A DELPHI REPORT

Global COPD Outlook

2035

COPENHAGEN INSTITUTE FOR FUTURES STUDIES

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Disclosures

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The Copenhagen Institute for Futures Studies independently designed the questionnaire and carried out the analysis, along with all insights and recommendations presented in the report.

RESPIRATORY HEALTH INITIATIVE

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Content

Executive Summary

Chronic obstructive pulmonary disease (COPD) affects an estimated 300 to 400 million people worldwide[1] making it the third leading cause of death globally. COPD has a wide range of negative impacts, including individuals' diminished quality of life and health outcomes, significant social and financial costs, as well as overburdened healthcare systems worldwide[2 3]. Public awareness, however, is alarmingly low, with an Ipsos poll revealing that 45% of people cannot correctly identify COPD as a lung disease[4]. This lack of awareness, coupled with insufficient funding and the impact of socioeconomic inequalities, exacerbates the issue[5].

The most common cause of COPD is exposure to tobacco smoke in high-income countries (HICs), while both tobacco smoke and indoor and outdoor air pollution are major contributing factors in low- and middle-income countries (LMICs). Despite its largely preventable nature, COPD remains underrecognised and inadequately prioritised especially in LMICs[6], where more than 90% of COPD deaths occur[7], despite these countries only accounting for 83% of the global population. Limited access to care and a lack of awareness combined with inadequate policies further exacerbate outcomes.

The systemic burden of COPD and its steady, rising prevalence, with an estimated increase to 600 million people by 2050 with the greatest growth in numbers and higher morbidity in LMICs, highlight the need for an integrated approach to its prevention and management. This includes raising awareness about COPD, developing a robust understanding of how health systems manage the condition, and identifying the best practices that support its prevention and improve outcomes of COPD patients.

The Copenhagen Institute for Futures Studies (CIFS), supported by an independent, expert steering committee, conducted a Delphi study, with the participation of experts from 39 countries, to collect insights on COPD care and expectations on how the future of COPD care will look like. The response period ran from May to August 2024 resulting in 95 responses.

The Delphi study highlights key global challenges in prevention, diagnosis, and management of COPD offering actionable solutions to address these gaps. The overarching goal with this study is to collect the knowledge that would aid in avoiding the unnecessary burden of COPD and achieving better and more equitable health outcomes for COPD patients. Calls to action are derived from expert insights but are also widely supported by relevant findings and cases of use in different settings.

The following globally shared COPD challenges were identified

- **Under- and misdiagnosis:** Poor access to diagnostic tools, particularly spirometry, weak reimbursement models, lack of training of healthcare professionals.

- **Insufficient and inadequate policies:** Lack of or poorly implemented laws, guidelines and policies – particularly national COPD strategy or guidelines and tobacco policies.

- **Lack of or low awareness on COPD**
  - **Public:** Lack of understanding of COPD risk factors together with COPD perceived as a 'self-inflicted disease' by the public.
  - **Healthcare professionals:** Significant gap in knowledge, particularly regarding medication, guidelines and comorbidities.
  - **Policy makers:** Often without sufficient or any knowledge on COPD and its burden, affecting prioritisation of COPD compared with other non-communicable diseases (NCDs).

- **Low patient empowerment**

- **Limited access to quality treatment**

- **Fragmented care, regional disparities, insufficient resources**

- **Environmental factors, and rising risks of climate change**

Strongest Opportunities

- **Stronger policy implementation:** Due to significant lack of national COPD, but also risk factor policies implementation in many Delphi countries, strong, well implemented and comprehensive national policies can effectively enhance COPD care

- **Increased awareness:** While widespread lack of awareness is reported, findings show critical need for public and professional education for better prevention and management

- **Early diagnosis:** As misdiagnosis and late diagnosis of COPD are addressed by many respondents as an overarching issue, expanding access to spirometry and spirometry training in primary care is essential

- **Smoking cessation:** Although smoking cessation programs are available in many countries, they are not equally accessible for everyone, despite accessible smoking cessation programs being vital to prevention and management.

- **Address environmental risks:** Environmental risks still highly affect COPD

in many countries, reducing air pollution and occupational hazards could lower COPD rates.

- **Integrated care:** Many address issues related to accessibility of some services, lack of clear care pathways affecting care, better coordination between care levels, especially between primary and specialist care could greatly improve outcomes

- **Pulmonary rehabilitation:** Despite commonly addressed in policy, pulmonary rehabilitation and additional services for COPD patients are not always accessible in practice as planned; Expanding access to pulmonary rehabilitation and secondary and tertiary care could enhance patient quality of life.

- **Guideline alignment:** Many countries are aligning with Global Initiative for Chronic Obstructive Lung Diseases (GOLD) guidelines, ensuring standardised care.

- **Data usability:** Lack of standardised, high quality COPD data collection and recording: Improving COPD patient data quality and accuracy can aid in better planning, care, and management.

- **International harmonisation:** By 2035, many experts expect more unified COPD guidelines and practices globally, with knowledge customised to primary care settings.

- **Alignment of efforts:** Many of the above opportunities would have a higher chance of success if many countries /entities were moving forward on similar initiatives/goals.

Calls to action

- **Invest in COPD nurse-led clinics** globally, especially in underserved regions, to enhance early intervention and long-term management of COPD.

- **Intensify public awareness campaigns and educational programs** to increase COPD recognition, improve prevention efforts, and support patient empowerment.

- **Intensify smoking cessation programs and environmental regulations** with good implementation, particularly in regions with highest burden, to reduce COPD incidence.

- **Equip primary care centres with spirometry tools and provide training for healthcare professionals** to improve early diagnosis and management of COPD.

- **Develop integrated care pathways** to improve coordination between primary, secondary, and tertiary care, facilitating smoother patient transitions and reducing treatment delays.

- **Create national databases for standardised COPD patient data collection,** ensuring all healthcare providers can access and share information to improve care coordination and policy development.

- **Develop screening programs for lung function**, either as standalone targeted procedure, or integrated into broader chronic disease screening initiatives, to detect COPD early and prevent disease progression.

- **Implement outcome-based reimbursement models** that prioritise quality COPD care, encouraging healthcare providers to focus on long-term patient outcomes and reducing overall healthcare costs.

- **Expand digital and telehealth solutions**, with an emphasis on user-friendly designs and accessibility, to improve healthcare equity in regions with limited physical healthcare infrastructure.

- **Prioritise the availability of affordable pharmacological treatments** for COPD worldwide, addressing both supply chain issues and barriers for patients.

List of abbreviations

CIFS Copenhagen Institute for Futures Studies
COPD Chronic Obstructive Pulmonary Disease
GOLD Global Initiative for Chronic Obstructive Lung Diseases
HICs High-Income Countries
LMICs Low- and Middle-Income Countries
NCD(s) Non-Communicable Disease(s)
PROs Patient-Reported Outcomes
SDGs Sustainable Development Goals
OR Odds Ratio
QI Quality improvement

Acknowledgements

Steering Committee Members

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1. Background

The Global COPD Outlook aims to address critical gaps in the understanding of prevention, care and management of Chronic Obstructive Pulmonary Disease (COPD) by leveraging the insights of experts and advocates from around the world. By employing the Delphi method, a structured approach to gathering expert opinion[8], the study seeks to capture consensus and divergence in views on COPD care. Through this process, we aim to uncover challenges, opportunities, and effective strategies in COPD prevention, diagnosis, management, and policymaking. Ultimately, the study's goal is to inform decision-makers on best practices and future directions in COPD care, with the long-term objective of improving patient outcomes, strengthening health systems globally, and increasing recognition of COPD.

An estimated 300 to 400 million people are affected by COPD worldwide[9], making it the third leading cause of death globally. COPD has a wide range of negative impacts, including individuals' diminished quality of life and health outcomes, significant social and financial costs, as well as overburdened healthcare systems worldwide[10 11].

Public awareness, however, is alarmingly low, with an Ipsos poll revealing that 45% of people cannot correctly identify COPD as a lung disease[12]. This lack of awareness, coupled with insufficient funding and the impact of socioeconomic inequalities, exacerbates the issue[13].

The most common cause of COPD is exposure to tobacco smoke in high-income countries, while both tobacco smoke and indoor and outdoor air pollution are major contributing factors in low- and middle-income countries (LMICs), where these risk factors are highly associated with COPD deaths. However, with the right policies, COPD and its impacts are largely preventable. Despite its largely preventable nature, COPD remains underrecognised and inadequately prioritised especially in LMICs, where more than 90% of COPD deaths occur[14], despite these countries only accounting for 83% of the global population. Limited access to care and a lack of awareness combined with inadequate policies further exacerbate outcomes[15 16].

The systemic burden of COPD and its steady, rising prevalence, with an estimated increase to 600 million people by 2050 with the greatest growth in numbers and higher morbidity in LMICs[17], highlight the need for an integra-

ted approach to its prevention and management. This includes raising awareness about COPD, developing a robust understanding of how health systems manage the condition, and identifying the best practices that support its prevention and improve outcomes of COPD patients.

The focus of The Global COPD Outlook was to investigate the knowledge and insights of experts and advocates internationally and communicate it to decisionmakers with the goal of improving both patient health outcomes and health system approaches to respiratory health.

Understanding challenges and barriers, but also opportunities and best local and global care practices on COPD prevention, care and management can lead to a more comprehensive and informed COPD care. To this end, CIFS together with the support of an independent, expert steering committee has conducted a Delphi survey to obtain experts' knowledge and opinions on COPD care as well as expectations on how the future of COPD care will look like.

The two-round study, using the Delphi method[18 19], ran from May to August 2024. The study aimed to:

1. **Identify challenges and opportunities:** Map experiences with COPD prevention, diagnosis, and management from the perspective of healthcare policymakers, professionals, and patients to identify key challenges, opportunities, best practices, and weaknesses.

2. **Influence policies:** Understand experts' perceptions of key stakeholders influencing COPD policies and strategies, the potential regional differences in these policies, and health system-level changes that could enhance patient outcomes.

3. **Evaluate the use of current strategies:** Map experts' knowledge and perspectives related to COPD care plans, strategies, and guidelines, the level of alignment with the international standard of GOLD guidelines, the adherence to these guidelines in healthcare settings, and the elements that should be included in a robust COPD guideline.

4. **Assess access to care:** Evaluate experts' perspectives on patients' access to care and their country's capacity to meet patient needs.

5. **Explore future perspectives:** Explore expectations for COPD care towards 2035, including the harmonisation of guidelines, sharing of best practices, change in the burden of COPD and the prioritisation of COPD in resource allocation.

6. **Identify major areas of agreement and disagreement:** Build consensus between stakeholder groups regarding ideal strategies, solutions, and priorities for the improvement of COPD care and patient outcomes.

The study additionally aims to provide additional arguments for higher prioritisation of COPD in future policy and decision-making, deepening the knowledge on the scope of the burning platform.

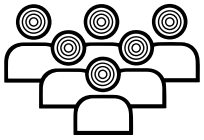
2. Discussion and calls to action

The findings from the Delphi study highlight significant challenges in prevention, diagnosis, and management of COPD globally. On the other hand, they also identify opportunities for improvement, areas for prioritisation, and best practices to use as solutions. Calls to action are derived from expert insights but are also widely supported by relevant findings and cases of use in different settings.

2.1. CALLS TO ACTION

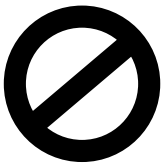
- **Increase investments in COPD nurse-led clinics globally, especially in underserved regions, to enhance early intervention and long-term management of COPD.**

A low-cost solution to relieve pressure on the healthcare systems and improve COPD outcomes has been commonly suggested by Delphi respondents. This finding is supported by a study on a program implemented in Hong Kong,[20] showing strong evidence of long-term survival, decreasing mortality risk compared to usual outpatient care. A similar practice has been implemented in the Australian context[21], while there is also evidence on the mental health effects of this type of patient support[22]. Furthermore, a systematic review and meta-analysis[23] that evaluated the effectiveness of nurse-led interventions in COPD patients found that nursing management significantly improved patients' quality of life, emotional state, and pulmonary and physical capacity. The interventions were categorized based on the care setting: hospital, respiratory, and primary nursing care. Empowering nurses to lead these clinics, particularly in regions with physician shortages, can offer a sustainable and efficient care model that ensures timely management of exacerbations and enhances patient support.



- **Governments, healthcare providers, and advocacy groups should intensify public awareness campaigns and educational programs to increase COPD recognition, improve prevention efforts, and support patient empowerment.**

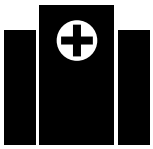
Low awareness of COPD risk factors and its societal burden remains a big challenge. In line with our Delphi recommendations, several articles show that public awareness campaigns[24] can help with changing the perception of COPD as the 'smoker's disease' thus reducing its stigma and empower patient adherence and self-efficacy[25], demonstrated by findings from Egypt. A decade-long awareness initiative in Ebina City, Japan[26], underscores the importance of public awareness campaigns. The campaign included public lectures, pulmonary function tests, and questionnaires assessing symptoms and knowledge of COPD. Among 1,206 participants over the age of 40, COPD was suspected in 5.6%, indicated by an FEV_1/FVC ratio of less than 0.70. Most of these individuals were previously undiagnosed, and half had not consulted any medical institution despite experiencing symptoms like cough and shortness of breath. One nationwide survey in Korea among current smokers found that while 60.6% of participants reported COPD-related symptoms, only 1.2% had been diagnosed or treated for the condition[27]. These campaigns should be a part of national health strategies to drive behavioural change and reduce stigma.



- **Governments and healthcare organisations should intensify smoking cessation programs and environmental regulations with good implementation, particularly in regions with highest burden, to reduce COPD incidence.**

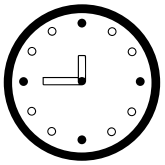
Despite COPD risks being a topic of many policies, there are still problems with successful implementation according to to a majority of the participants, especially in the case of smoking cessation. Some participants, and particularly those from LMICs, mention inadequate implementation of occupational exposure and environmental regulations, as well as regular use of biomass fuel in several regions. The importance of tackling these factors is demonstrated by findings on smoking as being the most critical individual risk factor, with current smokers having an odds ratio (OR) of 3.2, and ever smokers having an OR of 2.3 for developing COPD[28]. Smoking cessation is, therefore, a primary intervention for COPD prevention and management. In other words, implementation of comprehensive smoking cessation programs is paramount, with the inclusion of behavioural counselling, pharmacotherapy, and ongoing support to help individuals quit smoking and prevent relapse. Environmental factors like air pollution and temperature fluctuations contribute significantly to the exacerbation risk in COPD patients[29]. Another substantial risk factor is biomass exposure, particularly in LMICs where such practices are more prevalent. Mitigating exposure through cleaner fuel alternatives is essential to reduce COPD incidence in these populations[30]. Another significant factor is occupational exposure to dust, smoke, and chemical agents[31]. Emphasising the management and mitigation of risk factors is crucial in the fight against COPD. By addressing both environmental[32] and individual factors through comprehensive strategies involving policy changes, public health initiatives, and personalised interventions, it is possible to reduce the incidence of COPD and improve outcomes for those affected by the disease[33 34]. Collaborative efforts between govern-

ments, healthcare providers, employers, and communities are essential to implement these strategies effectively.



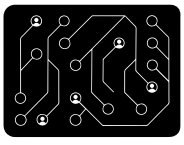
- **Equip primary care centres with spirometry tools and provide training for healthcare professionals to improve early diagnosis and management of COPD.**

Primary care practitioners – including general practitioners, nurses, pharmacists, physiotherapists, and community health workers – are often the first point of contact for patients and play a crucial role in COPD management, especially in settings with limited respiratory specialists[35] as reported by many countries in the Delphi. Our findings are also supported by a study that identified challenges for healthcare teams due to insufficient knowledge on COPD together with inadequate resources and tools for prevention, diagnosis and management[36]. The lack of organisation and coordination within COPD services leads to challenges such as inadequate screening, poor interprofessional communication, and low treatment adherence, all related to underdiagnosis and suboptimal disease management. Quality improvement (QI) collaboratives show promising effects in tackling this issue. Many findings emphasise the need for raising awareness and improving training of health workers. One study demonstrated that patients switching from multiple-inhaler triple therapy (MITT) to once-daily single-inhaler triple therapy (SITT) in a primary care setting experienced significantly fewer exacerbations and lower healthcare resource utilisation[37]. A strong, educated, and resource-equipped primary care system is essential for the effective prevention and management of COPD, particularly in LMICs where the disease burden is highest.



