Global burden of non-cystic fibrosis bronchiectasis: a simple epidemiological analysis

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Aims
• Non-cystic fibrosis bronchiectasis (NCFB) is a relatively rare condition in which bacterial respiratory pathogens frequently colonize the airways, often leading to recurrent exacerbations.1
• Although NCFB is classified as an orphan disease in the USA, there are limited data to quantify the burden of NCFB worldwide.1
• An Excel-based calculator (Microsoft) was developed to estimate country and regional prevalence of NCFB, based mostly on information from the literature.1
• An additional aim for the use of this calculator is to select patients with specific characteristics, such as Pseudomonas aeruginosa infection, or to identify patients with a certain number of exacerbations per year.1

Methods
Systematic literature search
• A systematic search of MEDLINE and PubMed (through to March 2011) was performed for original articles containing epidemiological information on: the prevalence rate of NCFB in the general population; the age and sex distribution of patients; the etiology of the disease; smoking status of the patients; the frequency of exacerbations; and the proportion of those with culture-positive sputum (including information on bacteria isolated in sputum).1
• Information was aggregated using a weighted average across multiple published studies to derive factors that were applied to all countries in the analysis.1

Assumptions for calculating NCFB prevalence
• Only three publications with prevalence information could be used to complete the analysis.1 4
• The sex- and age-specific population projections by country were obtained from the World Bank’s database of Health, Nutrition and Population statistics (HNPStats).1
• The prevalence by year of NCFB was estimated by applying age- and sex-specific prevalence rates to each country’s projections of population by age and sex.1

Assumptions for calculating exacerbation frequency
• Literature mostly reported an average number of exacerbations per year (between ~1.5 and ~3 exacerbations per year) and did not report exacerbation frequency distributions.4
• For this analysis, an average of 2 exacerbations per year was used.4
• Information from the US Bronchiectasis Registry Research in 2010 provided the only resource for exacerbations by frequency, with 40% of patients having no exacerbation in 12 months.13 This number seemed high and perception was that the value should be closer to 20%. For this Registry, it is known that NCFB patients with non-tuberculosis mycobacterial background were over-represented and that they tended to have fewer exacerbations. Therefore, the exacerbation frequency distribution was modified while maintaining the average exacerbations at ~2. This resulted in a share of patients (29%) with no exacerbations in 12 months.1

Assumptions for calculating bacterial species prevalence in sputum
• Thirty-one articles with satisfactory information on sputum culture results were found, some of which also included information on the percentage of patients who had negative culture results.1
• There is a high degree of variance in the data from the literature with regards to prevalence of each pathogen. Information was aggregated using a weighted average across multiple published studies.1

Systematic literature search
• The search yielded 97 publications: 33 gave quantitative epidemiological data in at least one of the specified categories for this study.1

NCFB prevalence analysis
• The sex- and age-specific rates of NCFB analyzed in this study resulted in an overall rate of 39.9 cases per 100,000 individuals, with an increasing prevalence rate by age as shown in Figure 1.1

Exacerbation frequency analysis
• Applying values derived from the analysis, 2.4 million patients have NCFB in 2012, with 1.9 million having bacterial growth in their sputum and 1.2 million having frequent exacerbations.1
• This study was sponsored by Bayer Pharma AG.

Application of the analysis outcomes on specific countries and globally
• Applying values derived from the analysis, 2.4 million patients have NCFB in 2012, with 1.9 million having bacterial growth in their sputum and 1.2 million having frequent exacerbations.1
• Table 1 depicts more data from various regions and countries, with estimations provided for 2020.1

Conclusions
• There is a clear lack of robust epidemiological data on NCFB in the literature.1
• For this reason, mean values derived from mostly European and US studies were applied to all regions and countries worldwide.1
• To date, it is uncertain whether prevalence itself or clinical factors associated with NCFB, such as number of exacerbations or type of colonizing bacteria, vary by region.1
• In summary, this epidemiology calculation demonstrates that there are substantial global numbers of NCFB patients who suffer from frequent exacerbations and who may need therapies that could potentially reduce the number of exacerbations. More data from individual regions and countries are needed to estimate global epidemiology of NCFB more accurately.1

Acknowledgments
• This study was sponsored by Bayer Pharma AG.

Table 1: Estimates of prevalence of NCFB patients >18 years worldwide in 2012 and 2020

<table>
<thead>
<tr>
<th>Region</th>
<th>Total number of patients (N)</th>
<th>Culture-positive sputum (N)</th>
<th>≥2 exacerbations/year (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2020</td>
<td>2012</td>
</tr>
<tr>
<td>Overall</td>
<td>2,410,102</td>
<td>3,060,035</td>
<td>1,828,641</td>
</tr>
<tr>
<td>Latin America*</td>
<td>245,358</td>
<td>370,828</td>
<td>186,633</td>
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<tr>
<td>Asia Pacific*</td>
<td>1,499,268</td>
<td>1,956,666</td>
<td>1,136,762</td>
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<tr>
<td>European Union*</td>
<td>206,042</td>
<td>229,726</td>
<td>157,740</td>
</tr>
<tr>
<td>USA</td>
<td>128,763</td>
<td>159,088</td>
<td>97,633</td>
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<tr>
<td>France</td>
<td>25,718</td>
<td>28,773</td>
<td>19,493</td>
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<td>Germany</td>
<td>35,297</td>
<td>37,657</td>
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<td>Italy</td>
<td>24,302</td>
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<td>Spain</td>
<td>18,452</td>
<td>20,377</td>
<td>13,990</td>
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<tr>
<td>UK</td>
<td>25,083</td>
<td>27,398</td>
<td>19,018</td>
</tr>
</tbody>
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References: