Estimating RSV burden using ICD-10 based surveillance systems

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Some basic information about the population in Germany

Age structure

- median age: 46 years

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>million</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4</td>
<td>2,8</td>
<td>3,5</td>
</tr>
<tr>
<td>5 - 64</td>
<td>61,0</td>
<td>74,8</td>
</tr>
<tr>
<td>65 +</td>
<td>17,7</td>
<td>21,7</td>
</tr>
<tr>
<td>total</td>
<td><strong>81,5</strong></td>
<td>100</td>
</tr>
</tbody>
</table>
Some basic information about the Health care system in Germany

Health care system:
Primary care:
~ 58 000 general practitioners and pediatricians
Secondary care
- ~ 2 000 hospitals;
  - 19 million patients in hospitals/year;
  - 8 hospital beds / 1 000 population

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>hospitalized patients /100 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 14</td>
<td>16 605</td>
</tr>
<tr>
<td>15 - 64</td>
<td>35 000</td>
</tr>
<tr>
<td>65 +</td>
<td>49 645</td>
</tr>
</tbody>
</table>
**ARI surveillance: data sources in Germany**

- **ICD-10-based SARI surveillance**
  - Sentinel hospitals

- **Primary care sentinel system**
  - (ICD10 based syndromic MAARI surveillance)

- **Weekly online survey**
  - (ARI-/ILI-rates in the population)

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**Virological surveillance**
- Influenza, RSV, hMPV, Rhinoviruses, Adenoviruses

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**Asymptomatic infection**

**Symptomatic infection**

**ICU cases**

**SARI cases**

**Deaths**

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**Transmission**

**Burden of disease**

**Severe cases**
Arbeitsgemeinschaft Influenza: Primary care sentinel system
Operated by Unit 36 and the National reference center for influenza (Unit 17) at RKI

Sentinel physicians
~ 500 Sentinel sites

syndromic part
ICD-10 codes J00 – 22 from practice software (case-based)

virological part

20% of sentinel sites

https://influenza.rki.de/
ARI- vs. ILI-consultation incidence (ICD10 code primary care sentinel)

During influenza season: only 20% of ARI consultations are due to influenza like illness

Medically attended ARI - Consultation incidence – Season 2016/17

MAARI / 100 000 population

Calendar week

0 – 4 years
5 – 14 years
15 – 34 years
35 – 59 years
≥ 60 years
all ages 2015/16
all ages 2016/17

https://influenza.rki.de/
Virological surveillance – season 2016/17
Primary care sentinel

The graph shows the number of samples and positivity rates for various viruses over calendar weeks 40 to 20. The viruses include hMPV, Adeno, Rhino, RSV, Influenza, and the general term 'samples'. The positivity rates are shown on the right y-axis as a percentage, while the number of samples is shown on the left y-axis.
Virological surveillance – Primary care sentinel - Season 2016/17

Proportion of positive tests, CW 40 / 2016 to CW 20 / 2017; primary care sentinel

- **Influenza A**: 184 (0 - 4 years), 275 (5 - 14 years), 269 (15 - 34 years), 355 (35 - 59 years), 231 (60 years and older)
- **Influenza B**: 6 (0 - 4 years), 28 (5 - 14 years), 3 (15 - 34 years), 37 (35 - 59 years), 10 (60 years and older)
- **RSV**: 225 (0 - 4 years), 35 (5 - 14 years), 35 (15 - 34 years), 75 (35 - 59 years), 58 (60 years and older)
- **hMPV**: 54 (0 - 4 years), 11 (5 - 14 years), 6 (15 - 34 years), 14 (35 - 59 years), 17 (60 years and older)
- **Rhinovirus**: 203 (0 - 4 years), 63 (5 - 14 years), 130 (15 - 34 years), 120 (35 - 59 years), 65 (60 years and older)
- **Adenovirus**: 130 (0 - 4 years), 25 (5 - 14 years), 6 (15 - 34 years), 7 (35 - 59 years), 2 (60 years and older)
RSV associated ICD10 code diagnoses by age group and gender (Oct 2007- March 2017) – Primary care sentinel

- J12.1 RSV pneumonia
- J20.5 acute bronchitis due to RSV
- J21.0 acute bronchiolitis due to RSV

→ no obligation to use pathogen specific ICD10 codes in primary care
Influenza-attributable medically attended acute respiratory illness (in millions)

Burden of disease - estimates of Influenza-attributable MAARI

![Graph showing MAARI (Medically Attended Acute Respiratory Illness) data over years.](image)

**Figure 1** Raw data (medically attended acute respiratory illness (MAARI) in per cent of the population (hollow dots), data modelled by the GAM sample-based model (baseline: green line), secular trend (blue line), MAARI attributed to influenza (IMAARI; red-shaded area). Vertical lines represent the change of the year, Germany, 2001/2002–2014/2015.