- **Develop integrated care pathways to improve coordination between primary, secondary, and tertiary care, facilitating smoother patient transitions and reducing treatment delays.**

Integrated care models for patients with COPD hold the promise to better outcomes of care but were also associated with better access to care for patients according to Delphi participants. This is perspective is also demonstrated by other research findings, an example is a clinical outcomes study, where the application of the COPDnet integrated care model resulted in a significantly better health status in patients with COPD[38]. Holistic models for integrated care also show promising results in improving care, but also patient quality of life[39]. Findings also show higher cost-effectiveness of integrated disease management in high risk, exacerbation prone patients with COPD in primary care compared to the standard care[40]. Fragmented care remains a significant challenge, particularly in regions with a lack of communication between primary and secondary care providers. Improved coordination between these levels of care is essential for effective COPD management.

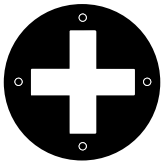


- **Create national databases for standardised COPD patient data collection, ensuring all healthcare providers can access and share information to improve care coordination and policy development.**

As discovered by many different responses in the Delphi, inconsistent record-keeping is a common practice in many countries. Data fragmentation and inconsistent record-keeping hinder our understanding of the true burden of COPD. A standardised system for recording COPD data would improve healthcare planning, resource allocation, and patient outcomes. Some promising findings in this field discover future possibilities, as for example the Europe-wide consensus Delphi to standardise the assessment and care of patients hospitalised for COPD exacerbations[41], indicating broad understanding of the gaps. Findings also show inconsistency in methods of identifying COPD in electronic health records and the lack of clinically important variables in healthcare databases globally[42]. However, a Clinical Data Practice Research Datalink in the UK, shows that possibilities for better patient data recording exist, as patients with COPD can be accurately identified from the UK primary care records using specific diagnostic codes with high accuracy[43].

- **Develop screening programs for lung function, either as standalone or integrated into broader chronic disease screening initiatives, to detect COPD early and prevent disease progression.**

According to Delphi participants, early detection in targeted, and in some instances even population-based COPD testing might be a cost-effective approach to tackle COPD burden. This is also demonstrated by research findings. One simulation modelling study in China discovers that offering public programs for COPD screening like existing preventive health services for other chronic diseases could be a promising strategy to improve population health outcomes and mitigate the disease burden of COPD in China[44]. Portable spirometer screening was also shown to be cost saving compared to questionnaire screening and no screening in high-risk COPD patients in China[45]. A good example is also demonstrated in Brazil, with screening the population with hypertension for COPD due to shared risk factors, discovering potential for use of low-cost screening technics as questionnaires along with lung function testing[46]. Delays in diagnosis result in patients not receiving treatment until the disease is advanced. Incorporating lung function screening, such as spirometry, into routine healthcare, especially in primary care, can significantly improve early detection.



- **Implement outcome-based reimbursement models that prioritise quality COPD care, encouraging healthcare providers to focus on long-term patient outcomes and reducing overall healthcare costs.**

Our findings demonstrate general support for outcome-based reimbursement models in improving patient outcomes, but with a need for local, context-based implementation process for success. Outcome-based reimbursement models are supported by several studies. An example from Switzerland highlighted the fragmentation of COPD care, especially in acute exacerbations, affecting patients' disease management and self-care abilities[47]. In the Netherlands, single-disease management bundle payments were found less effective than patient-centred strategies for multimorbidity or complex health needs, the model promotes the integration of care across primary and secondary healthcare providers

and the social care domain, while improving quality of life[48]. Similarly, a study in the United States demonstrated that adequate reimbursement for services like pulmonary rehabilitation ensures financial viability for providers and improves patient access to these beneficial programs[49]. Healthcare reimbursement models that would incentivise positive patient outcomes rather than volume of care can lead to better COPD management. Incentives for healthcare providers for improved quality of life in patients, less exacerbations, and higher adherence to treatment plans also need to be implemented well and take local context into consideration to work.

- **Expand digital and telehealth solutions, with an emphasis on user-friendly designs and accessibility, to improve healthcare equity in regions with limited physical healthcare infrastructure.**

High levels of support are reported for digital health solutions by Delphi participants. In support of this, several studies demonstrate high potential of digital solutions to remodel COPD care and management and meet the unmet needs[50]. Digital health can support early diagnosis and management of COPD[51]. One systematic review of randomised controlled trials discovers that digital health pulmonary rehabilitation can be more effective than traditional pulmonary rehabilitation in improving the pulmonary and physical outcomes for people with COPD[52], while another study also shows superiority of telemedicine COPD management compared to the usual approach[53]. As many findings come from HICs, one systematic review demonstrated the potential for low-cost interventions in COPD in a form of a smartphone-enabled home-based self-management informatics platform in India[54]. Digital health tools and telemedicine offer significant potential to improve access to COPD care in regions with healthcare disparities. However, these tools must be designed with ease of use and equity in mind, ensuring that all patients can benefit, as per Delphi findings. Some findings demonstrate that using machine learning methods integrated with EHRs could help improve high-risk patient detection in COPD patients[55], thus predict hospital readmissions.

- **Prioritise the availability of affordable pharmacological treatments for COPD worldwide, addressing both supply chain issues and barriers for patients.**

Many respondents highlight a lack of access to certain COPD medications or to COPD medication in general in their countries. This limited access stems largely from high costs that make treatments unaffordable, as well as from policies that introduce additional complexities in obtaining essential medications. Access to affordable COPD medication is still inconsistent, particularly in underserved populations and regions[56], seeking geographical or financial barriers to care. The challenges are increasing due to under-resourced healthcare systems. The lack of availability and affordability of diagnostic tools, pharmacological treatments, and non-pharmacologic therapies exacerbates the disease burden, indicating medication access as essential for enhancing COPD diagnosis and care in LMICs. Availability of low-cost treatments would significantly improve access, especially in LMICs, where they are often not accessible or affordable[57]. One study in Russia concluded that low affordability

of essential baseline therapy drugs contributes to the COPD burden and emphasised the need to improve drug supply mechanisms, especially for individuals with low income[58]. However, several Delphi respondents also address importance of improving access to specific, innovative treatments like triple inhalers or biologics in their countries, while some also mention issues regarding reimbursement policy, or bureaucratic barriers. These issues are most addressed in HICs experiencing high burden of COPD, but also relatively high inequity in treatment access.

3. Methodology

The research team designed a two-round questionnaire for the collection of a wide range of COPD-specific information. The first round of the questionnaire included combination of open ended and fact finding questions, i.e., several sections exclusively contained open-ended questions and statements seeking the expert opinion of respondents to identify whether a degree of consensus existed among the group (e.g., "The burden of COPD in my country will place significantly more strain on my country's health care system by 2035."), whereas other questions sought to collect information of a purely factual nature (e.g., "Does your country have an action plan for COPD?"). The second round of the questionnaire focused solely on consensus-seeking questions, as consensus was reached for open-ended and main topics of focus were detected from Round I.

The questionnaire forms were validated by an independent expert group, the COPD Index Steering Committee before being submitted to respondents (see Appendix A for the questionnaire form, and appendix B for Steering Committee list). The COPD Index was developed by CIFS with the support of the previously referred independent, expert steering committee. The Index is a unique data tool that assesses how country health systems approach the care, management, and prevention of COPD.

The committee includes eight global COPD and health policy experts. The members were selected to balance clinical knowledge in COPD, patient organisation leadership, and expertise in health policy development and implementation.

The questionnaire was distributed online to 258 potential respondents. The response period ran from May to August 2024.

Respondents were selected based on the following occupational/professional criteria to maximise the diversity of responses:

- Civil servant with a role in a national public health institution or equivalent body.
- Medical respiratory specialist, preferably with an affiliation or assignment with a national health institution or research institution.
- Primary care physician with a background in respiratory health.
- COPD patient advocacy group representative.
- COPD patient.
- Carer for COPD patients.

95 responses covering 24 COPD Index countries were received. Qualitative data collected in the first round of the Delphi, such as examples of challenges to and opportunities for COPD diagnosis, prevention, and management identified by respondents were not used to calculate indicator or country scores.

3.1. METHODOLOGY ROUND I

The first round of the Delphi study consisted of introductory open-ended questions, as well as Likert-style questions with participants expressing to what extent they agree or disagree with a statement. Likert-style questions were followed by an open-ended field to enable participants to give a broader explanation for their answer, thus justify their choices with additional information. This information was of significant value when formulating the questions for the second round of the Delphi study. Respondents were asked to respond in their individual capacity as an expert, and not as a representative for or on behalf of any organisations with which they are affiliated.

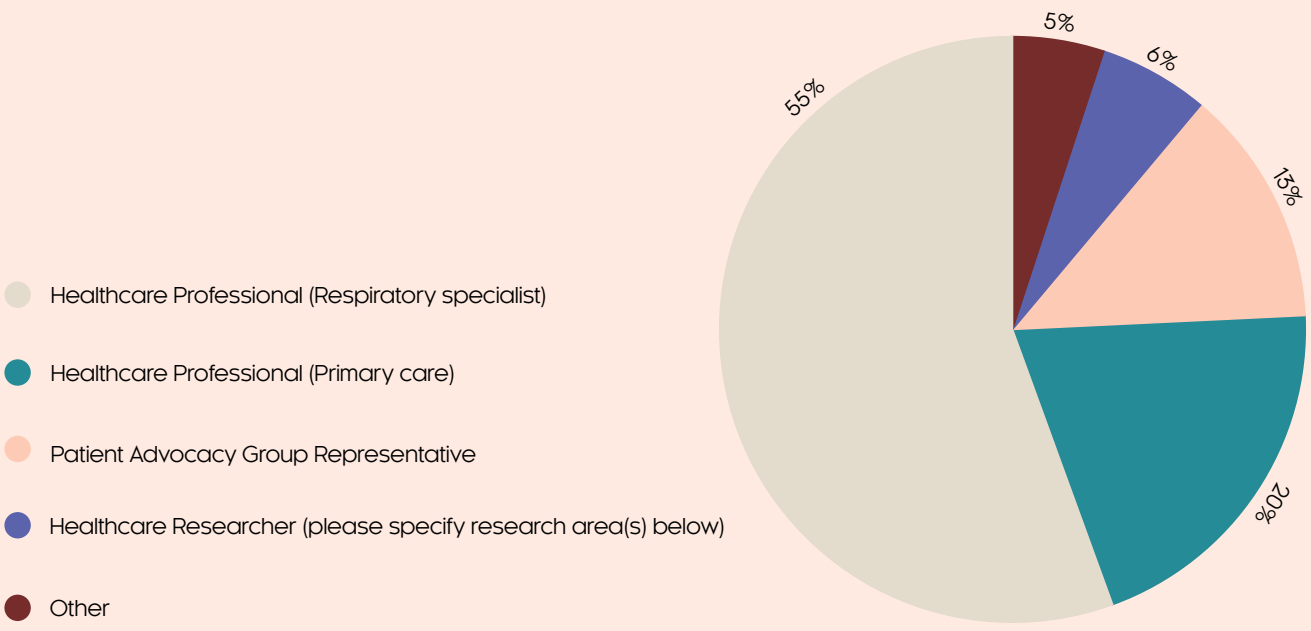
The survey was open from May 23rd to June 7th, 2024.

In line with Delphi methodology, respondents were allowed to change their responses at any time while the survey round was open if their perspectives changed. Although some respondents completed the survey together with colleagues or other members of their organisation, including an option to list additional contributors, the total number of participants reflects only the primary individual who submitted the responses. This means that while more individuals contributed to the Delphi process, only the main respondent is counted in the participant total.

95 out of 253 invited participants including experts and respiratory organisations fully filled out the survey, representing a 37.6% response rate. For details on survey respondents see Chart Figure 1.

