

Humanistic and economic burden of severe chronic obstructive pulmonary disease (COPD)

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Introduction

- COPD is a prevalent, progressive, incurable lung condition that causes airflow restriction and breathing difficulties, often referred to as emphysema or chronic bronchitis.^{1,2}
- COPD imposes a substantial burden on individuals and healthcare systems globally. As COPD advances, its burden increases, impacting patients' QoL, productivity, and healthcare costs.^{2,4}
- Understanding the humanistic, economic, environmental, and socio-demographic factors influencing COPD outcomes is essential for guiding effective management strategies.

Study objective: To identify and descriptively summarise the available evidence on the humanistic and economic burden of severe COPD. The impact of environmental and socio-demographic factors was also explored.

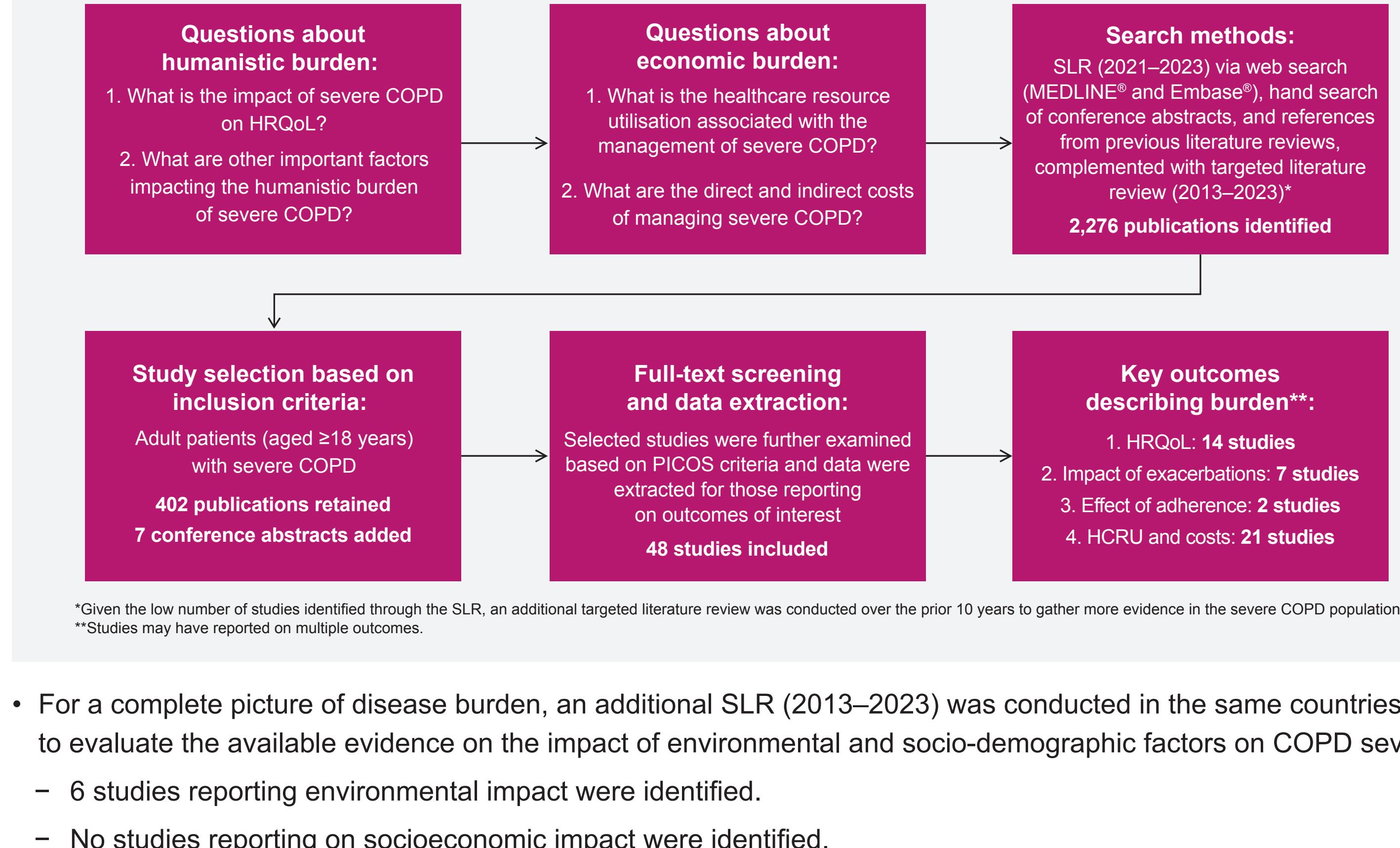
Methods

- A holistic SLR (2021–2023), complemented with a targeted literature review (2013–2023), was conducted on 17 November 2023 to evaluate the available evidence on the humanistic and economic burden of severe COPD (Figure 1). Here we present key outcomes, including:
 - 14 studies reporting on HRQoL, 7 on the impact of exacerbations, and 2 on the impact of treatment adherence.
 - 15 studies reporting on HCRU and 9 on costs.
- The following regions and countries were considered:



Figure 1. Humanistic and economic burden: SLR framework and search results

The SLR adhered to the Cochrane Handbook for Systematic Reviews of Interventions, the general principles of the Centre for Reviews and Dissemination guidance, and the PRISMA guidelines.



*Given the low number of studies identified through the SLR, an additional targeted literature review was conducted over the prior 10 years to gather more evidence in the severe COPD population.

**Studies may have reported on multiple outcomes.

- For a complete picture of disease burden, an additional SLR (2013–2023) was conducted in the same countries to evaluate the available evidence on the impact of environmental and socio-demographic factors on COPD severity:
 - 6 studies reporting environmental impact were identified.
 - No studies reporting on socioeconomic impact were identified.

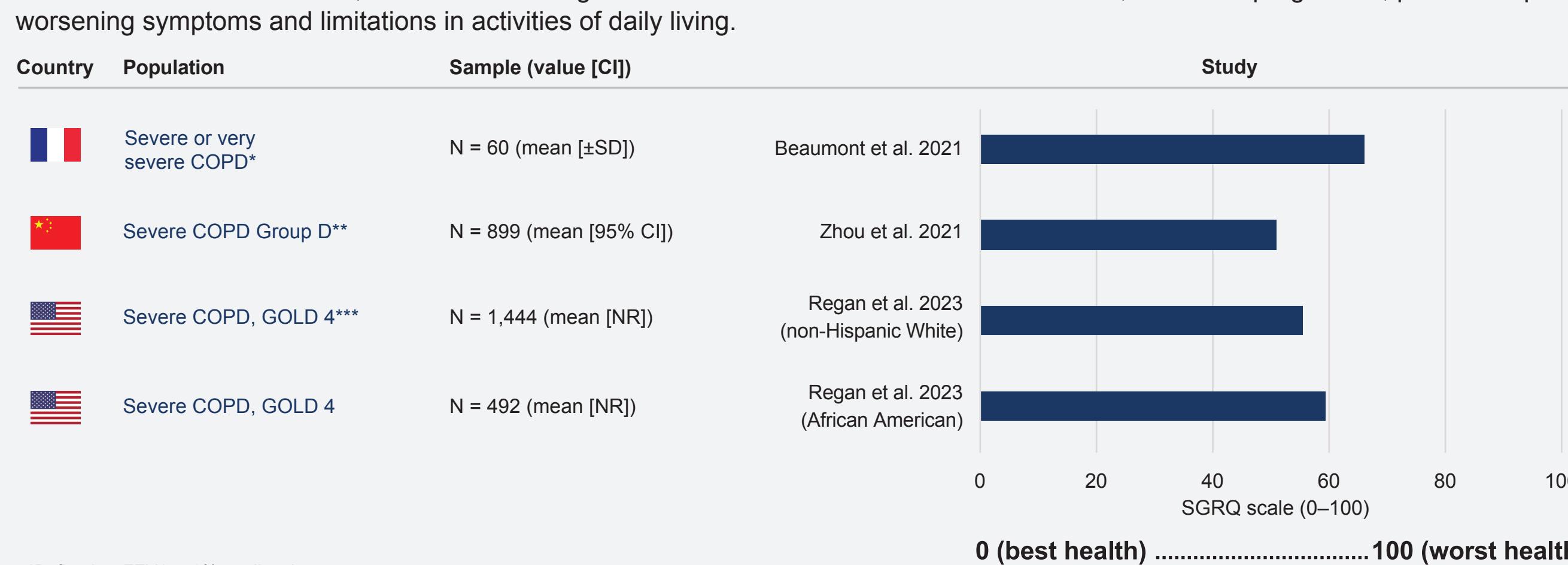
Humanistic burden

Impact on HRQoL

- Studies using disease-specific tools to measure HRQoL, such as SGRQ and CAT, revealed a substantial impairment in HRQoL, affecting both physical and psychological well-being of patients with severe COPD, which progressed as the disease advanced (Figures 2 and 3).^{5–10}

Figure 2. HRQoL (SGRQ) in patients with severe COPD at baseline or before treatment

SGRQ is a patient-completed questionnaire measuring the impact of COPD symptoms on QoL, activities, social functioning, and psychological state. In the reviewed studies, SGRQ results ranged between 51 and 66 and demonstrated that, as COPD progresses, patients experience worsening symptoms and limitations in activities of daily living.



