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Rates of Lower Respiratory Tract Infections Among US Adults Aged ≥18 Years With and Without Chronic Medical Conditions

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INTRODUCTION

- Lower respiratory tract infections (LRTIs)—including pneumonia and acute bronchitis—are a leading cause of morbidity and mortality among US adults, especially older adults and those with chronic or immunocompromising medical conditions[1-3]
- However, available evidence on rates of LRTI among US adults is limited, as few studies have evaluated adults across the age continuum or within subgroups defined by age and comorbidity profile[4-8]
- No studies have evaluated age- and comorbidity-specific rates of LRTI across strata defined by care setting (i.e., hospitalized vs. ambulatory cases)

OBJECTIVES

- Primary objectives of this study were to estimate:
  - Incidence rates of medically attended LRTI—by care setting—among US adults stratified by age and comorbidity profile
  - Relative rates of medically attended LRTI—by care setting—among US adults by age and comorbidity profile

METHODS

Study design and data source

- Retrospective observational cohort design
- IBM MarketScan Commercial Claims and Encounters (CCAE) and Medicare Supplemental and Coordination of Benefits (MDCR) databases spanning January 2016 through December 2019:
  - Each database includes comprehensive adjudicated medical (i.e., facility and professional service) claims, adjudicated outpatient pharmacy claims, and enrollment information for their covered populations

Study population

- Adults ≥18 years old with ≥1 year of continuous healthcare coverage:
  - Index date = day after initial 1-year continuous enrollment period
- Study population was stratified by age and comorbidity profile, which was defined using a 3-level stratification scheme:
  - Immunocompetent without chronic medical conditions (CMC–)
  - Immunocompetent with chronic medical conditions (CMC+)
  - Immunocompromised (IC)

Study measures

- LRTI included episodes of influenza, pneumonia, bronchitis, bronchiolitis, unspecified acute LRTI, and other miscellaneous respiratory manifestations identified using ICD-10 diagnosis codes[9]
- Episodes were ascertained on a monthly basis during the follow-up period (i.e., from the index date through the end of healthcare coverage or the end of the study period):
  - Qualifying encounters occurring within 30 days of each other were considered part of the same episode
- LRTI episodes were stratified by care setting (hospital, emergency department [ED], physician office/hospital outpatient [PO/HO]):
  - Episodes including encounters for LRTI in ≥1 setting were assigned to the most intensive care setting (i.e., hospital > ED > PO/HO)
- LRTI caused by respiratory syncytial virus (RSV), termed LRTI-RSV, was also identified using ICD-10 diagnosis codes

Statistical analyses

- Incidence rates (per 100,000 person-years [PY]) and relative rates of LRTI were estimated overall and by age and comorbidity profile
  - Relative rates of LRTI due to RSV were also estimated

RESULTS

Population characteristics

- At the start of follow-up, the study population included 22.2 million adults ≥18 years old **(Table 1)**:
  - Age 18–49y, 62.8%; 50–64y, 30.4%; ≥65y, 6.7%
  - CMC–, 80%; CMC+, 17%; IC, 3%

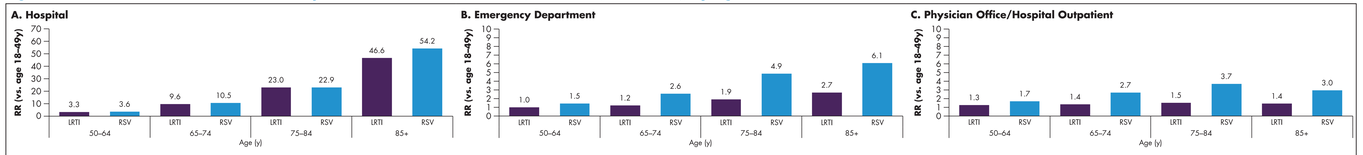
Incidence rates of LRTI

- Rates of hospitalized LRTI increased markedly with age; within each age group, rates were higher among adults with chronic/immunocompromising conditions **(Table 2)**
- Rates of ED LRTI and PO/HO LRTI also increased with age and the presence of chronic/immunocompromising conditions