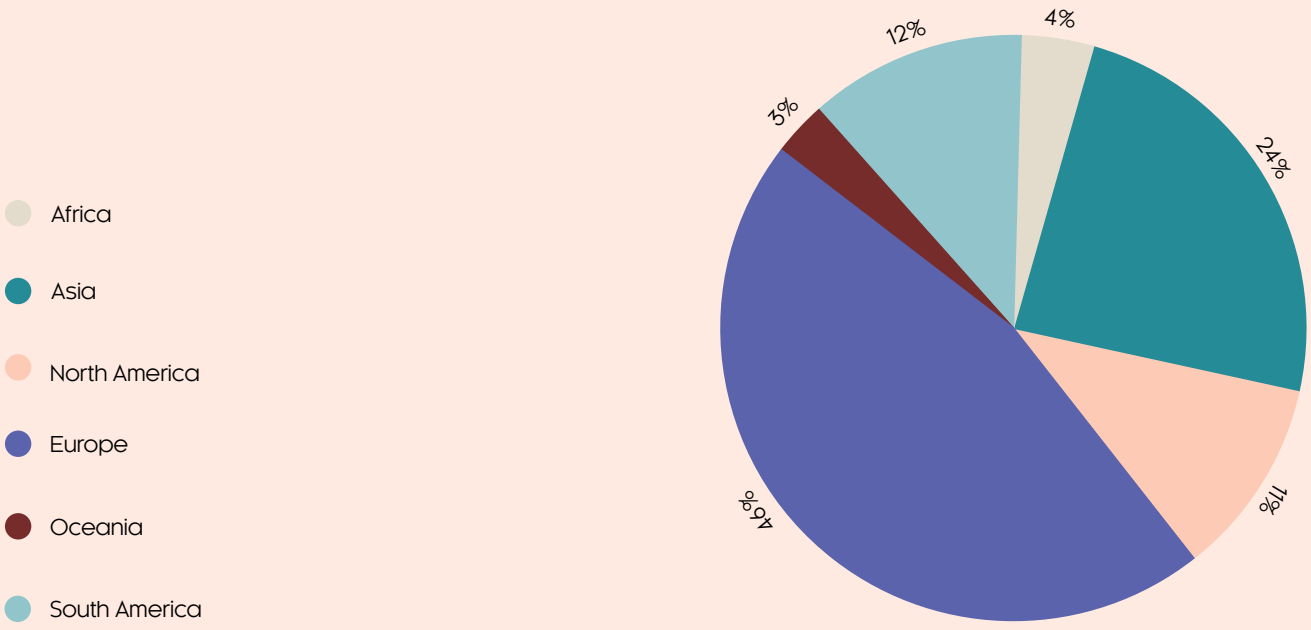
STAKEHOLDER CATEGORY

Figure 1 *Participant distribution by stakeholder category, Round 1.*



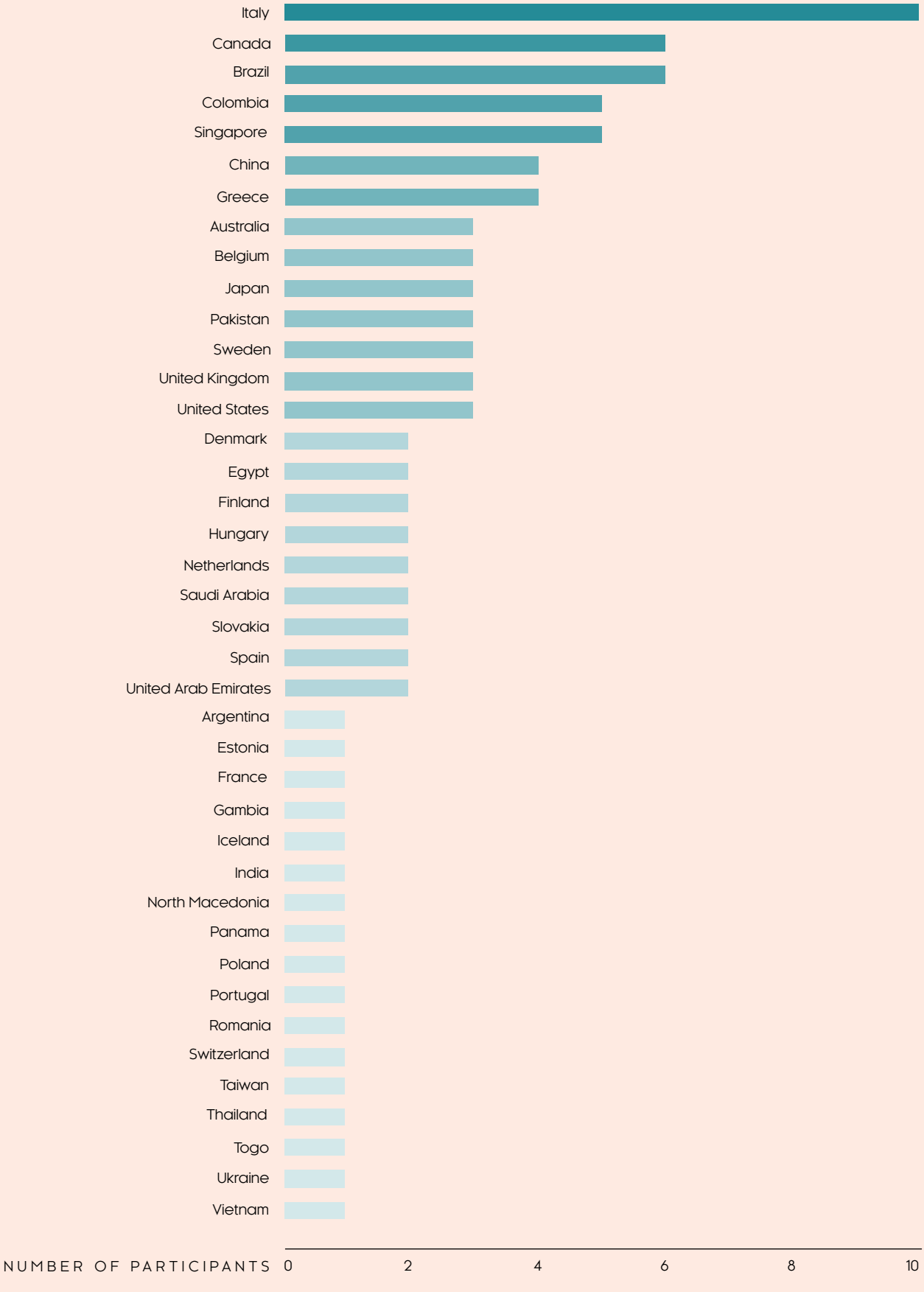
PARTICIPANTS REPRESENTATION PER CONTINENT

Figure 2 *Participant distribution by continent, Round 1.*



NUMBER OF DELPHI PARTICIPANTS PER COUNTRY

Figure 3 *Number of participants per country, Round 1.*



3.2. METHODOLOGY ROUND II

The second round of the COPD Care Foresight Study was primarily designed based on the answers from Round 1. Based on the answers of the first round's introductory open-ended questions, Likert-scale questions were developed for the Round 2. For example, in Round 1, participants were asked about the biggest challenges related to COPD care, management and treatment. Following this, participants were asked in Round 2 to rank the identified challenges in Round 1.

Based on those Likert-scale questions from Round 1 that had low consensus, new questions were developed. As these questions had an open field to allow participants to explain their choices, this information was of significant value when formatting the questions for the second round. For instance, consensus was not reached regarding the section on patients, access to care, and equity in Round 1 and thus Round 2 consisted of more questions on the practicalities regarding COPD care. Furthermore, most respondents stated that patients did not have access to digital tools in Round 1. Therefore, in Round 2, it was explored whether experts generally believe that access to telemedicine and digital tools would improve patient outcomes.

Round 2 consisted of sections on Challenges in COPD care, COPD guidelines and care approaches, Policymaking opportunities for COPD and a section on Telemedicine and digital tools for COPD. In total there were 15 questions from which 5 were Likert-scale (agree-disagree), 3 were open-ended questions. Similarly to the first questionnaire, respondents had the space after each question to explain or justify their answers with additional information.

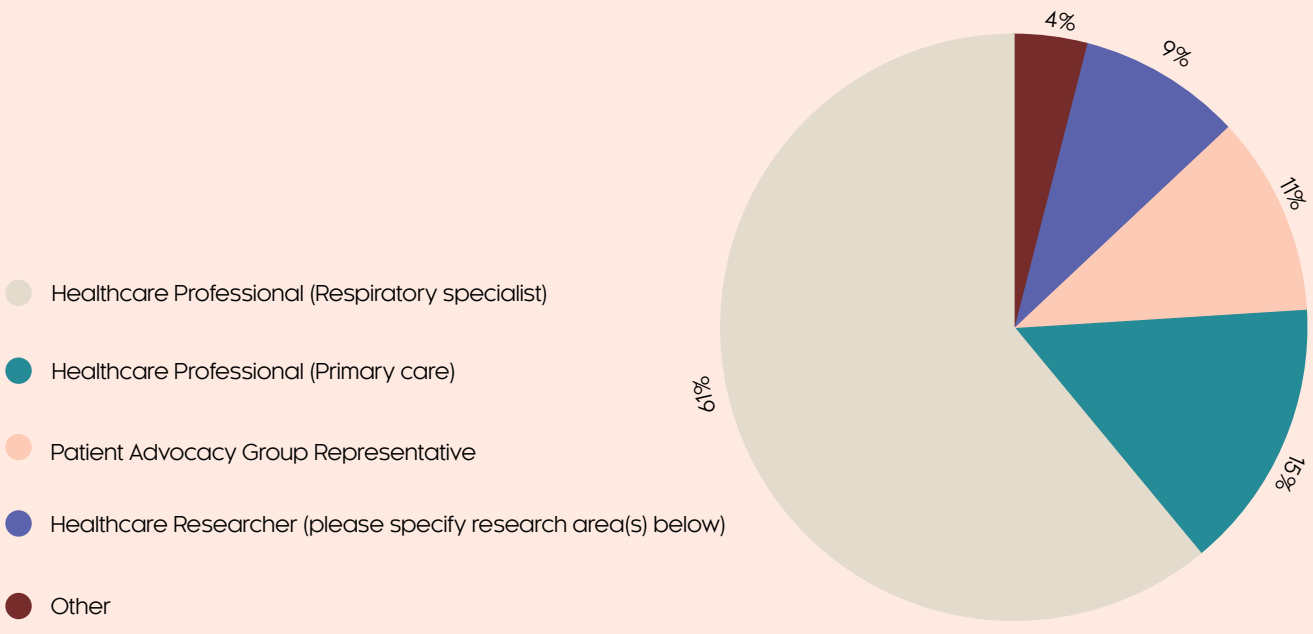
The survey was open from mid-June to August 2024. During this time, respondents were allowed to change their responses if their perspectives had changed. A total of 54 out of 95 participants including experts and respiratory organisations filled out the survey, representing a 57% response rate. Similarly to Round 1, the total number of participants reflects the number of primary persons filling out the survey even if they filled out the survey along with other members of their organisation. As with Round 1, respondents were asked to respond in their individual capacity as an expert, and not as a representative for or on behalf of any organisations which with they are affiliated.

Respondents were allowed to change their responses at any time while the survey round was open if their perspectives changed. Although some respondents completed the survey together with colleagues or other members of their organisation, including an option to list additional contributors, the total number of participants reflects only the primary individual who submitted the responses. This means that while more individuals contributed to the Delphi process, only the main respondent is counted in the participant total.

95 out of 254 invited participants including experts and respiratory organisations completed the survey round, representing a 37.6% response rate. For details on survey respondents see Figure 4.

STAKEHOLDER CATEGORY

Figure 4 *Participant distribution by stakeholder category, Round 11.*



4. Analysis

4.1. CONSENSUS IN DELPHI STUDY – ROUND I

In the Round 1 Questionnaire, there were 13 non-factual questions – asking respondents to express their perspectives and experiences with responses given on a Likert scale. Overall, 6 of 13 (46%) questions reached consensus, with consensus defined as a median threshold cut-off score of (66.67%) two-thirds, as standard practice in the interpretation of data generated in similar studies[59]. The section with the highest average level of consensus was "Future perspectives on COPD care", where all questions (5 out of 5) reached consensus, ranging from 75-84%. The section with the lowest average level of consensus was "Patients, access to care, and equity" where only 1 out of 8 questions reached the median threshold of 66.67%, with the consensus ranging from 31-62% for the remaining questions discussing the quality of COPD care, including data recording, patient adherence, access to care and medication, support, and resources in primary care.

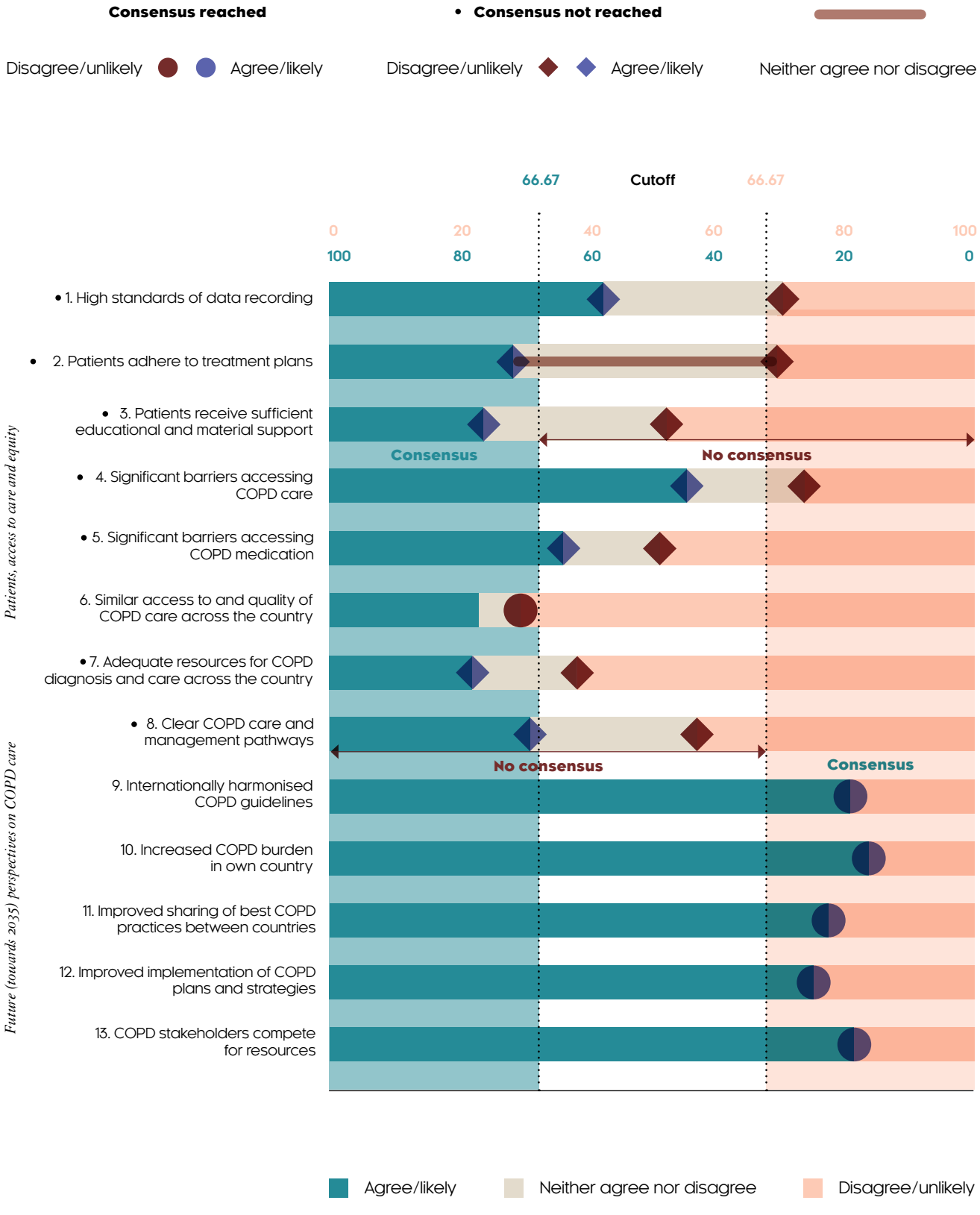
The results suggest that consensus is more easily reached on expectations about the future than on the current state of COPD care, access to care and adherence to treatment, partially explainable by different contexts, health system organisation, state of COPD care, policy, and health resources available in the country. However, a closer look at individual countries reveals that as the number of respondents from a given country increase, so does the level of disagreement among them. Additionally, differing responses to factual questions suggest a lack of awareness about COPD among various stakeholders within the country. This may also point to a semantic issue, where respondents interpret terms from the questions differently. For instance, one respondent stating that their country has a national COPD strategy but providing a link to guidelines instead.

The statements where consensus was not reached are:

1. In general, I believe that the recording of data meets sufficiently high standards of accuracy and usability.

2. Patients generally adhere well to treatment plans.

Figure 5 *Level of consensus per question, Round 1. Each coloured rectangle represents one side of the consensus. The purple-coloured area indicates that the majority agree, while the orange-coloured area indicates that the majority disagree. The position of the markers indicates the percentage of responses. If the percentage of the same responses has reached the cutoff of 66.67 %, it is marked by a circle, otherwise, both sides are represented by a cross. The bar between markers indicates that the majority neither agreed nor disagreed.*



3. Patients are generally given the educational and material support they need to manage their COPD after diagnosis.

4. Patients generally have significant barriers to accessing adequate COPD care (i.e. clinical interventions, hospital care, or seeing the doctor or getting home care) in my country.

5. Patients generally have significant barriers to accessing medication for COPD in my country.

6. Healthcare professionals in primary care settings generally have adequate resources to accurate and effectively diagnose and manage COPD in my country.

7. There are clear care pathways for COPD care and management in my country's health system.

Additionally, **all the respondents from countries that did not have a national plan or strategy to address either COPD or non-communicable diseases agreed that COPD prevention, diagnosis and management in their country would improve if their country had a plan or strategy for COPD**. This included respondents namely from Belgium, Greece, North Macedonia, Netherlands, Poland, Portugal, and Saudi Arabia. Notably, some respondents were not aware that their country had such a strategy and thus replied to this question. In general, however, even those respondents agreed with the statement.

4.2. CONSENSUS IN DELPHI STUDY – ROUND II

In the Round 2 Questionnaire, there were 5 non-factual questions – asking respondents to express their perspectives and experiences with responses given on a Likert scale. 4 out of 5 (80%) questions reached consensus, with consensus defined as median threshold of (66.67%) two thirds[60] with the level of consensus ranging from 59-85%. The results suggest that consensus is apparent among experts particularly regarding the potential use of telemedicine and digital tools for COPD (2 questions from the section Telemedicine and digital tools for COPD). The other questions were related to national COPD plans (1 question from the section COPD guidelines and care approached) and policy making opportunities (2 questions from the section Policymaking opportunities for COPD). Notably, there was low consensus on the potential benefits of an outcome-based financial incentive scheme, with 58.7% agreeing that it would lead to improved COPD care.

The statement where consensus was not reached is:

1. COPD care in my country would improve if an outcome-based financial incentive scheme were introduced for healthcare providers.

4.3. PREVENTION, DIAGNOSIS, AND MANAGEMENT OF COPD

In this section, the responses reflect a broad alignment of perspectives, highlighting a consensus reached on the key challenges, opportunities, best healthcare practices, strengths, and weaknesses related to COPD prevention, diagnosis, and management among participants.

4.3.1. Prevention

As anticipated, smoking was identified as a significant risk factor for COPD. This is largely due to the limited engagement with smoking cessation programs and the prevalent belief that COPD is a *"self-inflicted smokers' disease"*. Additionally, **environmental factors** are shown to hinder preventative efforts – such as air pollution, occupational exposures, and biomass cooking, with LMICs carrying the highest burden. Many participants argue that environmental policies have insufficient effects. Finally, there is a lack of public and professional knowledge and awareness on COPD, its prevention and societal impacts which impacts the care approach, but also understanding the risk factors.

"Smoking is a major risk factor for COPD, and China has one of the highest smoking rates in the world, particularly among men. Addressing the high smoking prevalence through comprehensive tobacco control policies and smoking cessation programs remains a significant challenge. Other challenges include the management of occupational exposure and air pollution."

– Chinese respondent

"The first spirometry for a diagnosis is performed quickly, it is more difficult to provide regular follow-up due to long waiting lists..."

– Italian respondent

4.3.2. Diagnosis

COPD is frequently underdiagnosed or diagnosed at late stage with misdiagnosis being common. Access to diagnostic tools, and specifically spirometry is severely lacking due to limited resources, workforce shortages, and for some, geographic barriers. The lack of diagnostic capacity is most pronounced in primary care, leading to fragmented and inconsistent practices. The limited availability of specialist care presents a significant challenge even in HICs, further exacerbating the problem.

4.3.3. Management

Access to treatment and care is limited, particularly within primary care set-

tings. The inadequate availability of healthcare resources, including medications and equipment, complicates efforts to manage COPD effectively. Poor communication and lack of shared knowledge across different sectors of care, together with a lack of integrated care results in fragmented care. This further reduces the accessibility of services; particularly pulmonary rehabilitation is widely inaccessible, along with often inaccessible smoking cessation programs. Low medication adherence and insufficient follow-up care also hinder effective disease management, as not enough efforts are aimed at self-management, patient empowerment, and regular follow-ups.

When ranking* the biggest challenges, participants acknowledge underdiagnosis (e.g., inadequate access to spirometry due to either regulatory restrictions or the lack of reimbursement policy), followed very closely by the negative social stigmatisation of COPD, and the inadequate collection and sharing of patient health data among HCPs/ health system organisations.

* Lowest average rank represents the biggest challenge (in this case underdiagnosis).

"Air pollution, climate change and rapid urbanization in Gambia where almost 95% of household use woodstoves with poor ventilation for domestic cooking will increase environmental exposures to particulate matter, coupled with a high smoking rate among men, mean that COPD prevalence will continue to increase in the foreseeable future."

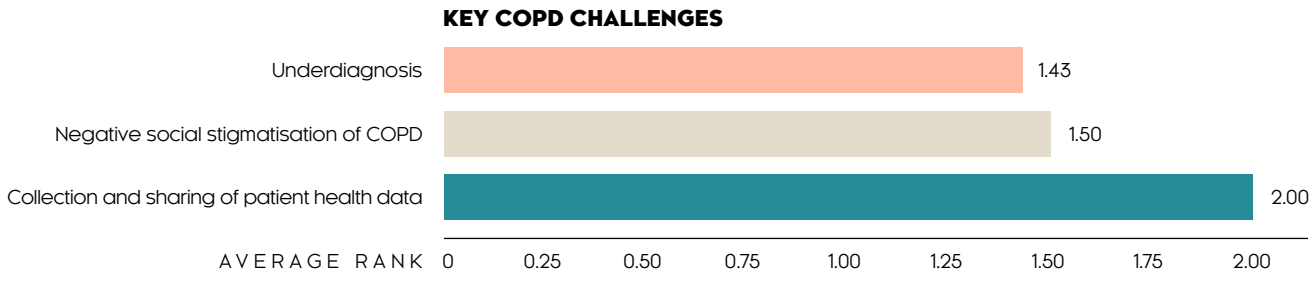
– Gambian respondent

"COPD is underdiagnosed because of lack of spirometry in primary care, smoking is at 38%, so prevention is not enough. Fragmented care. Lack of good collaboration with secondary care as primary care is undervalued."

– Greek respondent

4.3.4. Challenges Related to COPD Prevention, Diagnosis, and Management

Figure 6 *Please indicate which three challenges are the most important to address in order to improve COPD care in your country:*



"Developing and implementing integrated care models that involve multidisciplinary teams, including pulmonologists, primary care physicians, nurses, respiratory therapists, and other specialists, can ensure comprehensive management of COPD. Enhancing public health efforts, improving diagnostic capabilities, and adopting comprehensive management strategies can lead to earlier detection, better disease management, and ultimately, improved quality of life for COPD patients. Creating and disseminating educational materials that help patients understand their condition, treatment options, and self-management techniques. In Ukraine, improving COPD outcomes through public health initiatives presents a significant opportunity. Ukraine can make significant strides in improving the outcomes and quality of life for COPD patients."

– Ukrainian respondent

"To increase cost for cigarettes. Offer more smoking cessation programs, COPD awareness programs, spirometry screening such as case findings."

– Swiss respondent

"COPD may be missed despite health checkups. Many doctors are unaware that COPD is present in patients who see a general practitioner for hypertension, diabetes and so on. The disease COPD is not well recognised by the people. It is very important to raise awareness of COPD among doctors in charge of medical health checkup, general practitioners, and the public as a whole in Japan."

– Japanese respondent

Looking at region specific challenges on a global level, we notice somewhat varied primary challenges when addressing COPD care. Africa struggles most with inadequate awareness of risk factors among the general population, limiting preventive efforts. In Asia and North America, the biggest challenge is the inadequate management of multimorbidity, where COPD patients often have other chronic conditions that complicate care. Europe and South America primarily face underdiagnosis due to insufficient access to spirometry, making early detection difficult. In the Middle East, the leading issue is the non-differentiation between asthma and COPD in clinical guidelines, leading to misdiagnosis and inappropriate treatment. Oceania is most affected by low or inconsistent adherence to COPD care guidelines among healthcare providers, which results in uneven care quality across the region.

As the sample has a significant portion of (16) participants from Europe, looking specifically at this region demonstrates several distinct challenges. Underdiagnosis due to limited access to spirometry is a widespread issue affecting Eastern, Northern, Southern, and Western Europe. Inadequate support for patient self-management is a key concern in both Eastern and Northern Europe, while social stigmatisation of COPD is more pronounced in Northern and Western Europe. In Western Europe, there is also a lack of comprehensive lung function screening. Southern Europe faces issues with low adherence to COPD guidelines and limited access to pulmonary rehabilitation, while Eastern Europe struggles with insufficient smoking cessation services.

4.3.5. Opportunities for improvement

There is a significant potential for better COPD outcomes in comprehensive national **policy implementation and** enhanced public and professional **awareness** and knowledge of COPD. Expanding **early access diagnosis** through **spirometry** is most frequently addressed as a priority, particularly in primary care. Vital preventative strategies also lie in easy availability of smoking cessation programs and addressing environmental risk factors. Finally, developing **integrated, patient-centred care** is the overarching element of improvement – through better communication between different levels of care, stronger care referral pathways, accessible and available therapeutics and pulmonary rehabilitation.

4.4. COPD POLICY IMPLEMENTATION AND CHALLENGES

4.4.1. Stakeholders

In nearly every country analysed in the study, the most influential stakeholders in the development, implementation, and execution of policies, strategies, and guidelines that impact COPD patient outcomes and COPD prevention, diagnosis, and management were consistently the medical societies. This category includes specialised respiratory societies that directly influence clinical practice, education and policymaking such as The Thoracic Society of Australia & New Zealand (TSANZ), the Royal Australian College of General Practitioners (RACGP), and the British Thoracic Society. Government and policymakers are ranked second, as they are responsible for implementing national health strategies, determining insurance policies, and coordinating national health initiatives with the example of Denmark and Singapore. The third most influential are patient and advocacy organisations, which are increasingly prominent in some countries like Sweden, Poland and Canada, while their role is minimal in countries like Singapore. Pharmaceutical companies and industry play a strong role in the United States. Finally, universities and research institutions have a strong role in some countries, with the example of Belgium and Estonia. Nevertheless, most countries use a multi-stakeholder approach, with some of them simply being more influential in collaboration.

"Each province is responsible for the delivery of healthcare services in their jurisdiction. As such, the variations in COPD support are due to provincial budgets and priorities. As well, Canada is a massively large country. Healthcare services are very limited when you live 10+ hours of driving to the closest city or town with any form of healthcare, let alone respiratory care."

– Canadian respondent

"Australia has two main tiers of Government – A national approach for primary care and a state and territory approach for hospital care – this leads to national variation."

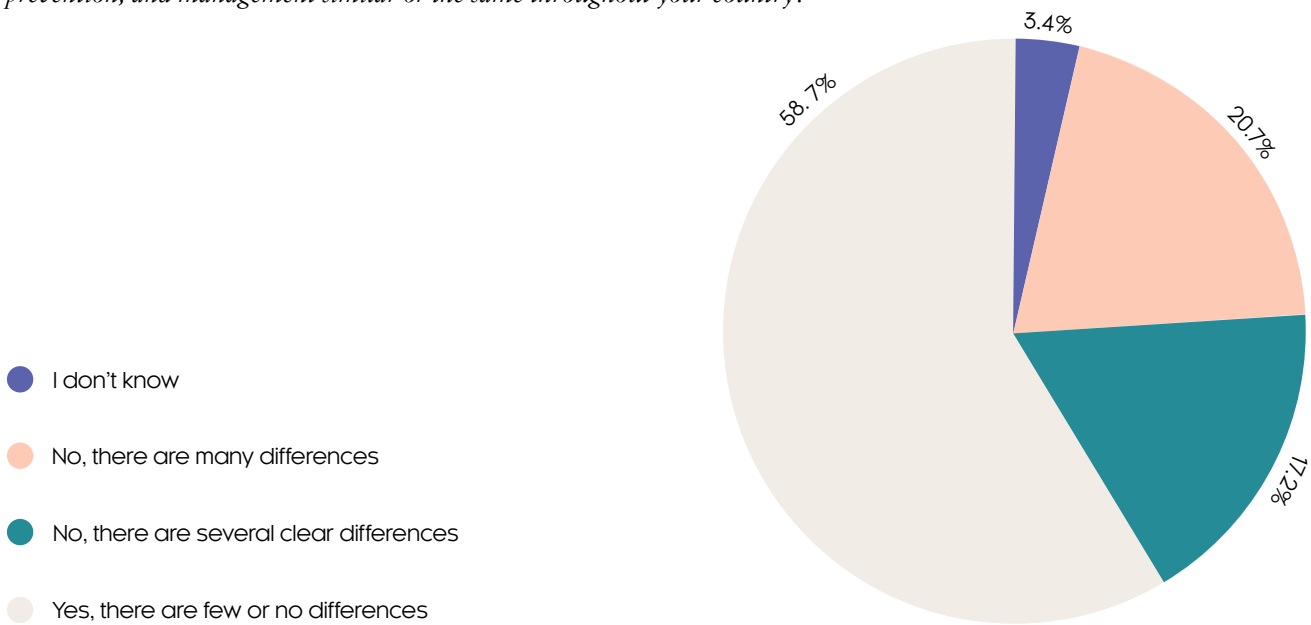
– Australian respondent

4.4.2. Policy and initiative consistency across countries

More than half (approximately 59%) of the respondents find that there are few to no differences in policies and initiatives to support COPD diagnosis, prevention, and management throughout their countries [More detail available in Figure 7]. On the contrary, 38% of the respondents believe that there are several or many differences, mainly due to parallel approaches or geographical differences within their countries. An example of this is Australia, with two main tiers of government with a national approach for primary care, and a territory approach for hospital care. Similarly, in Canada each province delivers the care in their jurisdiction, indicating differences related to provincial budgets and priorities, but also geography of the country and proximity of care.

POLICY AND INITIATIVE CONSISTENCY ACROSS COUNTRIES

Figure 7 *Are policies and initiatives to support COPD diagnosis, prevention, and management similar or the same throughout your country?*



4.4.3. Key Actions for Stakeholders to Enhance COPD Patient Outcomes and Alleviate Health System Burdens

Most respondents emphasise that early diagnosis is essential – especially the widespread access to spirometry and lung function testing in primary care, particularly highlighted in France and the United Kingdom. Expanding access to pulmonary rehabilitation to improve the quality of life, and disease management, especially in underserved areas, was an apparent issue in Australia and Canada among other countries. For reducing the prevalence, the recommendations are strong tobacco control measures, as well as smoking cessation programs, as noticed in Belgium. Health professional training and knowledge, highlighted by Swedish experts, but also patient and public awareness and advocacy are of high importance, along with strengthening collaboration between patients, governments, and the private sector in Singapore. Additionally, ensuring equitable access to pharmacological and non-pharmacological interventions is often highlighted as a high priority, especially in countries with varying access between urban and rural areas.

"(Stakeholders should engage in...) early diagnosis of COPD to reduce the COPD medical-economic impact, burden and comorbidities."

– French respondent

"(Stakeholders should engage in...) Improving the early diagnosis of COPD; enhancing adherence to medications in order to prevent exacerbation and disease progression."

– Hungarian respondent

4.4.4. Plans, strategies, and guidelines for COPD

16 out of all 39 countries in the study (40%) have both a strategy for NCD management and a separate respiratory health strategy that addresses COPD, 10 (25%) only an NCD strategy, 3 (7.5%) have a respiratory only strategy, while 17.5% (7 countries) have neither.

Figure 8 *Existence of national strategies or plans for COPD and NCDs.*

4.4.5. National COPD plan alignment with SDGs

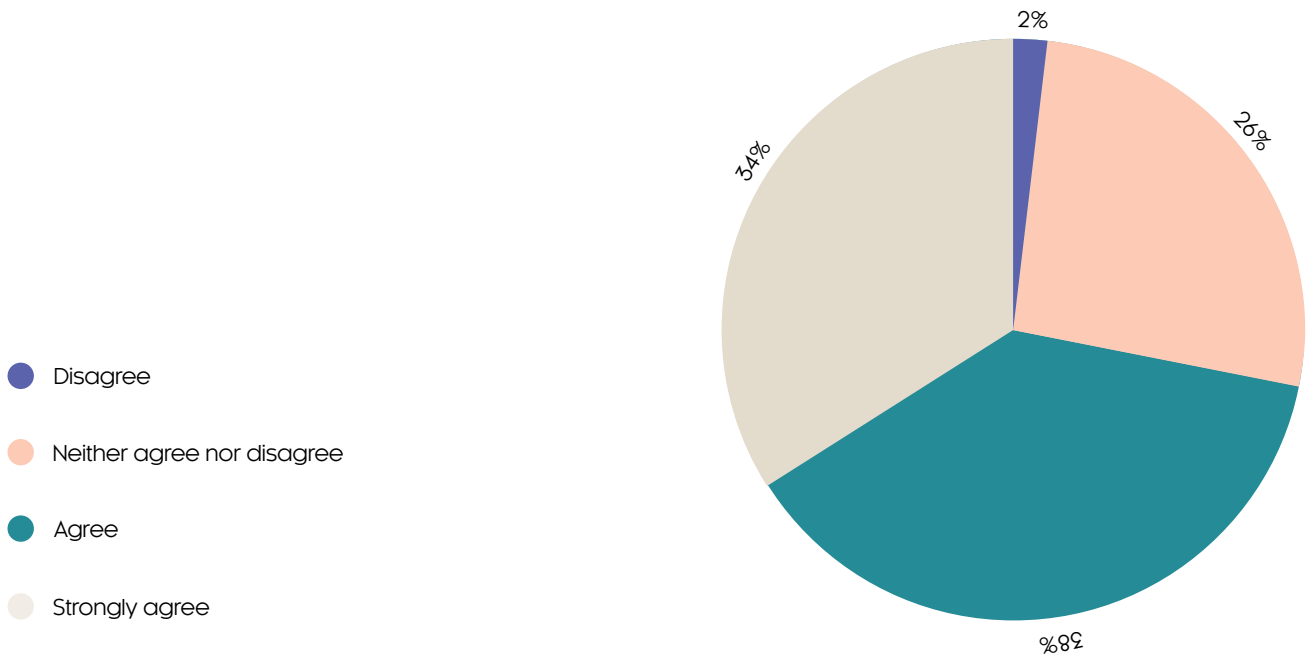
Majority of respondents agree that linking national COPD plans to global frameworks like the UN's Sustainable Development Goals (SDGs) or WHO's Health in All Policies approach would improve their effectiveness. Many feel this alignment could lead to better resource allocation, policy coherence, and overall health outcomes. For example, Brazil already incorporates these global frameworks into national health plans, reflecting broader support for this integration. However, some respondents emphasise the need for adaptation to local contexts, as seen in Australia. On the other hand, disagreement is related to systemic barriers, or simply problem of prioritisation. For instance, an expert from Denmark argues that the neglect of COPD in their country's health system is a more pressing issue than the lack of alignment.

"By linking national COPD plans to globally recognised concepts like the SDGs and the WHOs Health in All Policies approach, countries can ensure that their efforts are more effective, comprehensive, and sustainable. This alignment promotes a multisectoral and integrated approach, enhances resource mobilization, ensures policy coherence, facilitates monitoring and accountability, and strengthens advocacy efforts. Ultimately, this leads to better health outcomes for individuals with COPD and supports the broader goal of improving global health and well-being."

