Estimated Prevalence and Economic Burden of Severe, Uncontrolled Asthma in the United States

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Background: There are no standard terms/definitions of asthma severity and control\textsuperscript{1,2}

“What concepts of asthma severity and control are important in evaluating patients and their response to treatment as well as for public health, registries, and research (clinical trials, epidemiologic, genetic, and mechanistic studies), but the terminology applied is not standardized, and terms are often used interchangeably.” \textsuperscript{1}

[Proceedings from the World Health Organization meeting of experts held April 2009 to propose a uniform definition of severe asthma.]

Other terms used:\textsuperscript{1,2}

- Severe asthma
- Refractory asthma
- Steroid-dependent
- Resistant asthma
- Difficult to control asthma
- Poorly controlled asthma
- Brittle asthma
- Irreversible asthma
- Therapy-resistant asthma

Definitions of these terms have evolved since 2000, but cited research rarely specifies definitions that were used.

Underlying pathologies of asthma subtypes may differ.\textsuperscript{2}


Asthma costs vary by definitions and methods used to identify disease severity and control\(^1\)

<table>
<thead>
<tr>
<th>Venue of Care</th>
<th>Method used to determine severity</th>
<th>All patients with asthma</th>
<th>Severe</th>
<th>Moderately Severea</th>
<th>Asthma</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>Inpatient(^1)</td>
<td>SR</td>
<td>Not available</td>
<td>$304 ($1,698)</td>
<td>$192 ($1,111)</td>
<td>$137 ($1,198)</td>
<td>(\text{a} p&lt;0.05) severe vs. mild</td>
</tr>
<tr>
<td>Inpatient(^2)</td>
<td>SR</td>
<td>$788</td>
<td>$3,610</td>
<td>$366</td>
<td>$174</td>
<td>(\text{a} p&lt;0.05) all pairwise comparisons</td>
</tr>
<tr>
<td>Inpatient(^3)</td>
<td>CD</td>
<td>Not available</td>
<td>$2,448 ($12,605)</td>
<td>$2,318 ($32,091)</td>
<td>$1,536 ($8,539)</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Outpatient(^1)</td>
<td>SR</td>
<td>Not available</td>
<td>$999 ($1,230)</td>
<td>$716 ($723)</td>
<td>$608 ($629)</td>
<td>(\text{a} p&lt;0.0001) severe vs. mild ; (\text{b} p&lt;0.05) severe vs. moderate</td>
</tr>
<tr>
<td>Outpatient(^2)</td>
<td>SR</td>
<td>$582</td>
<td>$1,417</td>
<td>$551</td>
<td>$337</td>
<td>(\text{a} p&lt;0.05) all pairwise comparisons</td>
</tr>
<tr>
<td>Outpatient(^3)</td>
<td>CD</td>
<td>$4,385 ($11,934)</td>
<td>$2,924 ($5,769)</td>
<td>$2,622 ($4,494)</td>
<td>P&lt;0.01 moderate vs. mild, severe vs. mild; P&lt;0.05 severe vs. moderate</td>
<td></td>
</tr>
<tr>
<td>ED(^1)</td>
<td>SR</td>
<td>Not available</td>
<td>$37 ($164)</td>
<td>$42 ($174)</td>
<td>$81 ($369)</td>
<td>Not Significant</td>
</tr>
<tr>
<td>ED(^2)</td>
<td>SR</td>
<td>$488</td>
<td>$1,693</td>
<td>$320</td>
<td>$219</td>
<td>(\text{a} p&lt;0.05) all pairwise comparisons</td>
</tr>
<tr>
<td>ED(^3)</td>
<td>CD</td>
<td>Not available</td>
<td>$27,502 ($3,313)</td>
<td>$2,034 ($2,702)</td>
<td>$2,050 ($2,651)</td>
<td>p&lt;0.01 moderate vs. mild, severe vs. mild; p&lt;0.05 severe vs. moderate</td>
</tr>
<tr>
<td>Medications(^1)</td>
<td>SR</td>
<td>Not available</td>
<td>$1,460 ($1,282)</td>
<td>$1,016 ($935)</td>
<td>$814 ($869)</td>
<td>(\text{a} p&lt;0.0001) severe vs. mild ; (\text{b} p&lt;0.05) severe vs. moderate</td>
</tr>
<tr>
<td>Medications(^2)</td>
<td>SR</td>
<td>$2,731</td>
<td>$4,090</td>
<td>$2,971</td>
<td>$2,130</td>
<td>(\text{a} p&lt;0.05) all pairwise comparisons</td>
</tr>
<tr>
<td>Medications(^3)</td>
<td>CD</td>
<td>Not available</td>
<td>$27,502 ($3,313)</td>
<td>$2,034 ($2,702)</td>
<td>$2,050 ($2,651)</td>
<td>p&lt;0.01 moderate vs. mild, severe vs. moderate, severe vs. mild</td>
</tr>
<tr>
<td>TOTAL(^1)</td>
<td>SR</td>
<td>Not available</td>
<td>$2,801 ($3,005)</td>
<td>$1,965 ($1,693)</td>
<td>$1,641 ($1,827)</td>
<td>(\text{a} p&lt;0.0001) severe vs. mild ; (\text{b} p&lt;0.05) severe vs. moderate; (\text{c} p&lt;0.05) moderate vs. mild</td>
</tr>
<tr>
<td>TOTAL(^2)</td>
<td>SR</td>
<td>$4,589</td>
<td>$10,811</td>
<td>$4,208</td>
<td>$2,860</td>
<td>(\text{a} p&lt;0.05) all pairwise comparisons</td>
</tr>
<tr>
<td>TOTAL(^3)</td>
<td>CD</td>
<td>Not available</td>
<td>$10,766 ($20,620)</td>
<td>$8,161 ($35,583)</td>
<td>$6,433 ($12,630)</td>
<td>p&lt;0.01 severe vs. mild; severe vs. moderate</td>
</tr>
</tbody>
</table>