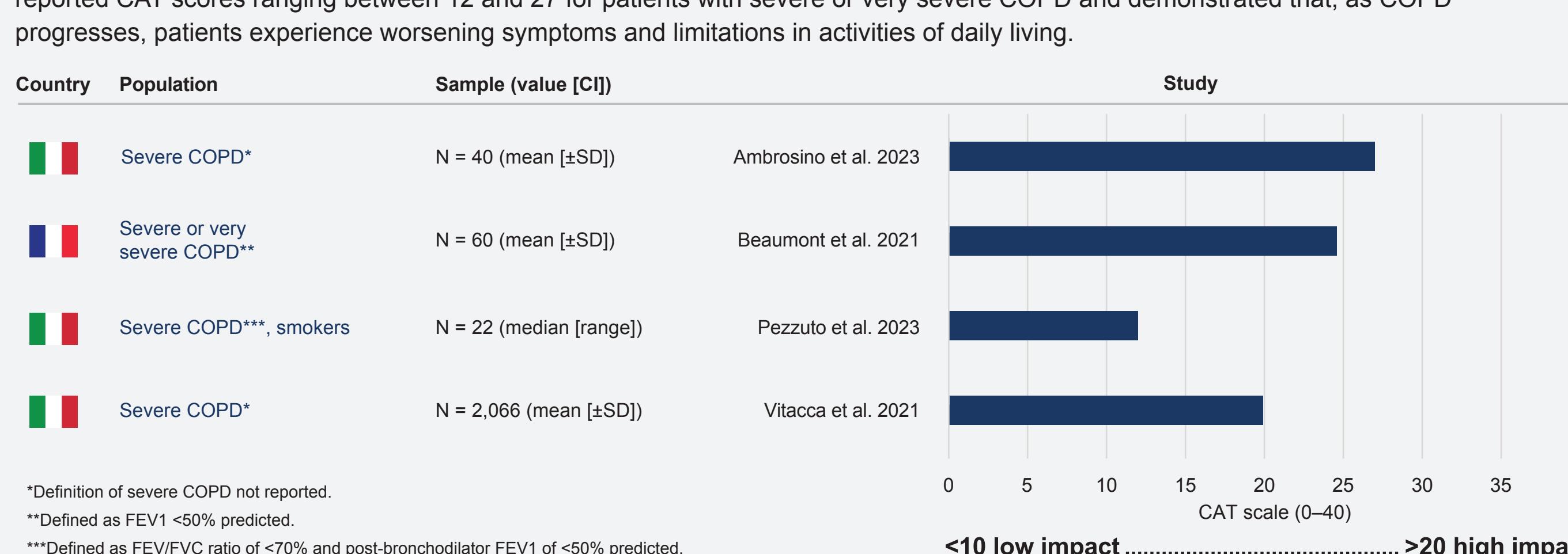
*Defined as FEV1 <50% predicted.

**Defined as (a) FEV1 <50% and COPD CAT score of 10, or (b) FEV1 ≥50% to <80% and a CAT score of 10, and either 2 moderate exacerbations or 1 severe exacerbation in the past year.

***Defined as FEV1 <30% predicted.

Figure 3. HRQoL (CAT) in patients with severe COPD at baseline or before treatment

CAT is a patient-completed questionnaire assessing the impact of COPD on people's health status. The results of the reviewed studies reported CAT scores ranging between 12 and 27 for patients with severe or very severe COPD and demonstrated that, as COPD progresses, patients experience worsening symptoms and limitations in activities of daily living.



*Definition of severe COPD not reported.