– Ukrainian respondent

NATIONAL COPD PLAN ALIGNMENT WITH SDGs DISAGREE

Figure 9 *National COPD plans would be more effective and implementable if they were directly linked to globally recognised concepts such as the United Nations' Sustainable Development Goals (SDGs) or the WHOs Health in All Policies approach to policymaking.*



4.4.6. COPD policy implementation

Most respondents highlighted significant issues in COPD policy or strategy implementation in their countries, with 45% defining it as low, and approximately 50% as moderate level, respectively, confirming the exacerbation of implementation problems rather than simply a lack of strategy or policy. The main explanation for low implementation is found in inconsistent and uncertain data reporting, changes in approach, diagnosis and management access issues, but also a lack of motivation in primary care professionals. The explanations for moderate-level implementation, on the other hand, more often have to do with only some COPD-relevant objectives being monitored, the framework or approach being under review, or newer programs and strategies currently being put in place.

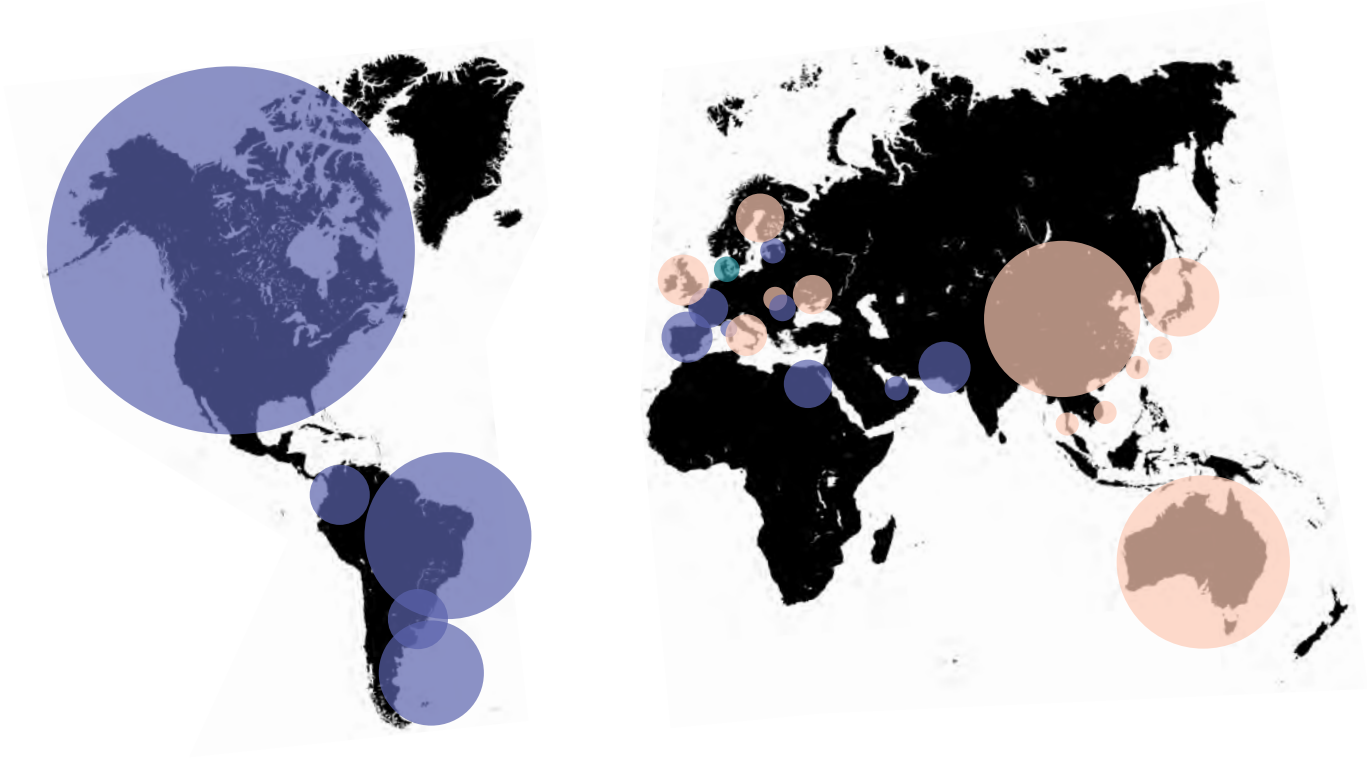
"Some areas have been implemented well; others (vaccinations, self-management) have been harder (spirometry) to achieve."

– UK respondent

"(There are. . .) Geographical and economical barriers, inconsistent screening and early diagnosis, challenges in medication access and adherence and rehabilitation access, limited public awareness and education."

– Colombian respondent

Figure 10 *Characterisation of the level of implementation of the country's strategy or national plan on COPD care.*



4.4.7. Strongest policymaking opportunities

When asked to rank the strongest policymaking opportunities for COPD, experts mentioned support for COPD nurse-led clinics, increased support for public awareness campaigns for COPD, supporting wider availability of affordable generic pharmacological treatments, development and implementation of clearer care pathways for COPD, and the introduction of reimbursement models that incentivise improved patient outcomes for COPD.

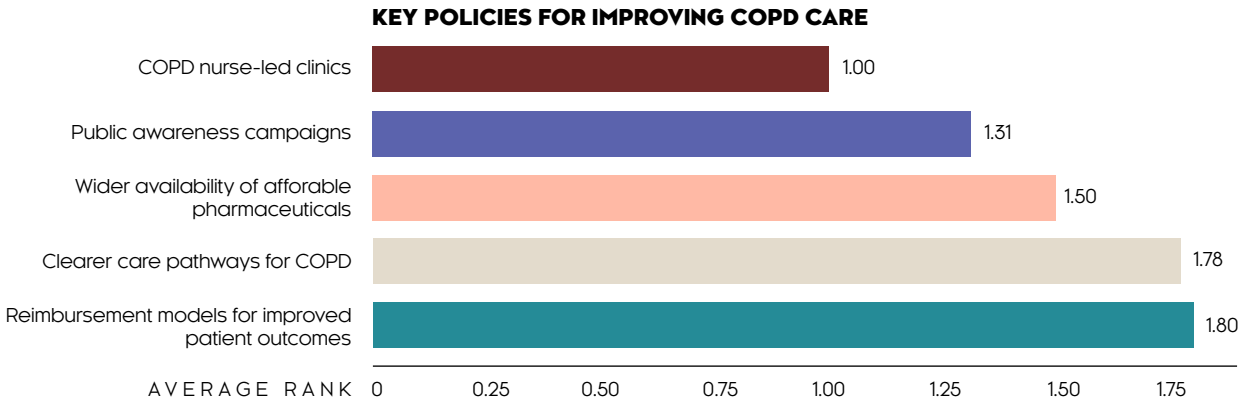
"Our province decreased vaccine awareness initiatives and there was a marked decrease in vaccination rates. Improved patient self-determination and education is central to better long term outcomes."

– Canadian respondent

"Strengthening primary health care can greatly contribute to better prevention and care for patients with COPD. All first 8 measures are important to influence on risk factors and better care for patients with COPD."

– North Macedonian respondent

Figure 11 *Which are the top three measures that policymakers should prioritise for improved COPD care and patient outcomes?*



4.4.8. Policymaker awareness about COPD in countries

The level of awareness about COPD among policymakers is generally characterised low by the majority (61%) of participants. The main explanation for this is significant gaps in awareness and interest among policymakers, along with a lack of media and public attention and insufficient advocacy from some patient organisations, in the example from Italy this is seen in limited policymaker engagement. Even where COPD is recognised, such as in North

Macedonia, the implementation of protocols for its management remains insufficient. This highlights broader systemic issues, where COPD, despite being identified as a serious health concern, is often overlooked in health policy priorities and fails to receive the necessary resources for prevention and management.

"There is no national adaptation of GOLD – just copy paste – one should be more ambitious – especially with regard to smoking cessation, which unfortunately is not prioritised."

– Danish respondent

"The level of awareness is low even though COPD is recognised as one of the five most common chronic non-communicable diseases and a national PHC protocol has been drawn up. But its implementation is low, considering that the implementation of the reforms in PHC are stalled."

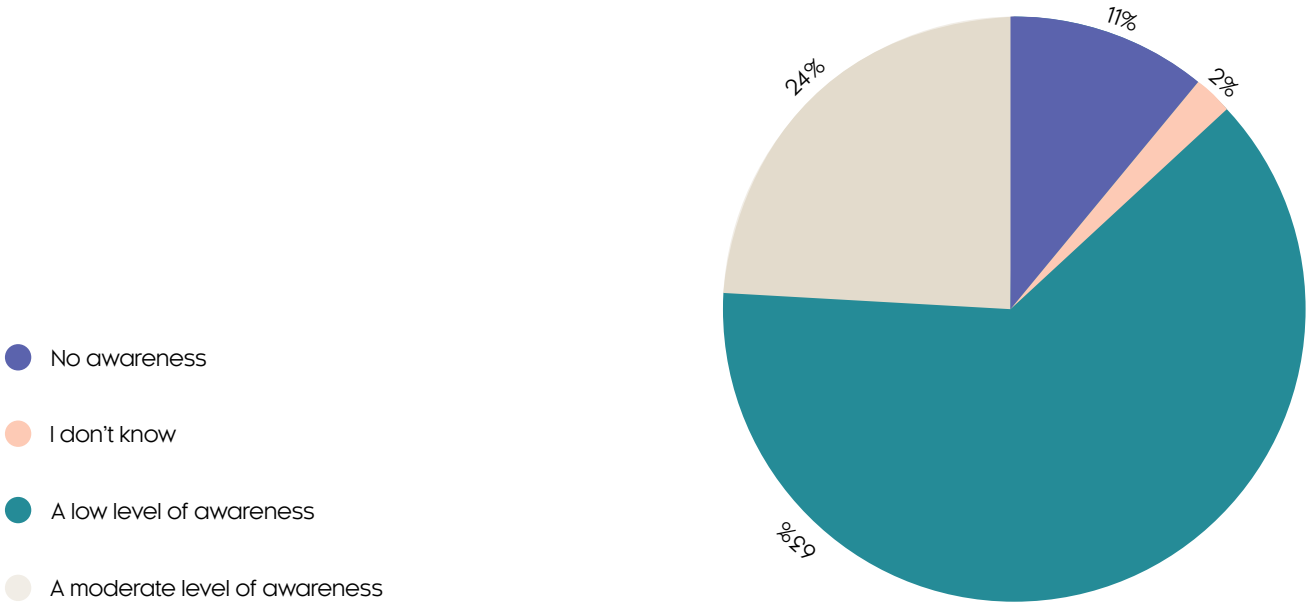
– North Macedonian respondent

"In Italy we have never produced public awareness campaigns on the harm of smoking and illness."

– Italian respondent

POLICYMAKER AWARENESS

Figure 12 *The level of awareness about COPD among policymakers in my country is best characterised as:*



4.5. GUIDELINES FOR COPD CARE AND PREVENTION

"The CTS guidelines are more progressive than GOLD. GOLD is not a guideline, they are recommendations. The CTS has a strict evidence-based guideline methodology using GRADE with both systematic reviews and meta-analysis. Our guideline address mortality in COPD, the first guideline to do so."

– Canadian respondent

"At national level (there is...) government recommendation called PCDT, we have some limitations to provide treatment to COPD patients, for example, FEV1 < 50% to receive LABA+LAMA medication, we don't have all medication and non-medication treatment available. Our triple therapy is LABA+LAMA in one device and ICS isolate in another device. No roflumilast, no rehabilitation. For vaccination flu, covid and polissaride 23 pneumococo. And other limitations..."

– Brazilian respondent

4.5.1. Guideline alignment with GOLD guidelines

Over half of the participants view their country's COPD care and treatment guidelines as closely aligned with the GOLD guidelines. While some of them practically apply GOLD together with including national factors, some miss this perspective. Some countries are implementing GOLD by also taking a stronger evidence-based approach as in the case of the Canadian Thoracic Society. Some countries exhibit a moderate level of alignment with the GOLD guidelines but also use other approaches. Nevertheless, the countries differ in prescribing practices, such as restricting LABA+LAMA for patients with FEV1 <50%, have specific therapy and vaccination recommendations, but lack single inhaler triple therapy or Blood Eosinophil Count (BEC) inclusion. The main reason for a low level of alignment is usually seen in outdated guidelines, with some of them currently being updated.

"We have unique practical care guideline system which is managed by Medical Society Duodecim and the guidelines are intended primarily for primary care. All guidelines are in the same portal that is open to all healthcare providers and patients. All the guidelines (COPD, asthma, heart, diabetes, etc) are in the same portal."

– Finnish respondent

"(There is. . .) lack of knowledge, lack of motivation for GPs to implement guideline, lack of reforms in PHC and introducing new model for indicators of quality."

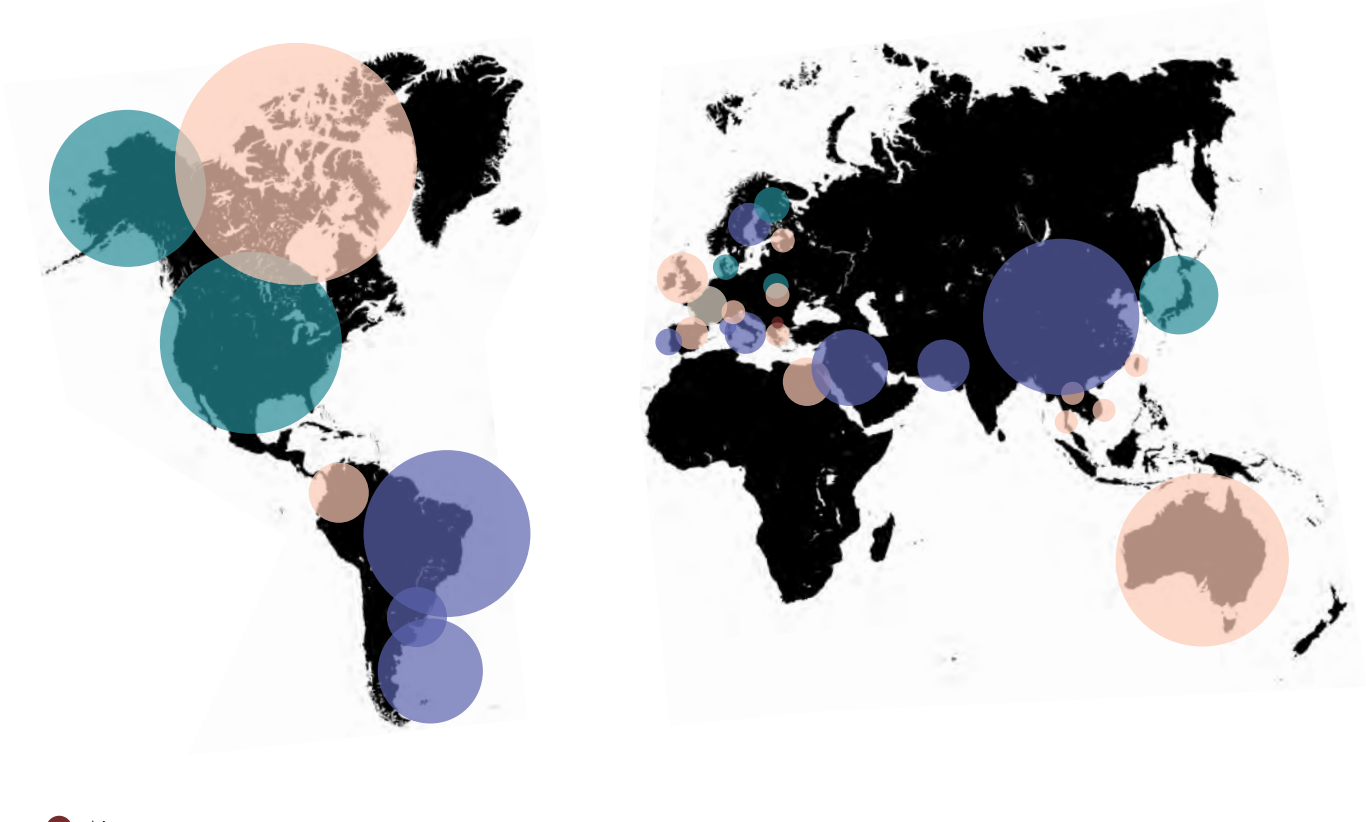
– North Macedonian respondent

"Not many physicians and health care workers are aware of the presence of these guidelines."