SR=Self Report
CD = Claims Data

Objective
Estimate U.S. prevalence and annual direct costs of severe, uncontrolled asthma

Methods
Review published epidemiological and cost studies to estimate:
1. The number of people in the U.S. with asthma
2. % of asthmatics with severe disease
3. % of those with severe asthma who are uncontrolled
4. Aggregate annual direct costs of asthma in the U.S.
5. % of asthma-related direct costs attributable to patients with severe disease
6. % of asthma-related direct costs attributable to patients with severe disease who are uncontrolled
Estimated U.S. Annual Direct Costs of Severe, Uncontrolled Asthma

- Approximately 8.4% of the U.S. population (26 million) currently has asthma¹
  - 19 million adults (age ≥18 yrs)
  - 7.0 million children
- An estimated 5-10% of those with asthma (1.3 – 2.6 million) have severe disease²-⁴
- 50% of those with severe asthma remain uncontrolled⁵
- Estimated U.S. annual asthma-related direct costs are $56 billion⁶
- Approximately 50% of costs ($28 billion) incurred by patients with severe asthma²,³,⁷
- Patients with uncontrolled, severe asthma incur up to 3 times greater asthma-related costs than those with controlled, severe asthma⁸,⁹
  - $21 billion (75% of $28 billion)

³⁸% of total annual U.S. asthma-related costs ($21 billion / $56 billion) are incurred by 2.5% to 5% of all asthma patients (650,000 / 26 million to 1.3 / 26 million)

Annual asthma-related direct costs per severe, uncontrolled asthma patient are $16,154 to $32,308 ($21 billion / 650,000 to 1.3 million patients)

Comparisons: Average Annual Per-Patient Direct Costs of Asthma and Other Chronic Diseases

Of the 26 million Americans with asthma, 5-10% (1.3 to 2.6 million) have severe asthma and 50% (650,000 to 1.3 million) remain uncontrolled.

At an estimated annual cost of $21 billion, this represents annual per patient direct estimated costs for severe, uncontrolled asthma of $16,000 to $32,000.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Average Annual Per-Patient Direct Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis and other rheumatologic disorders</td>
<td>$2,414</td>
</tr>
<tr>
<td>Diabetes (diagnosed and undiagnosed)</td>
<td>$5,787</td>
</tr>
<tr>
<td>All Cancers (4,5)</td>
<td>$10,185</td>
</tr>
<tr>
<td>Severe Uncontrolled asthma (lower estimate)</td>
<td>$16,154</td>
</tr>
<tr>
<td>Severe Uncontrolled asthma (higher estimate)</td>
<td>$32,308</td>
</tr>
<tr>
<td>Lung cancer (4,6)</td>
<td>$34,188</td>
</tr>
</tbody>
</table>

References:
Conclusions

38% of total annual U.S. asthma-related direct costs ($21 billion/$56 billion) are incurred by the 2.5-5% of asthma patients with severe, uncontrolled disease.

Annual direct per-patient estimated costs of severe, uncontrolled asthma:
$16,154 ($21 billion/1.3 million) to $32,308 ($21 billion/650,000)

At least 3 times greater than reported estimate for diabetes ($5,787)

Our higher estimate is roughly equivalent to estimated costs reported for lung cancer ($34,188)