia: for Argentina the information was obtained from the Statistics and Information Department of Health (DEIS),¹⁹ for Colombia the information was provided by the National Institute of Health (INS),²⁰ for Mexico the information was available from the National System of Health Information (SINAIS) and the National Epidemiological Surveillance Center (CENEVACE),^{21,22} for Brazil reported cases were obtained from the Database of the Unified Healthcare

System (DATASUS),^{23,24} for Chile the cases were reported by the Department of Statistics and Health Information of the Ministry of Health of Chile (DEIS),^{25–28} and for Venezuela the statistical database of the Ministry of Popular Power for Health (MPPS) was consulted.²⁹

To identify the total pneumonia cases treated as outpatients, the difference between the cases reported by epidemiological bulletins and the inpatient cases was determined, and the result was considered as the cases that did not require hospitalization.

2.3. Incidence

The incidence was calculated based on the total cases of pneumonia (ICD-10 codes J12–J18 and ICD-9 codes 480–486) reported by the various local sources of epidemiological notification in each country during 2009,^{15–25} both for hospitalized patients as well as non-hospitalized patients. Data were collected within age groups (age 50–64, 65–74, 75–84, and ≥ 85 years), which were then divided by the population $\times 100\,000$ inhabitants, respectively, to obtain the incidence rate per 100 000 person-years.

2.4. Mortality

The total numbers of deaths due to the ICD codes listed above were obtained from data published by different local sources in each country in regards to the reported deaths that required hospital attention by age group (ages 50–64, 65–74, 75–84, and ≥ 85 years).^{19–29} Hospital deaths divided by the overall number of hospitalizations were used to estimate a case fatality rate (percent mortality per hospitalization) by age.

3. Results

In 2009, the total number of hospitalized cases (incidence per 100 000 inhabitants/year) for pneumonia in adults aged ≥ 50 years in the various Latin American countries was: Mexico 82 397 (413.1); Brazil 225 341 (611.6); Colombia 26 955 (326.6); Venezuela 31 601 (640.1); Chile 30 434 (738.5); and Argentina 39 674 (401.1) (Table 1). The incidence of hospitalized pneumonia increased similarly in each country with each increasing age category. Outpatient cases (incidence per 100 000 inhabitants/year) of pneumonia in adults aged ≥ 50 years were: Mexico 83 354 (417.9); Brazil 260 277 (706.4); Colombia 27 713 (335.8); Venezuela 39 645 (803.0); Chile 33 173 (804.9); and Argentina 54 093 (546.8). In general, the proportion of outpatient to inpatient cases decreased with advancing age. In the age group 50–64 years, the cases treated on an outpatient basis represented 64% (range 57–80%) of total cases, compared to the age group ≥ 85 years where cases of outpatient care represented 39% (range 8–56%) of total cases. The average death rate reported in 2009 for adults aged ≥ 50 years in the six countries studied was 17.7% (Table 2). The total cases of hospital deaths reported (death rate, %) in each country was as follows: Mexico 13 312 (16.2%); Brazil 47 287 (20.9%); Colombia 2981 (11.0%); Venezuela 11 101 (35.1%); Chile 3072

Table 1
Total pneumonia hospitalizations, deaths, and outpatient visits for adults over 50 years of age, 2009

	Mexico	Brazil	Colombia	Venezuela	Chile	Argentina
Hospitalizations	82 397	225 341	26 955	31 601	30 434	39 674
Outpatient visits	83 354	260 277	27 713	39 645	33 173	54 093
Deaths	13 312	47 287	2981	11 101	3072	5099
Incidence rates (per 100 000)						
Pneumonia hospitalizations	413.1	611.6	326.6	640.1	738.5	401.0
Pneumonia outpatient visits	417.9	706.4	335.8	803.0	804.9	546.8
Hospital case fatality rate (%)	16.2%	21.0%	11.1%	35.1%	10.1%	12.9%

Table 2
Pneumonia inpatient and outpatient incidence and hospital case fatality rates by age, 2009

Country	Age, years							
	50–64		65–74		75–84		≥85	
	Inpatient	Outpatient	Inpatient	Outpatient	Inpatient	Outpatient	Inpatient	Outpatient
Mexico								
Cases	12 500	49 811	17 872	21 532	24 101	9679	27 924	2332
Incidence ^a	104.0	414.3	326.6	393.4	1304.0	523.7	4656.4	388.9
HCFR (%) ^b	12.4		12.6		16.5		19.8	
Brazil								
Cases	70 679	95 696	59 297	67 152	64 062	66 560	31 303	30 869
Incidence ^a	292.2	395.6	733.0	830.1	1700.9	1767.2	3922.9	3868.5
HCFR (%) ^b	10.2		13.6		30.2		40.4	
Colombia								
Cases	5701	11 320	5589	6924	8194	6108	7471	3361
Incidence ^a	102.2	203.0	325.2	402.9	1028.5	766.7	4636.3	2085.7
HCFR (%) ^b	6.9		9.5		12.7		13.6	
Venezuela								
Cases	6221	14 464	6767	9849	10 511	10 003	8102	5329
Incidence ^a	184.5	429.1	687.8	1001.1	2213.0	2106.0	7552.4	4967.5
HCFR (%) ^b	19.5		28.4		32.1		56.6	
Chile								
Cases	4965	12 235	6404	8756	10 635	7799	8430	4383
Incidence ^a	193.9	477.9	657.9	899.5	2252.9	1652.1	7295.5	3793.2
HCFR (%) ^b	7.7		8.6		9.4		13.6	
Argentina								
Cases	8814	11 588	8978	12 061	12 149	18 143	9734	12 301
Incidence ^a	159.9	210.2	367.4	493.6	849.5	1268.6	1916.0	2421.2
HCFR (%) ^b	8.4		12.0		13.2		17.2	

^a Incidence per 100 000 person years.

^b Hospital case fatality rate (percent).

(10.1%); and Argentina 5099 (12.9%). A majority of deaths occurred in persons aged ≥75 years, who accounted for 69.2% (range 64.6–72.0%) of total deaths in adults.

4. Discussion

Pneumonia is a frequent cause of physician visits, hospitalization, and death among older adults in Latin America. Increasing age was associated with a substantial increase in the overall incidence of pneumonia, the likelihood of hospitalization, and the likelihood of mortality. Among the studied population, 51% of hospitalizations (range 42–63%) and 69% of deaths (range 65–72%) were in adults ≥75 years, who represented only 13% of the population above 50 years of age.

Our findings are similar to other reports globally and regionally. In Europe the incidence of hospitalized pneumonia in adults has been reported with rates of 1.5–9.8 per 1000 population in persons aged 65 years and older,³⁰ which is lower than the 7.0–16.3 per 1000 persons aged 65 years and older across the countries in our analysis. Our estimates are more aligned with an observational study in Brazil, which reported the incidence of pneumonia from 2000 to 2007, resulting in an annual incidence in the age group 70–79 years of 1134–1193 cases per 100 000 inhabitants, and in the age group 80 years and over of 2177–2895 cases per 100 000 inhabitants.⁷

With regard to the hospital death rate, Caberlotto et al. prospectively studied patients diagnosed with community-acquired pneumonia (CAP) in two hospitals in Argentina and found death rates of 13.5% and 13%, respectively,³¹ and the average age at death was 58–68.31 years. In our study, the average death rate was 17.69% (10.10–35.11%) for adults aged ≥50 years, with a rate of 12.5% in Argentina. Jardim et al., carried out a multicenter clinical study in five Latin American countries to evaluate the efficacy and safety of treatments with moxifloxacin or amoxicillin in patients 18 years of age and older suspected of having CAP due to pneumococcus; the study showed that the hospitalization rate of

the patients studied was 52.8%.³² In our study, the average hospitalization rate in the different Latin American countries for adults aged ≥50 years was 46.7% (range 42.3–49.3%).

Hospitalized CAP may be caused by many organisms, with *Streptococcus pneumoniae* (20–60%) being the most commonly identified pathogen in Latin America.^{33,34,5} Vaccination of adults against pneumococcal disease has the potential to reduce the incidence of hospitalizations and associated costs of disease.^{35–38} A 23-valent polysaccharide vaccine (PPV23) is available in several countries and is generally recommended for use in the elderly based on its effectiveness in reducing invasive pneumococcal disease.³⁹ Guidelines for the use of PPV23 often recommend use in adults over the ages of 50, 60, or 65 years, in recognition of their heightened risk and the relative value of disease prevention.⁴⁰ A 13-valent pneumococcal conjugate vaccine (PCV13) is now approved in many countries for use in adults to prevent pneumococcal disease caused by vaccine serotypes. A large clinical trial is currently underway to investigate the efficacy PCV13 in reducing CAP in adults ≥65 years of age, which may further clarify the potential role of this vaccine in clinical practice.⁴¹ Given the high burden of pneumonia, the increase in morbidity and mortality with increasing age, and the demographic aging of the population, understanding the opportunity for disease prevention is of increasing importance.

Pneumonia can impose significant financial costs due to hospitalization, outpatient treatment, and lost productivity. In this study we were limited to the identification of pneumonia cases through ICD-9 and ICD-10 registries, which are general codes that often include unconfirmed cases, nosocomial pneumonias, readmissions, and hospitalizations due to other causes.^{42–46} However, ICD-coded cases can be useful as a relative metric to health utilization that can facilitate comparison within a country, over time, in relation to other ICD-coded events, and across demographic groups. Given this utility, studies have applied ICD-based studies as a measure of pneumonia disease burden in other parts of the world,^{47,48} and have evaluated

ICD-based pneumonia indicators over time as a metric for monitoring pneumococcal vaccine impact.^{49–51}

When ICD-coded all-cause hospitalized pneumonia data have been compared against clinical records to identify radiographically confirmed CAP in adults, between 54% and 71% of coded cases meet these criteria.^{42–46} Coding practices may vary by country and region, and similar data are not currently available from Latin American countries, therefore the transferability of these data is uncertain. Further research into the validation of administrative coded pneumonia cases in Latin America with regard to cause and etiology would significantly benefit our understanding of the nature of pneumonia in adults.

In conclusion, we found a population weighted average incidence of hospitalized pneumonia in persons over 50 years of age of 519.6 hospitalizations per 100 000 person years, with an average fatality rate of 19.0 per 100 hospitalizations, representing 436 402 hospitalizations and 82 852 deaths in 2009. Assuming the same disease behavior for the 1.03 billion population over 50 across Latin American countries,⁵² this represents an estimated 533 083 hospitalizations and 101 283 deaths per year. Extrapolating forward to 2020, with a projected adult population of 1.49 billion, pneumonia could account for up to 617 993 hospitalizations and 112 680 deaths in a single year. Pneumonia represents a significant health burden in adults, which may continue to grow as the population ages.

Conflict of interest: This study was conducted with the financial support of Pfizer Inc. New York, without generating any kind of legal compromise and/or the results thereof. At the time of the study, Craig Roberts and Joaquin Mould-Quevedo were employees of Pfizer Inc., New York.

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