An Approach to Estimate the National Burden of RSV-Associated Respiratory Illness Hospitalization Using Sentinel Surveillance Data

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Background

1. Obtaining the National Burden (rates and numbers) of RSV-associated severe illness is important for informed decisions on interventions.

2. A rapid assessment methodology of the national burden of influenza-associated severe respiratory illness using sentinel surveillance data has been developed.
   

3. Such methodology can be adapted to estimate the national burden of RSV-associated severe respiratory illness.
Data Needs

- **RSV proportion positive**: from one or more sentinel hospitals where laboratory-confirmed RSV surveillance is conducted by pre-specified age groups.

- **Rates of SARI/LRTI**: from one or more sentinel hospitals or Province/administrative division within pre-specified age groups.

- **Mid-year population estimates**: from projection of census data by:
  - Pre-specified age groups.
  - Province/administrative division.
  - Year (for the study period – usually 3-5 years are included).
Data Needs

- **Demographic and Health Survey (DHS):** ideally conducted in years close to the study period.

- **Healthcare Utilization Survey (HUS):** conducted in the area where SARI/LRTI rates are estimated. This is needed only for the estimation of non-medically-attended illness.
Estimation Approach – Step 1

Estimate SARI/LRTI at sentinel hospital(s) or Province/administrative division (Base Province).
(see also WHO Manual on Estimation of Influenza Disease Burden)

If rates are obtained from a sentinel hospital use that rate as proxy for the Province/administrative division.

Output: SARI/LRTI hospitalization rates in the Base Province/Administrative Division
Estimation Approach – Step 2.1

Adjust SARI/LRTI rates from the base province/administrative division to those of other Provinces/administrative divisions based on differential prevalence of known risk factors for pneumonia from DHS (usually measured):

- Malnutrition (children only)
- Low birth weight (children only)
- Non-exclusive breastfeeding (children only)
- Indoor air pollution (children and adults)
- Crowding (children and adults)
- HIV infection (children and adults)
Estimation Approach – Step 2.2

Adjust SARI/LRTI rates from the base province/administrative division to those of other provinces/administrative division based on differential healthcare seeking behavior for Acute Respiratory Illness (ARI) from DHS (usually measured).

Output: SARI/LRTI hospitalization rates in the Other Province/Administrative Divisions
Estimation Approach – Step 3

Multiply Provincial/administrative division SARI/LRTI rates by the RSV proportion positive from laboratory confirmed RSV surveillance conducted at sentinel hospitals.

Output: RSV-associated SARI/LRTI hospitalization rates by Province/Administrative Division
Estimation Approach – Step 4

Multiply Provincial/administrative division RSV-associated SARI/LRTI rates by the provincial/administrative division mid-year population estimates.

Output: Number of RSV-associated SARI/LRTI hospitalizations by Province/Administrative Division
Estimation Approach

- If HUS data on non-medically-attended illness for SARI/LRTI are available non-medically-attended RSV-associated severe respiratory illness can be obtained using the same approach (Steps 1 to 3).
Influenza Example from Zambia

**TABLE 1** Estimated mean annual numbers and rates of severe acute respiratory illness and influenza-associated severe acute respiratory illness hospitalizations, Zambia, 2011-2014

<table>
<thead>
<tr>
<th>Age-group (in years)</th>
<th>SARI hospitalizations</th>
<th>Influenza-associated SARI hospitalizations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number (95% CI)</td>
<td>Rate (95% CI)*</td>
</tr>
<tr>
<td>&lt;1</td>
<td>57,449 (34,642-80,256)</td>
<td>11,548.3 (6,963.6-16,133)</td>
</tr>
<tr>
<td>1-4</td>
<td>37,775 (22,136-53,414)</td>
<td>1,898.4 (1,112.5-2,684.3)</td>
</tr>
<tr>
<td>5-24</td>
<td>6,525 (4,626-8,424)</td>
<td>95.2 (67.5-122.9)</td>
</tr>
<tr>
<td>25-44</td>
<td>9,708 (6,737-12,679)</td>
<td>297.8 (206.7-388.9)</td>
</tr>
<tr>
<td>45-64</td>
<td>4,211 (3,045-5,377)</td>
<td>385.8 (278.9-492.7)</td>
</tr>
<tr>
<td>≥65</td>
<td>3,000 (2,106-3,894)</td>
<td>794.3 (557.6-1,031.0)</td>
</tr>
<tr>
<td>&lt;5</td>
<td>95,223 (67,037-123,409)</td>
<td>3,828.4 (2,695.2-4,961.6)</td>
</tr>
<tr>
<td>≥5</td>
<td>23,444 (16,083-30,805)</td>
<td>202.5 (138.9-266.1)</td>
</tr>
<tr>
<td>All</td>
<td>118,668 (82,948-154,386)</td>
<td>843.6 (589.7-1,097.5)</td>
</tr>
</tbody>
</table>

Province

- **Central**: 10,148 (7,215-13,081) 727.8 (517.5-938.1) 529 (376-682) 38.1 (27.3-49.2)
- **Copperbelt**: 20,450 (13,988-26,912) 981.6 (671.4-1,291.8) 1,066 (729-1,403) 51.2 (35.0-67.4)
- **Eastern**: 15,328 (10,837-19,819) 902.2 (637.9-1,166.5) 800 (566-1,034) 47.1 (33.3-60.9)
- **Luapula**: 7,725 (5,098-10,352) 731.9 (483.1-980.7) 402 (265-539) 38.1 (25.1-51.1)
- **Lusaka**: 21,843 (15,421-28,265) 889.7 (628.1-1,151.3) 1,132 (799-1,465) 46.1 (32.5-59.7)
- **Muchinga**: 5,949 (4,123-7,775) 774 (536.4-1,011.6) 310 (215-405) 40.4 (28.0-52.8)
- **North Western**: 7,439 (5,334-9,544) 968.7 (694.6-1,242.8) 388 (278-498) 50.6 (36.3-64.9)
- **Northern**: 8,296 (5,674-10,918) 692.9 (473.9-911.9) 432 (295-569) 36.1 (24.7-47.5)
- **Southern**: 13,709 (9,624-17,794) 804.3 (564.6-1,044) 715 (502-928) 42.0 (29.5-54.5)
- **Western**: 7,781 (5,602-9,960) 826 (594.7-1,057.3) 407 (293-521) 43.2 (31.1-55.3)

SARI, severe acute respiratory illness; CI, confidence intervals.

*Rates expressed per 100,000 population.
Thank you!!!

(Questions?)