**Defined as FEV1 <50% predicted.

***Defined as FEV/FVC ratio of <70% and post-bronchodilator FEV1 of <50% predicted.

- Non-disease-specific tools, such as the 6MWD, mMRC, MFI-20, and SF-36, also demonstrated a decline in physical function, increased dyspnoea, and increased levels of fatigue with advanced COPD.^{5,11,12}
- Pulmonary rehabilitation and smoking cessation were reported as effective interventions, leading to significant improvements in various HRQoL metrics.^{7–10}

Abbreviations

6MWD, 6-minute walk distance test; CAT, COPD Assessment Test; CI, confidence interval; COPD, chronic obstructive pulmonary disease; FEV1, forced expiratory volume in 1 second; GOLD, Global Initiative for Chronic Obstructive Lung Disease; HCRU, healthcare resource utilisation; HRQoL, health-related quality of life; MFI-20, Multidimensional Fatigue Inventory-20 Questionnaire; mMRC, Modified Medical Research Council dyspnoea scale; NR, not reported; PEx, pulmonary exacerbations; PICOS, Population, Intervention, Comparison, Outcome, Study design; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; QoL, quality of life; SD, standard deviation; SF-36, Short Form-36; SGRQ, St George's Respiratory Questionnaire; SLR, systematic literature review; UK, United Kingdom; US, United States.

Other factors impacting humanistic burden

- Evidence showed that patients with severe COPD experienced a considerable burden of exacerbations, which escalated with disease severity and considerably affected health status.^{13–16}
- Evidence from two studies showed that patients who adhere well to their prescribed regimen were more likely to attain clinical control of COPD than those with poor adherence.^{17,18}

Economic burden

- The reviewed evidence consistently reported a high frequency of HCRU, including primary care visits, emergency department visits, and hospitalisations among patients with severe COPD, resulting in significant economic burden.
- Patients with severe and very severe COPD incurred higher direct costs versus those with mild or moderate COPD (see Figure 4 for examples from the US).^{19,20}
- Inpatient hospitalisations and exacerbations were major contributors to the increased direct costs observed in patients with more severe COPD (see Figure 5 for examples from Germany and the UK).^{21,22}
- Indirect costs were also higher in severe and very severe COPD compared with mild or moderate COPD (see Figure 6 for examples from Germany and Spain).^{23,24}
- Although direct comparisons cannot be made between different studies due to differences in study methodologies, the economic burden of COPD varied considerably across countries, which may, in part, reflect differences in healthcare systems, disease management practices, and socio-economic factors.^{23–25}

Figure 4. Examples of population-level direct healthcare costs increasing with higher COPD severity in the US

Direct healthcare costs included primary care visits, emergency department visits, and hospitalisations.

In 2015, total all-cause direct costs were ~3x higher in GOLD Stage 4 vs GOLD Stage 1.

In 2014, total all-cause direct costs were ~1.6x higher in GOLD Stages 3 or 4 vs GOLD Stages 1 or 2.

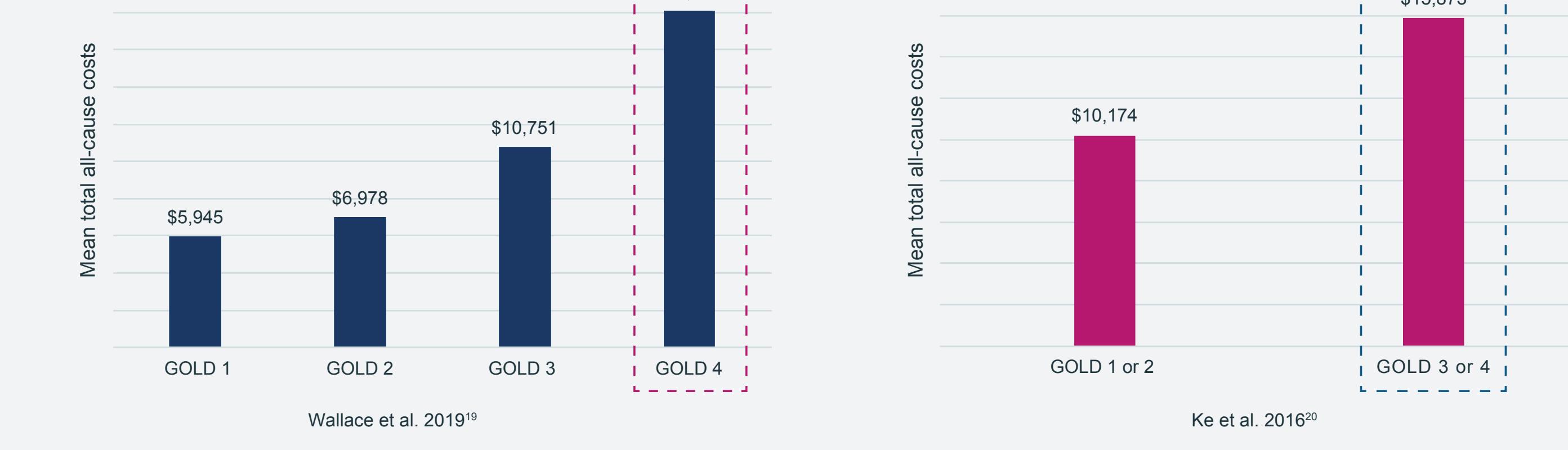


Figure 5. Key drivers of increased costs associated with severe COPD: examples from Germany and the UK

Costs associated with hospitalisations were higher across all stages and increased with increasing GOLD stage.