**preliminary results for Influenza and RSV (all age groups)**

![Graph showing MAARI data for Influenza and RSV.](image)
Burden of disease - estimates of RSV-attributable MAARI?

preliminary results for Influenza and RSV (all age groups)

Estimated RSV-associated MAARI in 2016/17: 700,000 (all age groups)
Estimated Influenza-associated MAARI in 2016/17: 5,800,000 (all age groups)
German SARI surveillance - Sentinel hospitals

<table>
<thead>
<tr>
<th>Year</th>
<th>Total number of clinics</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>39</td>
</tr>
<tr>
<td>2010</td>
<td>39</td>
</tr>
<tr>
<td>2011</td>
<td>41</td>
</tr>
<tr>
<td>2012</td>
<td>47</td>
</tr>
<tr>
<td>2013</td>
<td>48</td>
</tr>
<tr>
<td>2014</td>
<td>83</td>
</tr>
<tr>
<td>2015</td>
<td>84</td>
</tr>
<tr>
<td>2016</td>
<td>84</td>
</tr>
<tr>
<td>2017</td>
<td>84</td>
</tr>
</tbody>
</table>

- **2015:**
  - 4.3% of German clinics
  - 5.9% of hospitalized patients in Germany

Weekly transferred data sets (case based)

Data set (denominator)
- clinic, dates of admission and discharge, age, gender, postal code (2 of 5 digits)
- Length of stay in hospital/on ICU, type of discharge

Data set (numerator)
- additional: primary, secondary and admission diagnoses, duration of ventilation, specialty department, postal code (3 of 5 digits)
Weekly SARI cases in German sentinel hospitals

Number of SARI patients with ICD 10 codes J09 – J22 in primary diagnosis and hospitalization one week or less (timely case definition)

Number of SARI patients with ICD 10 codes J09 – J22 (timely case definition) per age group


https://influenza.rki.de/Wochenberichte/2017_2018/2017-42.pdf
Number of hospitalisations with RSV associated ICD code diagnoses (Jan 2009-April 2017)

→ Obligation to use pathogen-specific ICD10 codes in hospitals (billing-relevant information)

- RSV pneumonia: J12.1
- Acute bronchitis due to RSV: J20.5
- Acute bronchiolitis due to RSV: J21.0

- A total of 1,417,700 hospitalisations with primary or secondary diagnoses of J00-J99 (respiratory diagnosis: numerator data set)
- 3,154 (0.2%) hospitalisations with RSV associated ICD10 code diagnoses as admission diagnoses
- 6,918 (0.5%) hospitalisations with RSV associated ICD10 code diagnoses as primary diagnoses at hospital discharge
Hospitalisations with RSV associated ICD code primary diagnoses by age group and gender (Jan 2009-April 2017)

Number of hospitalisations with RSV associated ICD code diagnoses

- 0-1 year: 3623 (Male: 2792, Female: 831)
- 2-4 years: 205 (Male: 120, Female: 85)
- 5-14 years: 17 (Male: 12, Female: 5)
- 15-34 years: 9 (Male: 2, Female: 7)
- 35-49 years: 2 (Male: 1, Female: 1)
- 50-59 years: 49 (Male: 30, Female: 19)
- 60+ years: 0 (Male: 0, Female: 0)
Hospitalisations with RSV associated ICD10 code primary diagnoses or SARI associated ICD code primary diagnoses

Age groups 0 – 1 and 2 – 4 years, basic case definition
Proportion of RSV codes / SARI codes (ICD10 code primary diagnoses) (Jan 2014 – Nov 2017)

Proportion RSV diagnosis / SARI diagnosis

- 0 - 1 year
- 2 - 4 years
Conclusions

- RSV specific ICD 10 codes in primary and secondary care in Germany are present almost only in age groups 0 – 4 years (especially in age group 0 – 1 year). However, these results are plausible in relation to virological results in primary care.

- Estimates for burden of disease for the whole population will be challenging because the youngest age group is small in Germany.

- Virological data are used to extract influenza-attributable MAARI (iMAARI) consultations in primary care and to estimate the burden of disease – in future also possible for RSV.

- Coding behaviour is different between primary and secondary care; only hospitals are obliged to use ICD 10 codes for disease/pathogen specific diagnosis.

- Up to 60% of SARI cases in the age group 0 – 1 year are discharged with RSV-specific ICD 10 codes from German sentinel hospitals.
Thank You for your Attention!