Relative rates of LRTI vs. RSV

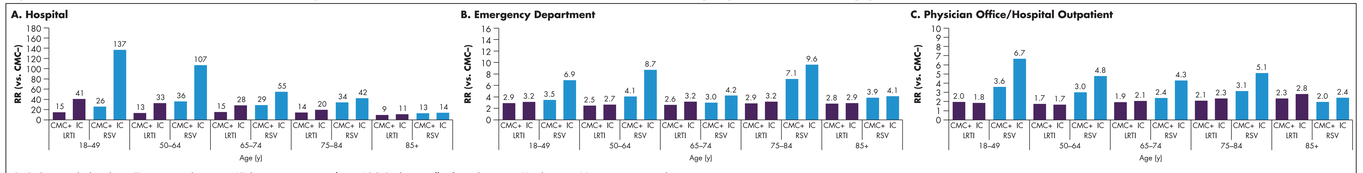
- Age-specific relative rates of hospitalized LRTI-RSV were largely comparable to overall LRTI results **(Figure 1)**
- Age-specific relative rates for ED and PO/HO LRTI, and relative rates for adults by comorbidity profile, were generally higher for LRTI-RSV **(Figure 2)**

Figure 1. Relative rates of LRTI and RSV hospitalizations, ED visits, and PO/HO visits (2017–2019), by age



ED: emergency department; LRTI: lower respiratory tract infection; PO/HO: physician office/hospital outpatient; RR: relative rate; RSV: respiratory syncytial virus

Figure 2. Relative rates of LRTI and RSV hospitalizations, ED visits, and PO/HO visits (2017–2019), by age and comorbidity profile



CMC: chronic medical conditions; ED: emergency department; LRTI: lower respiratory tract infection; PO/HO: physician office/hospital outpatient; RR: relative rate; RSV: respiratory syncytial virus

Table 1. Baseline characteristics of study population (2017–2019), by age and risk*

	All Adults (N=22,165,449)	Comorbidity Profile		
		CMC– (N=17,796,042)	CMC+ (N=3,678,629)	IC (N=690,778)
Demographic profile				
Age (y), mean (SD)	43.2 (15.9)	40.5 (14.6)	53.7 (16.2)	57.7 (14.5)
Age group (y), %				
18–49	62.8	69.9	36.0	25.4
50–64	30.4	26.8	44.5	48.6
65–74	3.7	2.2	9.4	13.1
75–84	2.1	0.8	6.6	9.5
≥85	0.9	0.3	3.5	3.5
Male, %	47.5	48.0	46.5	42.4
Comorbidity profile, %	--			
CMC–	80.3	100	--	--
CMC+**	16.6	--	100	--
Chronic cardiopulmonary	0.1	--	0.6	--
Chronic cardiovascular	4.6	--	27.7	--
Chronic hematologic	0.9	--	5.4	--
Chronic hepatic	0.4	--	2.4	--
Chronic metabolic	8.2	--	49.4	--
Chronic neurologic	2.3	--	13.9	--
Chronic pulmonary	4.6	--	27.7	--
Chronic renal	1.4	--	8.4	--
Obesity (BMI >40 kg/m^2)	2.6	--	15.7	--
IC†	3.1	--	--	100

BMI: body mass index; CMC: chronic medical condition; IC: immunocompromised; SD: standard deviation
*Patient characteristics are based on all information available as of the day after last date of the initial 1-year continuous enrollment period
**Percent of patients with individual conditions sums to >100% because some patients had multiple CMCs
†IC includes patients with solid cancer, hematological malignancies, transplant, immunosuppressive medication

Table 2. Incidence rates and relative rates of LRTI (2017–2019), by age, and by age and comorbidity profile

