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Healthcare Costs Following Severe Respiratory Syncytial Virus Infection in Infancy:

Results from a Matched Cohort Study in Germany

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BACKGROUND & OBJECTIVE

- Respiratory syncytial virus (RSV) is a leading cause of severe acute respiratory infections (SARI) in infants, with potential long-term respiratory and economic consequences that remain poorly quantified in Germany.[1,2]
- This study aims to quantify healthcare resource utilization (HCRU) and costs following severe RSV infection in infancy in Germany, with focus on long-term economic burden beyond the acute episode.

MATERIALS & METHODS

- **Design:** Retrospective matched cohort study using German statutory health insurance claims data (BARMER; ≈9 million insured individuals; 2012–2024).
- **Population:** Infants born during birth seasons 2012-2013 to 2022-2023.
- **Exposure:** Infants hospitalized for RSV (ICD-10-GM J12.1, J20.5, J21.0, or J09–J22 with secondary code B97.4) during their first RSV season.
- **Comparator:** Individuals without RSV hospitalization, irrespective of hospitalization for other diagnoses, exactly matched up to 1:10 on sex, birth month/year, term and preterm birth status, palivizumab immunization, risk condition, and calendar quarter of cohort entry.
- **Cohort identification and follow-up start:** Individuals in the exposure group were identified based on RSV hospitalization during their first RSV season. Follow-up started after this season. Matched comparators without RSV hospitalization were assigned the same follow-up start date as their corresponding RSV case.
- **Health outcomes:** First occurrence of recurrent wheezing/asthma[a], SARI hospitalization, recurrent wheezing/asthma medication prescription, otitis media, ARI, and antibiotic prescription.
- **HCRU and cost outcomes:** All-cause HCRU included outpatient physician visits, hospitalizations, and prescription drug dispensations, while all-cause costs comprised inflation-adjusted total, outpatient, inpatient, and drug costs.
- **Analysis:** Incidence rate ratio (IRR) with 95% confidence interval (CI) for respiratory outcomes, and mean difference with 95% CI for HCRU and cost outcomes. Controls were inverse-weighted within matched sets. A sensitivity analysis (SA) compared RSV hospitalization cases to non-RSV SARI controls during the first RSV season.

RESULTS

Table 1: Characteristics of the study population

	RSV group		Control group (weighted)	
	N/mean	%/SD	N/mean	%/SD
Overall	9,488	100.0	9,488	100.0
Sex				
Female	4,113	43.4	4,113	43.4
Male	5,375	56.7	5,375	56.7
Age at cohort entry				
Months	6.35	6.0	6.35	6.0
Age groups				
≤6 months	5,269	55.5	5,269	55.5
>6 months	4,219	44.5	4,219	44.5
Birth status				
Term	8,154	85.9	8,154	85.9
Late preterm	1,224	12.9	1,224	12.9
Extreme preterm	110	1.2	110	1.2
Immunization with palivizumab				
Yes	143	1.5	143	1.5
No	9,345	98.5	9,345	98.5
Risk condition				
Yes	1,855	19.6	1,855	19.6
No	7,633	80.5	7,633	80.5

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Abbreviations: ARI: acute respiratory infection; CI: confidence interval; HCRU: healthcare resource utilization; IRR: incidence rate ratio; RSV: respiratory syncytial virus; SA: sensitivity analysis; SARI: severe acute respiratory infections; SD: standard deviation

[1]Koch et al. Epid Bull 2024;26:3. | [2]Poshtiban et al. BMC Infect Dis 2024;24:844 | [a]Defined as ≥2 (broad) or ≥4 (narrow) diagnoses of acute bronchitis (J20) or wheezing (R06.2) in different quarters within 12 months, or ≥1 diagnosis of asthma (J45/J46).

Health Outcomes

- The matched cohort included 102,293 infants (9,488 RSV cases; 92,805 controls; 87 RSV cases unmatched). After weighting, both groups represented 9,488 infants and were well balanced on baseline characteristics (Table 1).
- Severe RSV infection was associated with a significantly higher incidence of recurrent wheezing/asthma across both definitions[a] and follow-up periods (Figure 1).
- Significantly increased rates were observed across all health outcomes, with the strongest associations found for SARI hospitalization and wheezing/asthma medication use (Figure 1).

Sensitivity Analysis

- Compared with infants hospitalized for non-RSV SARI (4,280 RSV cases; 4,910 controls), no significant differences in recurrent wheezing/asthma were observed across thresholds, with IRRs ranging from 0.93 to 0.97 at 1 year and 0.93 to 0.95 at 5 years.

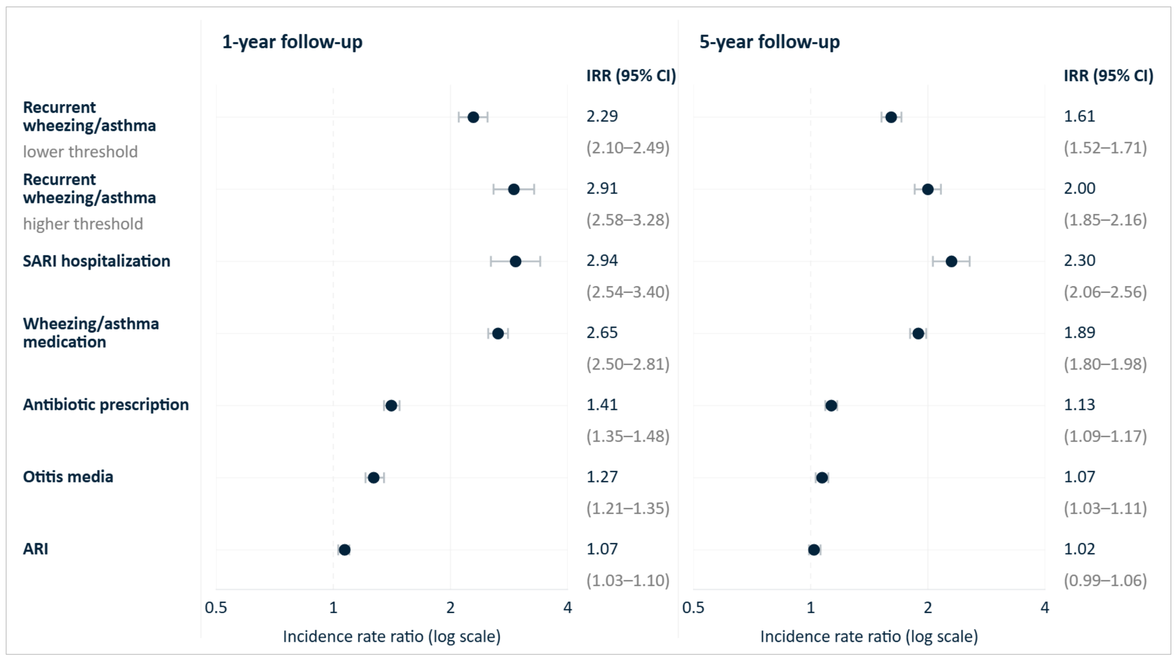


Figure 1: Incidence rate ratios for health outcomes (N=9,488), lower-threshold (N=7,494 at risk per group) and higher-threshold (N=8,541 at risk per group) recurrent wheezing/asthma, 1-year and 5-year follow-up

HCRU and Cost Outcomes

- RSV cases had significantly higher HCRU than matched controls:
  - 1-year follow-up: +2.43 physician contacts, +0.16 hospitalizations, and +3.83 prescriptions
  - 5-year follow-up: +5.62 physician contacts, +0.30 hospitalizations, and +8.25 prescriptions
- RSV cases had significantly higher healthcare costs than matched controls:
  - 1-year follow-up: +€628 total excess costs (95% CI €492–€764), including +€417 inpatient, +€135 drug, and +€76 outpatient costs (Figure 2)
  - 5-year follow-up: +€1,378 total excess costs (95% CI €898–€1,858), including +€763 inpatient, +€425 drug, and +€190 outpatient costs

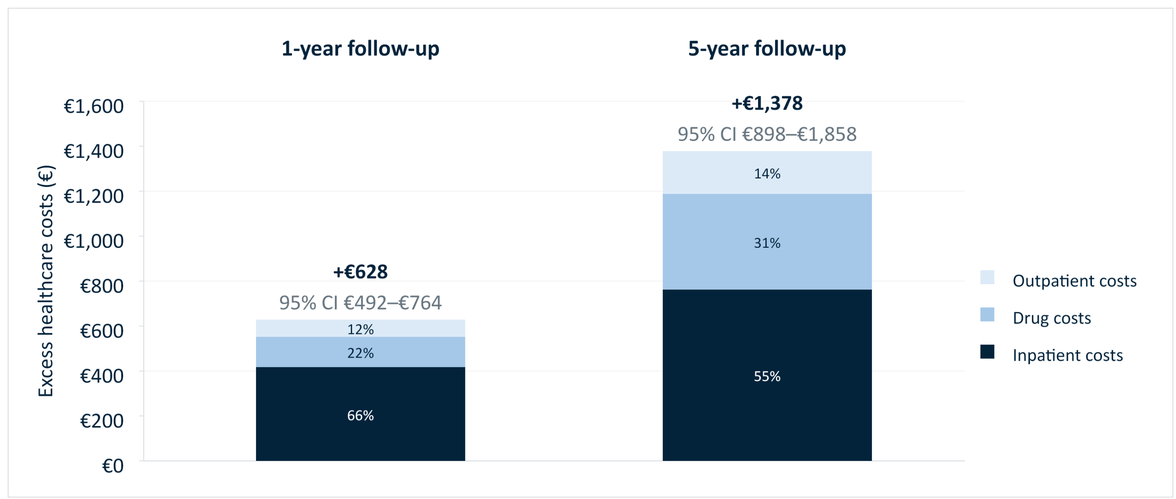


Figure 2: Excess healthcare costs, 1-year and 5-year follow-up

CONCLUSION

- RSV hospitalization was followed by substantial long-term healthcare and economic burden, supporting RSV prevention to reduce acute disease and longer-term healthcare utilization and costs.
- No significant difference in recurrent wheezing/asthma after non-RSV SARI highlights the broader burden of severe infant respiratory infections.