– Pakistani respondent

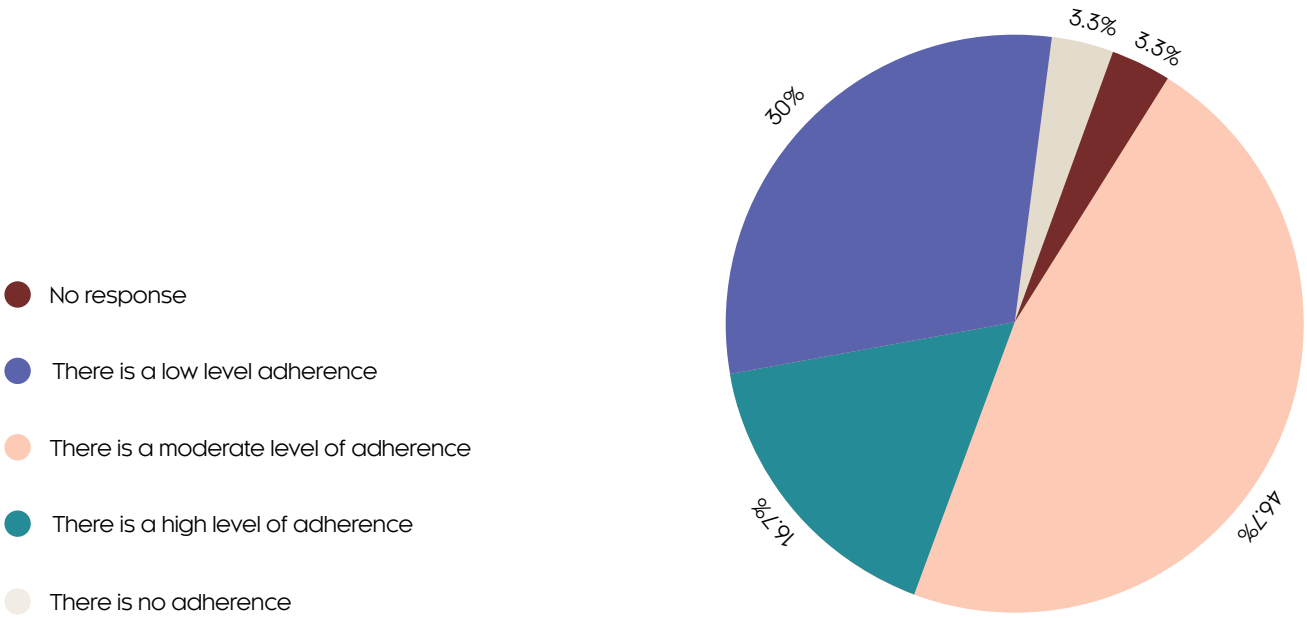
CHARACTERISATION OF LEVEL OF ADHERENCE TO GUIDELINES FOR COPD CARE

Figure 13.1 *I would characterise the level of implementation of the policy or strategy in the following way:*



CHARACTERISATION OF LEVEL OF ADHERENCE TO GUIDELINES FOR COPD CARE

Figure 13.2 *I would characterise the level of implementation of the policy or strategy in the following way:*



4.5.2. Adherence to guidelines in healthcare

Experts acknowledge gaps in adherence to COPD care guidelines in healthcare settings, with almost 80% evaluating the level of adherence as low or moderate. A commonly addressed reason for this was a lack of knowledge and awareness, particularly in primary care and related to specific therapy practices. Other reasons were related to lack of access to guidelines, either due to geographical distance, resource allocation, or just limited availability of certain health practices. On the other hand, high adherence to guidelines, according to the expert respondent from Finland*, had to do with easily accessible guidelines, open to all healthcare providers and patients.

4.5.3. Robust elements for COPD guidelines

Primarily, guidelines should aim for a holistic approach to COPD, at every step of care. Through patient empowerment by using clear and straightforward messages, there could be a better understanding of risk factors, improved medication adherence, but also enhanced disease self-management and vaccination rates. Early diagnosis, screening and tailored treatment that includes both pharmacological and non-pharmacological methods and the utilisation of telemedicine are the following important steps. Comprehensive COPD management is multidisciplinary, proactive, and it addresses comorbidities, exacerbations, and end-of-life care, through primary care guidelines adaptable to the local context. Robust epidemiological data, and high-quality and standardised health data collection and recording, could significantly improve patient outcomes.

* Unique practical care guideline system, which is managed by Medical Society Duodecim, and the guidelines are intended primarily for primary care: The Finnish Medical Society Duodecim (2024). Chronic obstructive pulmonary disease (COPD). Current Care Guidelines. https://www.kaypahoito.fi/en/ccs00068.

"Numerous elements: the burden, etiology, pathogenesis, classification, diagnosis (incl. screening issues, case finding), management of stable COPD, Acute exacerbations of COPD (with definition, etiopathogenesis, classification, management), prevention of COPD, prevention of COPD at all levels, focus on multimorbidities, frailty, end-of life issues and management, telemedicine etc..."

– Estonian respondent

"Shortly epidemiology, risk factors, diagnostics very carefully, all treatment modalities (preventive, smoking cessation, drug therapy, other treatments), acute situations and their treatment, comorbidities/multimorbidity/frailty, preventive strategy for exacerbations, hospitalizations and mortality."

– Finnish respondent

4.5.4. Priorities

Top three ranked elements that should be prioritised for the robust and effective guidelines for COPD care and prevention were emphasis on management and mitigation of risk factors, primary prevention, and early and accurate diagnosis*.

* Emphasis on frailty was ranked number 1 by US but that's only one respondent so it is considered an outlier.

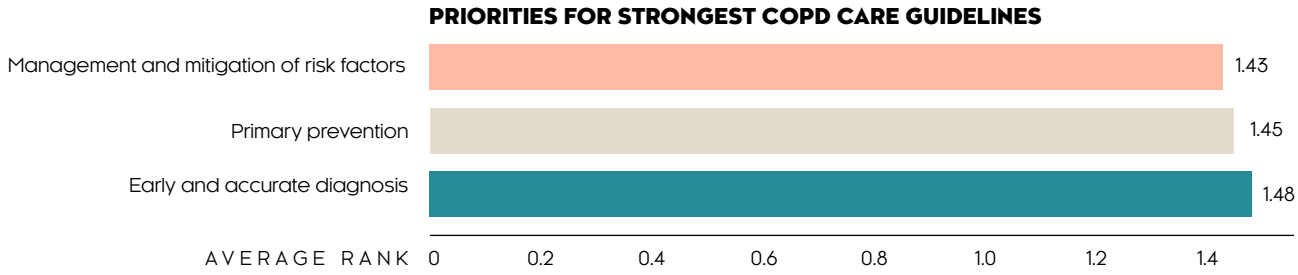
"(Robust guidelines should include...) Early diagnosis and screening, management of multimorbidity, focus on geriatric care, patient education and self-management, monitoring and follow-up."

– Colombian respondent

"Strategy for COPD of the National Health System is from 2009. The latest update is from 2014. There have been no subsequent updates, and it was never fully implemented across the entire Spanish territory. Currently, there are some plans in the regions (only some), but they are partial and only applicable at the regional level."

– Spanish respondent

Figure 14 *Which are the top three elements that should be prioritised for the strongest possible guidelines for COPD care and prevention?*



When looking at the Europe level, in Eastern and Southern Europe, the focus is on early and accurate diagnosis. Northern Europe prioritises improving access to pulmonary rehabilitation and long-term physical activity. Western Europe highlights primary prevention as the key element.

On a global scale, regions have identified their top priority for robust and effective COPD care and prevention guidelines. In Africa, the focus is on the management and mitigation of risk factors, while Asia, Europe, South America, Oceania, and the Middle East all emphasise the need for early and accurate diagnosis. In North America, the highest priority is practical approaches to smoking cessation.

"Most smokers of non-industrialised cigarettes or biomass exposure have performed screening of COPD and most of them never being questioned by a health professionals about other respiratory symptoms."

– Brazilian respondent

4.6. PATIENTS, ACCESS TO CARE, AND EQUITY

4.6.1. COPD personalised treatment and self-management plans

Many respondents indicate a heterogenous approach to COPD patients in their country, related to a lack of awareness of the disease, treatment, or action plans. In some cases, personalised care and self-management are outlined in guidelines, but not implemented in practice to a sufficient extent. Heteroge-

neity of approach is further compounded by regional, institutional, or health provider differences, and a lack of high health data standards. In some of the countries where personalised treatment and self-management plans for COPD care are standard practice, the implementation level is sometimes unknown, and there is a lack of standardised evaluation of patient adherence to plan, creating inequities and making domination of a universal plan persistent.

"Treatment is personalised by the physician in charge. However, self-management plans are not used for COPD and there is no COPD nurse to explain and implement this. There is no national self-management plan."

– Belgian responden

"...The patient e-records are areal in our place, in some they are healthcare provider specific, but we have a national health care data system (kanta.fi) where all your health data is collected (but not easiest to access). Instead, we do not have anything like COPD-registry, or COPD-quality register as Sweden has and doing such is strictly prevented by the current laws for doing research."

– Finnish respondent

4.6.2. Patient data recording

The majority of (70%) experts agree that in their own countries there is no standardised practice for COPD patient data recording, or that data is recorded only in a database not accessible outside individual practice or point of care. In other words, while some countries' health institutions have local electronic records, there is a need for process and structure that would unify data from different sources, hampering access to national-level aggregate data. Recording practices also vary in different levels of care, affecting the accessibility of aggregated data, with many experts acknowledging unavailability of patient data outside of primary care databases. In one-fourth of cases, data is recorded in a national database, however, in some countries, there are still issues with healthcare provider compliance, aggregation, or limited access between private and public healthcare settings.

"Yes, but there are, however, large inequalities between health care providers in using/providing personalised treatment and self-management plans for COPD patients."

– Estonian respondent

"The health system is not unified. There are hospitals, generally private, with electronic medical records available, accessible only to that institution. The national health system does not have an electronic medical record, data collection is not possible."

– Argentinian respondent

"Data is collected at a national, state, jurisdictional, and practice level. However, it is not linked data or aggregated data, it is not easy to get a national picture of what is happening in COPD care at local level."

– Australian respondent

"Individual healthcare institutions collect and store data on COPD. Significant personal data protection laws hamper access to national level aggregate data."

– Singaporean respondent

4.6.3. Accuracy and usability of the recording of patient data

Less than half of (42%) participants agree or strongly agree that despite some issues such as lack of availability in some regions, or in smaller health institutions, the accuracy and usability of COPD patient data is generally high, including automatic data linkage. However, those who disagree (30%) point out significant gaps in data recording, mainly due to the absence of national datasets or simply inconsistent quality across individual practices, indicating a lack of structured medical records. What is sometimes missing is information on smoking history, FEV1, or dyspnoea assessment. Furthermore, patients have limited access to their data, and there is insufficient sharing among stakeholders. Neutral participants, despite identifying the usability of COPD patient data often elaborated their answer by explaining that there is a lack of structure due to a combination of electronic and paper records in some countries, or simply a need for a COPD registry.

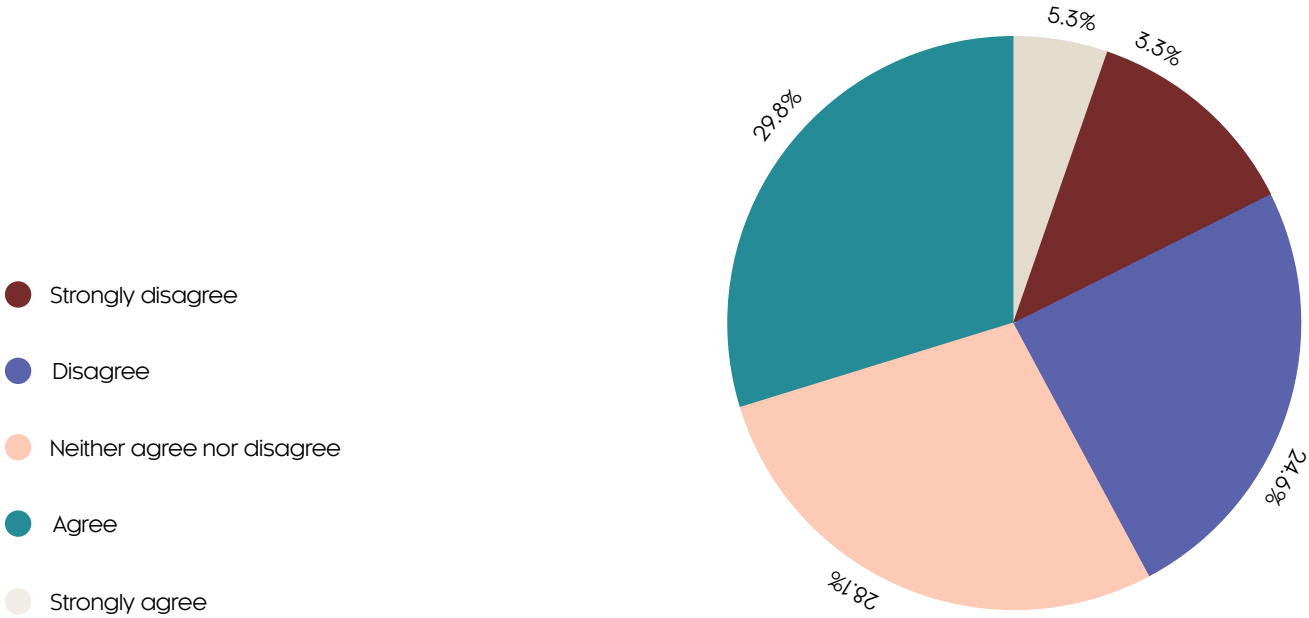
"There are very few fields in this (healthcare) platform, to adequately register information concerning COPD. Also, there are no rules to do it, so people do it at their own way."

-Portuguese respondent

"There are also minimum data requirements for hospitals, which would code cases according to ICD-10."

– Canadian respondent

Figure 15 *In general, I believe that the recording of data meets sufficiently high standards of accuracy and usability.*



4.6.4. Support for patient-reported outcomes database

There is strong support among participants (approximately 80%) for that the creation of a patient-reported outcomes (PROs) database would have a positive impact on COPD care in their country. However, they also highlight factors of importance such as clear implementation processes, audits, or quality improvement initiatives as suggested by an expert from Denmark. Another example from Belgium suggests that the effectiveness of such a database depends on which specific PROs are included and whether additional COPD data is available to complement it. Additionally, others highlight the need for trained personnel, choice of outcomes to track, and their practical application.

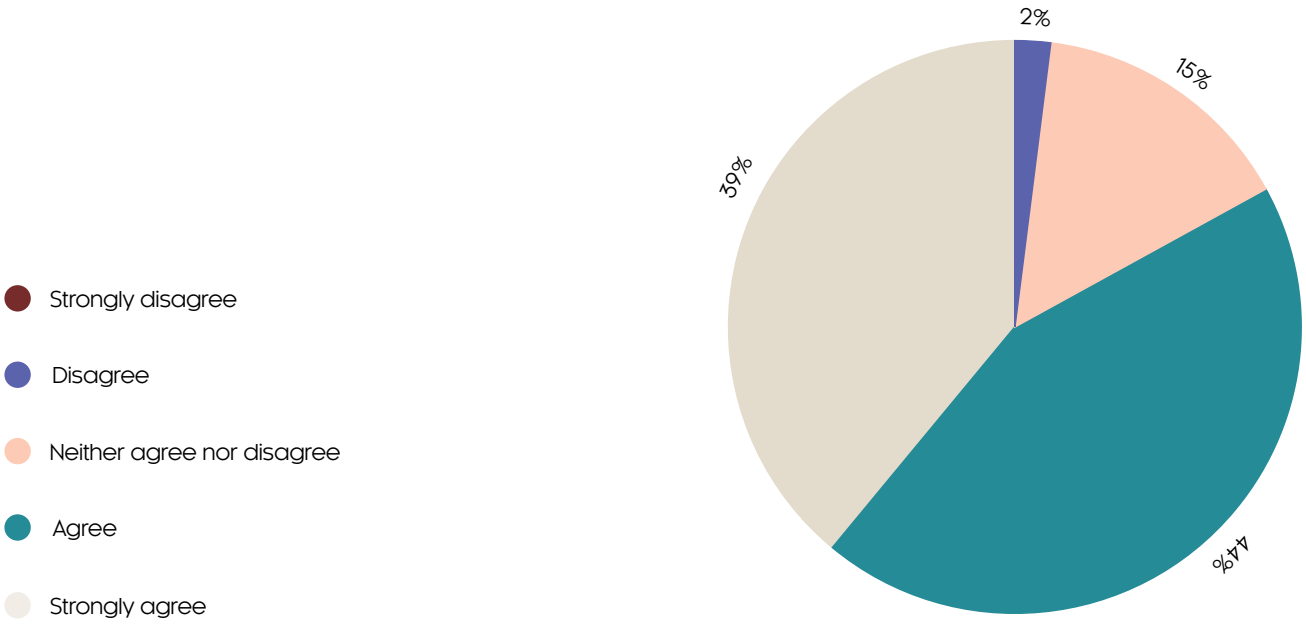
"Access to patient-reported outcomes data enables healthcare providers to tailor treatment plans based on individual patient needs, preferences, and reported outcomes. This personalised approach can lead to better patient adherence and improved clinical outcomes."