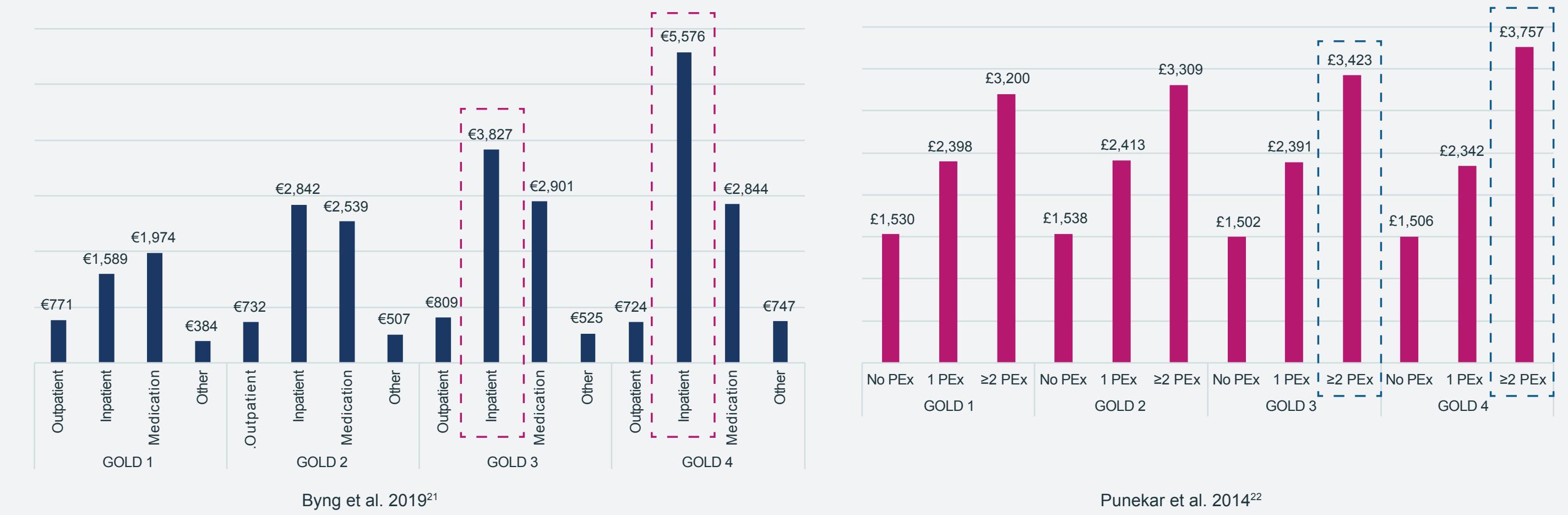


Figure 6. Examples of indirect costs increasing with higher COPD severity in Germany and Spain

In 2012, total annual indirect costs per patient were ~2.3x higher in GOLD Stage 4 vs GOLD Stage 1.

In 2015, total annual indirect costs per patient were ~7.8x higher in GOLD Stage 4 vs GOLD Stage 1.



Environmental and socio-demographic impact

- Exposure to air pollutants both indoors and outdoors was generally associated with reduced lung function and increased hospital admissions in patients with severe COPD,^{26–29} although two studies did not find a direct correlation.^{30,31}
- While it is known that lower socio-economic and underprivileged populations have worse outcomes in chronic diseases, we could not retrieve specific studies on the burden of severe COPD in these populations, suggesting that more research is needed in this field.

Conclusions

- Severe COPD leads to substantial impairment in HRQoL, so there is a high need for interventions to improve disease control and symptoms management.
- Reducing frequency and severity of exacerbations, and increasing adherence to treatment, are also important targets for reducing disease burden.
- The cost of COPD is substantial and increases with disease severity. Cross-country differences highlight the need for tailored interventions that consider local healthcare contexts and socio-economic factors.
- Environmental factors may impact severe COPD outcomes, but further work is needed to fully elucidate this association.
- Evidence on the impact of socio-demographic conditions and access to healthcare on patients with severe COPD is lacking. Such insight could assist in optimising the management of severe COPD and should be further investigated.



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