			LRTI Care Setting								
			Hospital			Emergency Department			Physician Office/Hospital Outpatient		
				Relative Rate			Relative Rate			Relative Rate	
Age (y)	Comorbidity Profile	Person-Years	Incidence (per 100K PY)	By Age (vs. 18–49)	By Comorbidity Profile (vs. CMC–)	Incidence (per 100K PY)	By Age (vs. 18–49)	By Comorbidity Profile (vs. CMC–)	Incidence (per 100K PY)	By Age (vs. 18–49)	By Comorbidity Profile (vs. CMC–)
18–49	All	22,234,033	148 (146-149)	1.0	--	567 (564-570)	1.0	--	6,458 (6,447-6,469)	1.0	--
	CMC–	18,953,458	42 (41-43)	--	1.0	440 (437-443)	--	1.0	5,665 (5,654-5,675)	--	1.0
	CMC+	2,909,016	632 (623-641)	--	15.0 (14.6-15.4)	1,287 (1,274-1,300)	--	2.9 (2.9-3.0)	11,116 (11,077-11,154)	--	2.0 (2.0-2.0)
	IC	371,559	1,736 (1,694-1,779)	--	41.1 (39.8-42.5)	1,387 (1,350-1,426)	--	3.2 (3.1-3.2)	10,466 (10,363-10,571)	--	1.8 (1.8-1.9)
50–64	All	13,215,760	485 (481-488)	3.3 (3.0-3.3)	--	576 (572-581)	1.0 (1.0-1.0)	--	8,198 (8,182-8,213)	1.3 (1.3-1.3)	--
	CMC–	8,603,065	75 (73-76)	--	1.0	377 (373-381)	--	1.0	6,530 (6,513-6,547)	--	1.0
	CMC+	3,800,312	995 (985-1,005)	--	13.3 (13.0-13.7)	934 (925-944)	--	2.5 (2.4-2.5)	11,391 (11,357-11,425)	--	1.7 (1.7-1.8)
	IC	812,383	2,437 (2,403-2,471)	--	32.6 (31.7-33.6)	1,012 (990-1,034)	--	2.7 (2.6-2.7)	10,917 (10,845-10,989)	--	1.7 (1.7-1.7)
65–74	All	1,616,085	1,424 (1,405-1,442)	9.6 (9.5-9.8)	--	707 (694-720)	1.2 (1.2-1.3)	--	8,821 (8,775-8,866)	1.4 (1.4-1.4)	--
	CMC–	698,074	131 (123-140)	--	1.0	354 (340-368)	--	1.0	5,693 (5,638-5,750)	--	1.0
	CMC+	711,846	2,028 (1,996-2,062)	--	15.5 (14.5-16.5)	930 (908-953)	--	2.6 (2.5-2.8)	11,021 (10,944-11,098)	--	1.9 (1.9-2.0)
	IC	206,166	3,712 (3,629-3,796)	--	28.3 (26.4-30.3)	1,131 (1,086-1,177)	--	3.2 (3.0-3.4)	11,812 (11,664-11,961)	--	2.1 (2.0-2.1)
75–84	All	861,572	3,402 (3,363-3,441)	23.0 (22.7-23.4)	--	1,088 (1,066-1,110)	1.9 (1.9-2.0)	--	9,780 (9,714-9,846)	1.5 (1.5-1.5)	--
	CMC–	240,117	297 (276-320)	--	1.0	453 (427-481)	--	1.0	5,348 (5,257-5,442)		1.0
	CMC+	471,573	4,201 (4,143-4,260)	--	14.1 (13.1-15.2)	1,299 (1,267-1,332)	--	2.9 (2.7-3.1)	11,161 (11,066-11,257)		2.1 (2.0-2.1)
	IC	149,882	5,860 (5,739-5,984)	--	19.7 (18.3-21.3)	1,442 (1,382-1,504)	--	3.2 (3.0-3.4)	12,531 (12,353-12,712)		2.3 (2.3-2.4)
≥85	All	387,006	6,884 (6,802-6,967)	46.6 (45.9-47.4)	--	1,527 (1,488-1,566)	2.7 (2.6-2.8)	--	9,162 (9,068-9,258)	1.4 (1.4-1.4)	--
	CMC–	81,531	875 (813-941)	--	1.0	622 (570-678)	--	1.0	4,314 (4,173-4,459)	--	1.0
	CMC+	246,074	8,229 (8,117-8,343)	--	9.4 (8.7-10.1)	1,759 (1,707-1,812)	--	2.8 (2.6-3.1)	10,056 (9,931-10,182)	--	2.3 (2.3-2.4)
	IC	59,400	9,561 (9,315-9,812)	--	10.9 (10.1-11.8)	1,806 (1,701-1,918)	--	2.9 (2.6-3.2)	12,118 (11,841-12,401)	--	2.8 (2.7-2.9)

LRTI: lower respiratory tract infection; PY: person-years

LIMITATIONS

- Algorithms used for identifying LRTI encounters have not been validated, and thus their sensitivity/specificity is unknown
- Most patients with LRTI are not tested for RSV; thus, RSV cases in this study may not be representative of all patients with RSV infection
- To the extent that RSV testing varies based on patient age and/or comorbidity profile, relative rates of LRTI-RSV may not be accurately estimated
- Operational algorithms used to characterize comorbidity profiles likely resulted in misclassification of some patients
- Data source includes commercially insured US persons only, and thus study results may not be generalizable to other adult populations

CONCLUSIONS

- **LRTI incidence, especially for episodes requiring hospitalization, is markedly higher among older adults and adults of all ages with chronic medical conditions or immunocompromising conditions**
- **To address the LRTI burden of disease, prevention strategies should focus on older adults and adults with chronic medical conditions**

ACKNOWLEDGEMENTS

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