– Ukrainian respondent

"It depends on what it is used for. As long as we had an implementation process / audit / QI initiative to follow-up with, otherwise it's just data collection for data collection's sake."

– Australian respondent

Figure 16 *The creation of a patient-reported outcomes database would have a positive impact on COPD care in my country.*



4.6.5. Patient adherence to treatment plans

Respondents provided varying answers on whether patients adhere well to treatment plans, indicating a significant variability among patients regarding treatment adherence, thus complicating the progress of the disease. This is also indicating a lack of comprehensive data on patient adherence. Some of the explanations include adherence depending on the care level, lack of long-term adherence, inaccessibility of drugs, or simply regional differences. In several countries as in the example of Hungary, non-adherence is a significant issue in COPD patients. In Argentina there is an issue related to treatment affordability and equity. Experts from countries with existing survey data on adherence (cited by respondents when answering the question) demonstrate that the percentage of patients that adhere to treatment plans in the first few months is 60% in Italy, and 20% or less of the patients adhere to treatment plans within the first 6 months in China. Due to a lack of standardised and reliable data recording across countries as well as different answers to this question within the same country, these values are fully not comparable.

"At present, COPD patients in our country may go to specialized departments or grassroots levels, and most of them do not have regular medical treatment."

– Chinese respondent

"Medication non-adherence is a significant issue in COPD patients in Hungary."

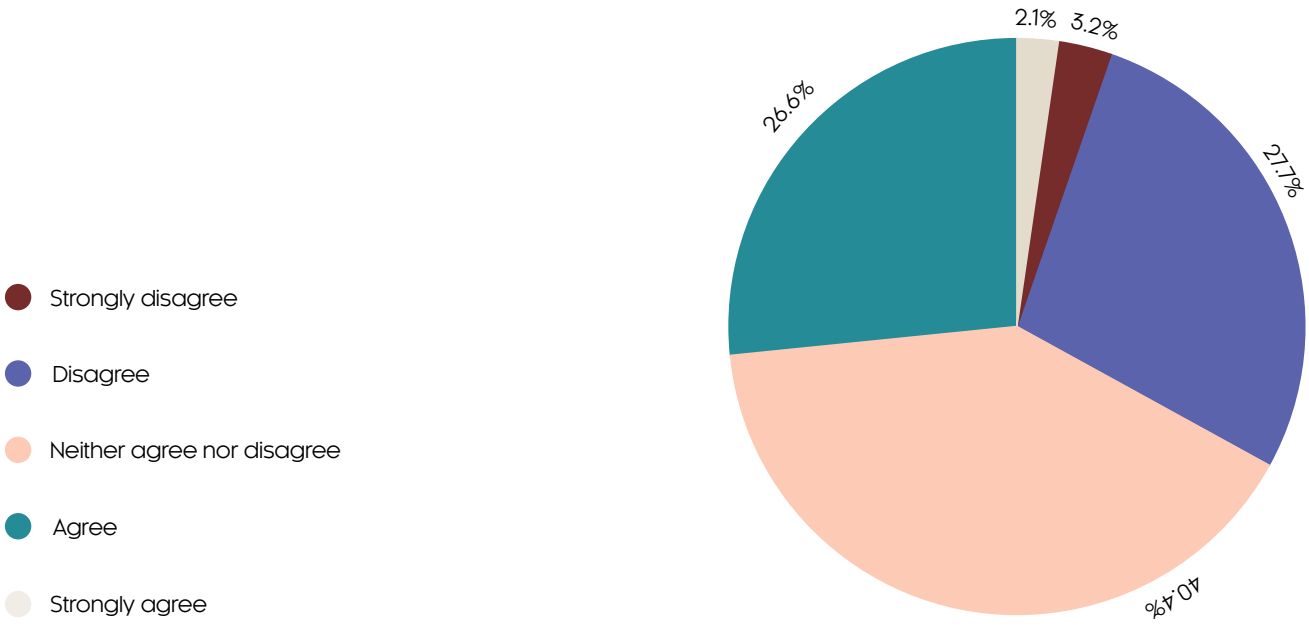
– Hungarian respondent

"The population that can buy the treatment usually adheres to it. But there is a large part of the population that does not have access to treatment, especially due to economic barriers."

– Argentinian respondent

PATIENT ADHERENCE TO TREATMENT PLANS

Figure 17 *Patients generally adhere well to treatment plans.*



4.6.6. Educational and material patient support for COPD management

Almost half of the participants believe there is a widespread lack of consistent educational and material support for COPD management. In some cases, lacking support is more common in outpatient care, while it is further exacerbated by a lack of healthcare professional awareness and limited consultation time. An expert from Spain cited a survey that demonstrated that a small number of COPD patients receive adequate information from physicians, with a similar situation being apparent in Belgium, currently developing a national patient education brochure. A smaller share of respondents claiming that support is available mention significant gaps within the country as in the examples of Colombia and Greece. The most common issues were varying institutional practices, lack of patient feedback on whether the information was fully comprehended, and short consultation times.

"From our experience, the information provided to patients is very limited, and there are significant gaps in knowledge about the disease itself, its progression, prevention of exacerbations, or habits that can improve prospects and quality of life, among other things. In a survey of respiratory patients conducted by FENAER in 2022, only 16% of COPD patients reported having received guidance from their doctors on where to find reliable information about their disease. Only 35.3% reported having received satisfactory information from their doctors in response to their doubts or questions. 27% reported leaving the consultation with doubts about how to administer a medication, or what it is for."

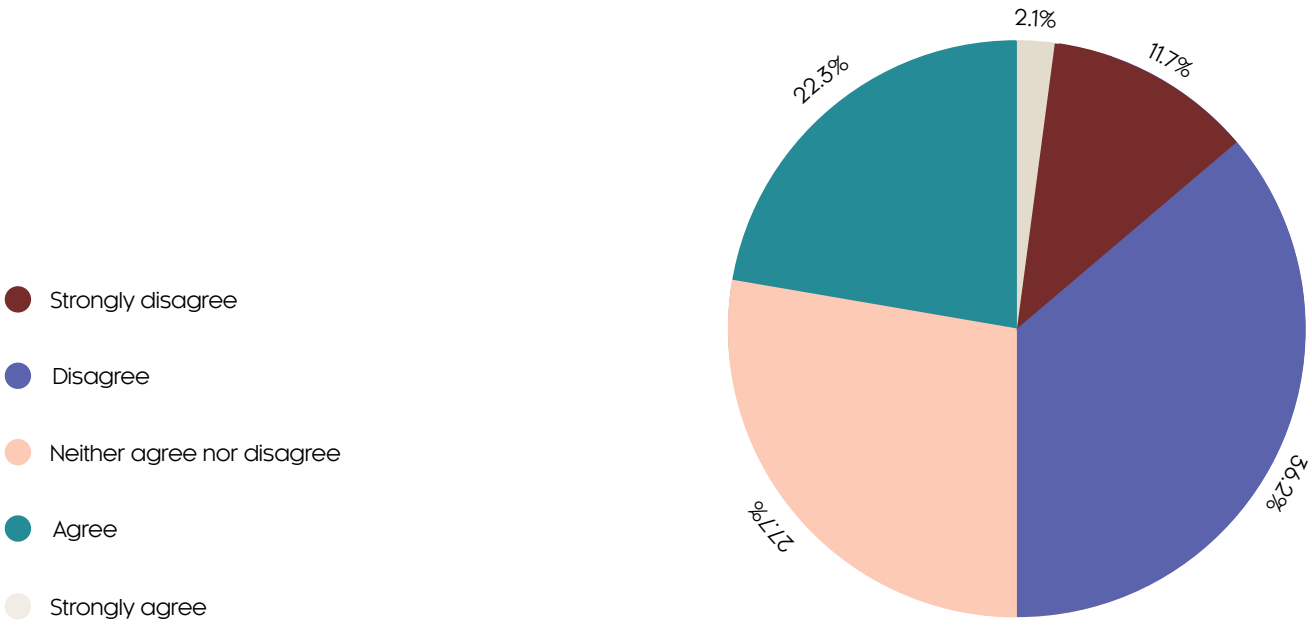
– Spanish respondent

"In Greece, there is material support by the national healthcare insurance organisations, not entirely compensated. Also, regarding the educational support, patients depend on clinicians, doctors and their pharmacist's consultation, but there's still lack of knowledge."

– Greek respondent

PATIENT EDUCATIONAL AND MATERIAL SUPPORT FOR COPD MANAGEMENT

Figure 18 *Patients are generally given the educational and material support they need to manage their COPD after diagnosis.*



"In a developing country like Colombia, the educational level of patients is average, and the time dedicated to educating them in the medical consultation is very short. Those centres with integrated COPD care programs can apply it more easily."

– Colombian respondent

4.6.7. Patient barriers to COPD care

More than half (55%) of the participants agree that patients have significant barriers to accessing adequate COPD care, including clinical interventions, hospital care, seeing a doctor, or getting home care. In Argentina and Brazil, issues are related to disinvestment in public health systems, along with a lack of specialist care. Geographic disparities were commonly mentioned as a barrier in Colombia, Iceland, Finland and Australia, implying a lack of access to specialist care and active case-finding. Long waiting times and health professional shortages are also highlighted by participants from France, Italy and Greece, while Spain and the UK highlight particularly long waiting times for specialists. Neutral respondents still acknowledge regional variations, such as in Canada, with a publicly funded system ensuring access to hospital care, but not to all medications in some provinces. In China, these disparities are related to the location and income of patients, highlighting inequities. On the contrary, Japan is one of the few countries with relatively good access to COPD care, accomplished through universal health insurance and accessible primary care. Singapore follows Japan's footsteps with a new healthcare policy aimed at reducing barriers to care access. Interestingly, an Estonian participant reports that despite relatively good structural access to care, there are psychological patient barriers related to reluctance to seek care.

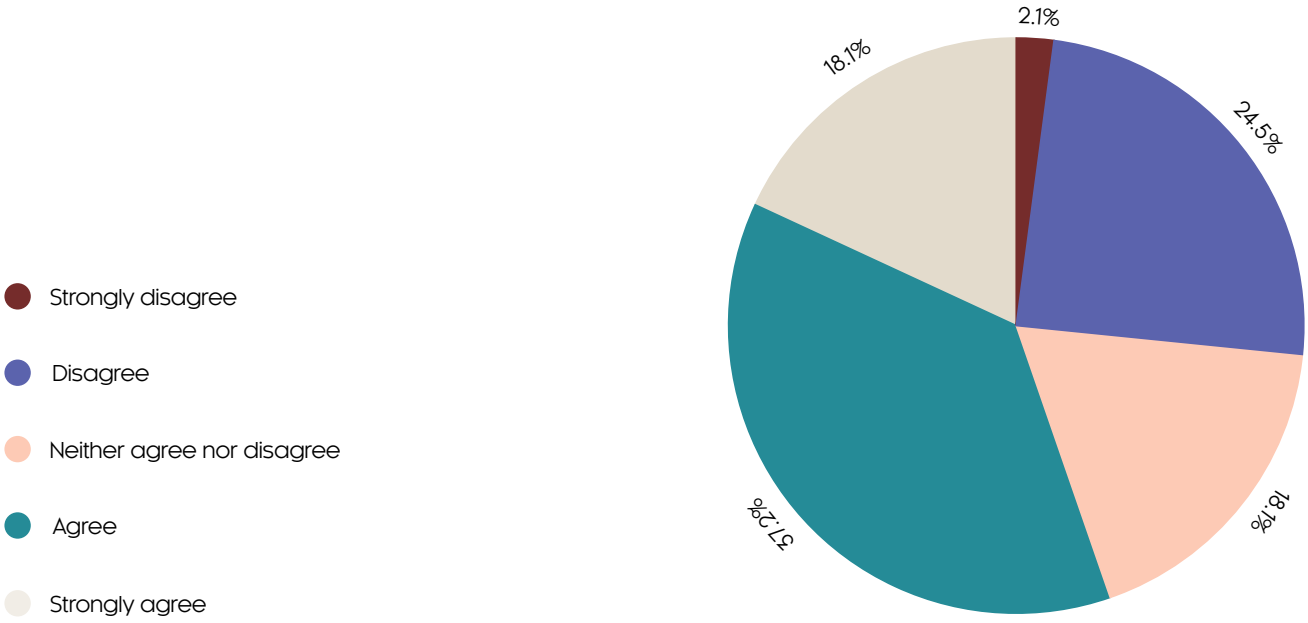
"Patients have convenient and quick access to healthcare services in cities, but rural areas might lack high-quality services."

– Chinese respondent

"The objective barriers (e.g. cost of the medication) are less important as sometimes the psychological opposition."

– Estonian respondent

Figure 19 *Patients generally have significant barriers to accessing adequate COPD care (i.e. clinical interventions, hospital care, or seeing the doctor or getting home care) in my country.*



4.6.8. Patient barriers to COPD medication

According to approximately half of respondents, access to COPD medication is generally good. This is often accompanied by universal health insurance and heavily subsidised medication, such as in Japan, Australia and Poland. The wide availability of medications is also noted in Spain, France, and Portugal, with the latter two reporting some affordability issues for part of the population. However, a notable portion (36%) of respondents reports significant barriers to medication access in their countries. In some countries, this is related to financial constraints as in the case of Argentina, Brazil and Pakistan. **In the United States, many patients still find COPD medications unaffordable.** In Canada, Italy and North Macedonia, issues are sometimes bureaucratic, formulary and policy-related, complicating access to specific treatments like triple inhalers. Neutral responses were often related to regional disparities or complex reimbursement policies as in Finland, Estonia, or China. In the UK, despite relatively good access, there are some restrictions limiting access to biologics. In Egypt, the issue is related to inconsistent insurance coverage.

"Most patients can access and afford COPD medications, but a significant number find it burdensome and costly."

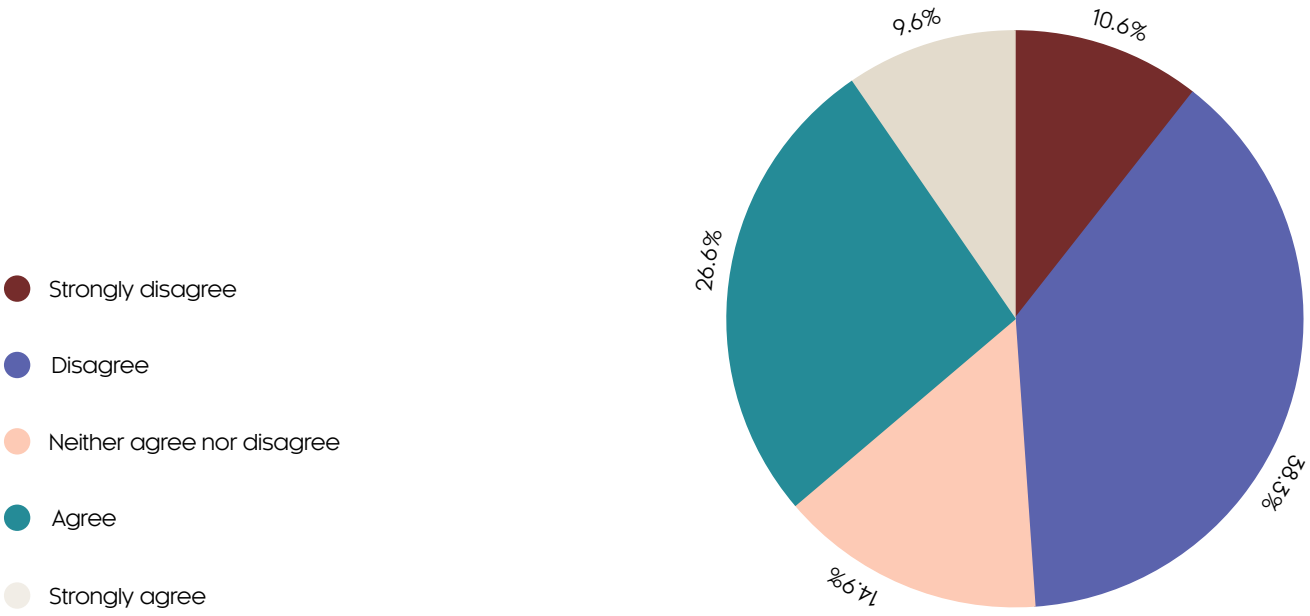
– US respondent

"Japan has a system of universal health insurance. It seems easy to access medication for COPD."

– Japanese respondent

PATIENTS BARRIERS TO COPD MEDICATION IN COUNTRY

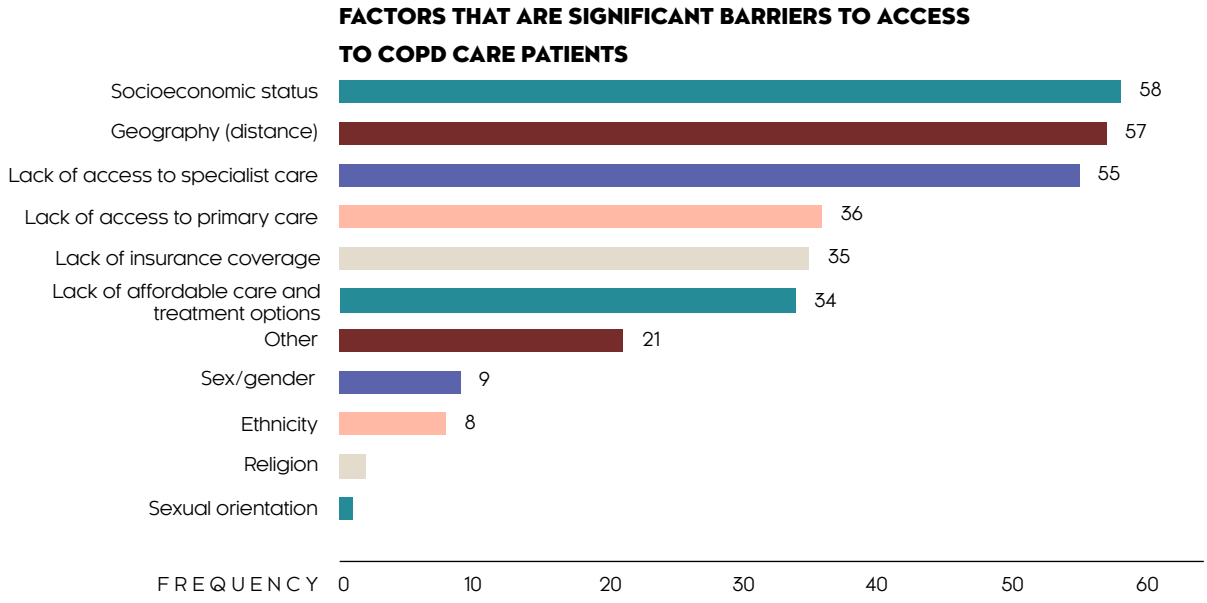
Figure 20 *Patients generally have significant barriers to accessing medication for COPD in my country.*



4.6.9. Significant Factors that present Barriers to COPD care

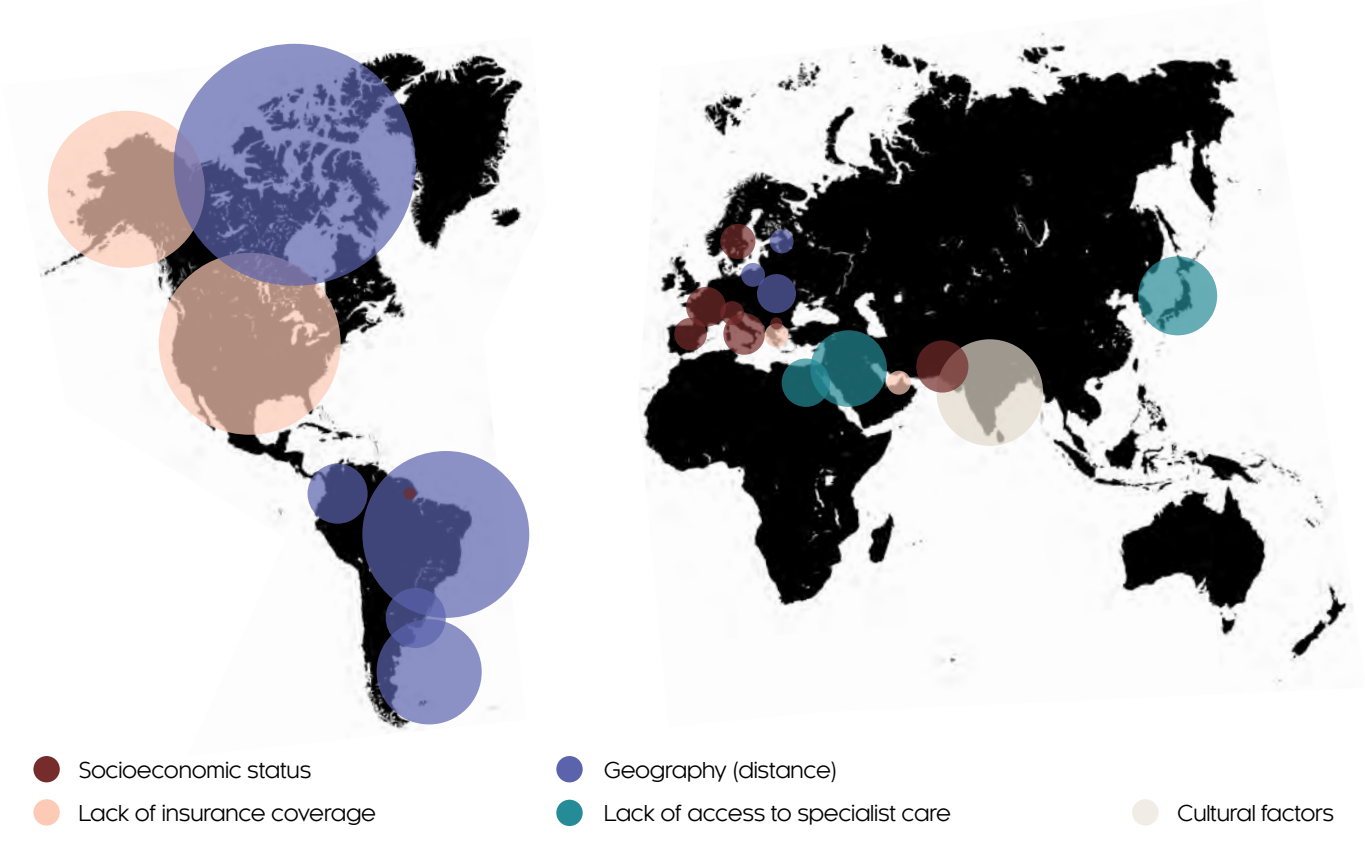
The three most significant barriers to patient access to COPD care ranked by respondents were socioeconomic status, geography (distance from care), and lack of access to specialist care, with highly comparable rates, and more than half of respondents acknowledging their importance.

Figure 21 *The following factors are significant barriers to access to COPD care for patients in my country / ranking:*



GLOBAL BARRIERS TO COPD CARE ACCESS BY MOST COMMON FACTOR

Figure 22 *The most common factors that are significant barriers to access to COPD care for patients, globally.*



4.6.10. Within country regional differences in access to care

A big majority (71%) of participants recognised that access to and quality of care differ across the entirety of their country – indicating significant inequalities within. In Argentina, Brazil and Colombia, rural and underserved areas face challenges in accessing specialist care, spirometry and essential treatments. However, in Europe, participants from Italy, Slovakia and Spain also report variations, but with rural areas experiencing longer waiting times, along with shared limited access to specialist care. Geography plays a critical role in Canada and Australia, where the size of the country presents an obstacle resulting in remote areas facing greater barriers to care. Rural populations are also disadvantaged in Pakistan, Saudi Arabia, and China. A smaller group of respondents find that access to and quality of COPD care are relatively consistent in their countries, typically related to a more centralised healthcare system, smaller geographic areas, or higher income. Particularly, higher-income countries, as expected, usually have more evenly distributed healthcare resources. A small portion of experts are neutral, indicating present, but not as stark differences or transitional health systems currently going through changes.

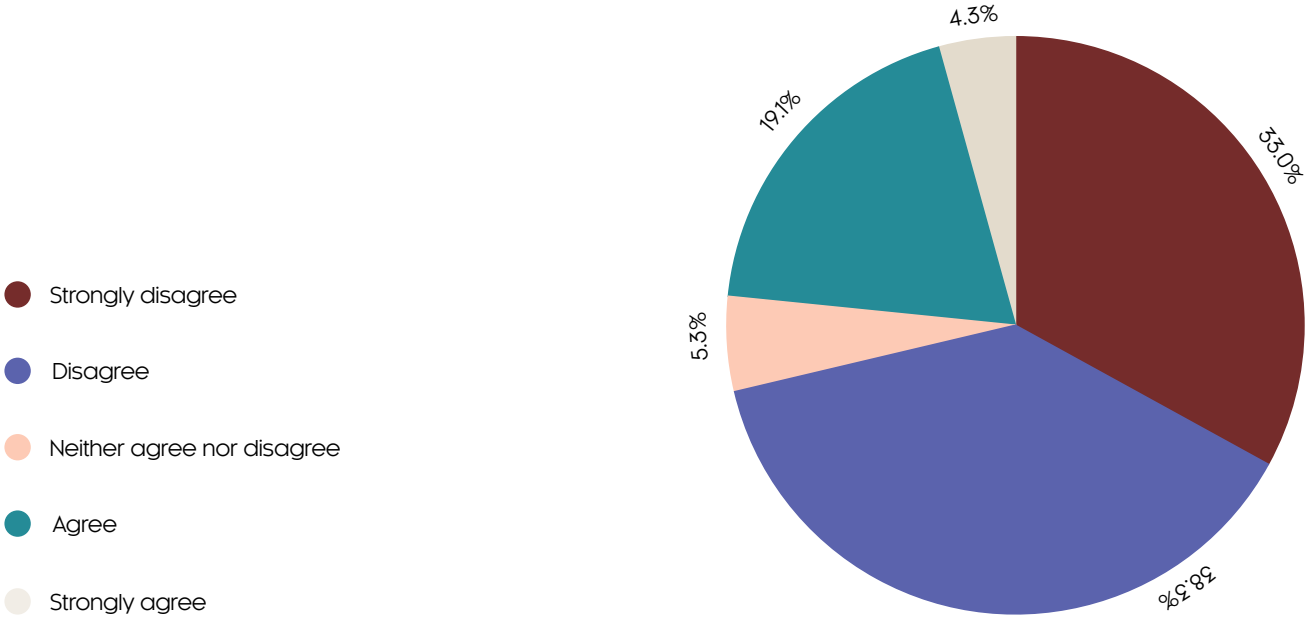
"Access to general COPD care in major cities is excellent. Access to COPD care in rural and remote Canada is limited and difficult. Access to pulmonary rehab is limited regardless of location/region."

– Canadian respondent

"There are differences in access to health, in the possibility of making a diagnosis, indicating an appropriate treatment and patient access, depending on the place of residence in the country."

– Argentinian respondent

Figure 23 *Access to and quality of care is similar across the entirety of my country (i.e., there are no significant regional differences in access to and quality of care within the country).*



4.6.11. Health professionals' resources for COPD diagnosis and management

Experts generally (62%) believe that healthcare professionals in primary care do not have adequate resources to accurately diagnose and effectively manage COPD in their country. The **most frequent issues were related to low disease awareness, lack of clear primary care guidelines, support and training, access to diagnosis, particularly spirometry, followed by specialist care and pulmonary function testing**. Other areas needing improvement were medical equipment and medication access. Finally, primary care was described as overstretched, with limited possibilities for general practitioners to perform diagnosis, treatment, or prescribe COPD medications, tasks typically managed by respiratory specialists.

"For 93-97% of patients, diagnosis is based on access to spirometry performed by a pneumologist rather than a primary care provider."

– French respondent

"Rural clinics see general medical care, but not specialist knowledge. They are also less likely to refer you to a specialist."

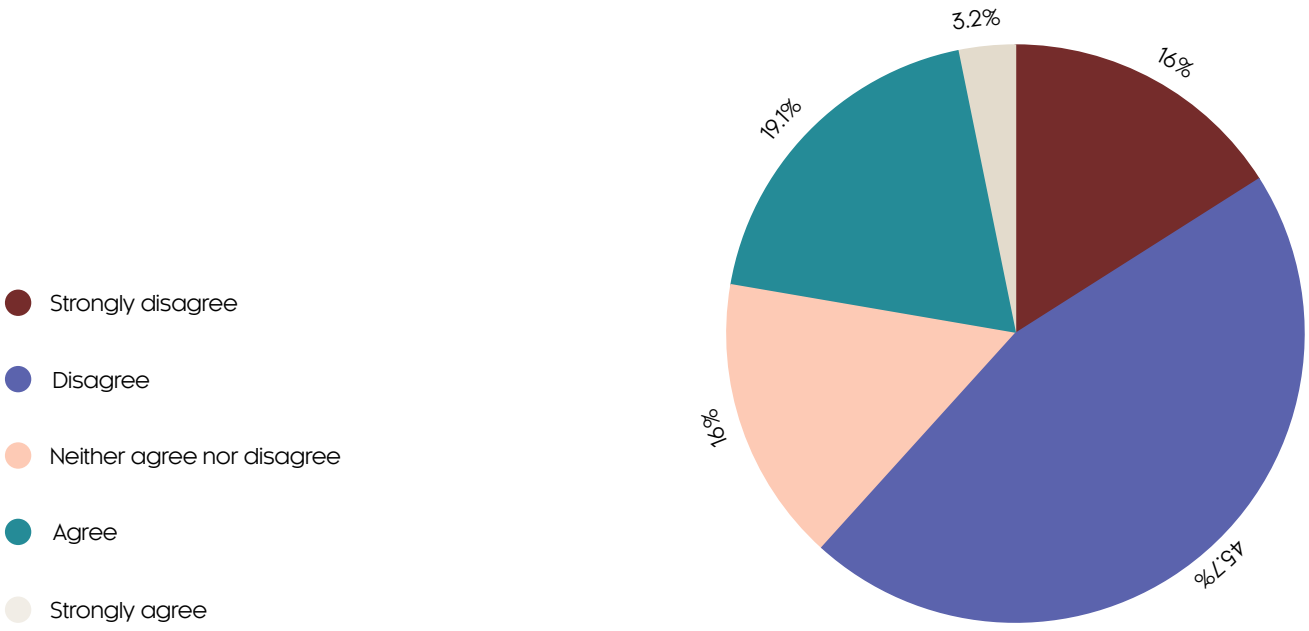
– Singaporean respondent

"GPs are not allowed to manage COPD in Slovakia – neither diagnose, nor treat, although they have capacities to do so, and many are willing to do so."

– Slovakian respondent

PRIMARY CARE HEALTHCARE PROFESSIONALS RESOURCES FOR COPD DIAGNOSIS AND MANAGEMENT

Figure 24 *Healthcare professionals in primary care settings generally have adequate resources to accurately and effectively diagnose and manage COPD in my country.*



4.6.12. Clarity of COPD care and management pathways

Approximately one-third of participants confirm the existence of clear care pathways for COPD care and management. However, the number of experts who acknowledge the lack of clear care pathways for COPD care and management in their country is somewhat higher. Participants expressed concerns about the lack of consistent guidelines, particularly in primary care, with pathways often limited to specialist, secondary, or tertiary care. **Adherence to these guidelines and coordination between care levels is a major issue, and regional differences in healthcare professional knowledge further complicate this. As a result, exacerbations are often neglected unless they are severe.**

"Only a few regions/Autonomous Communities have clear and written processes regarding the pathway for COPD patients. There is no national COPD plan that outlines the care and attention for COPD patients."

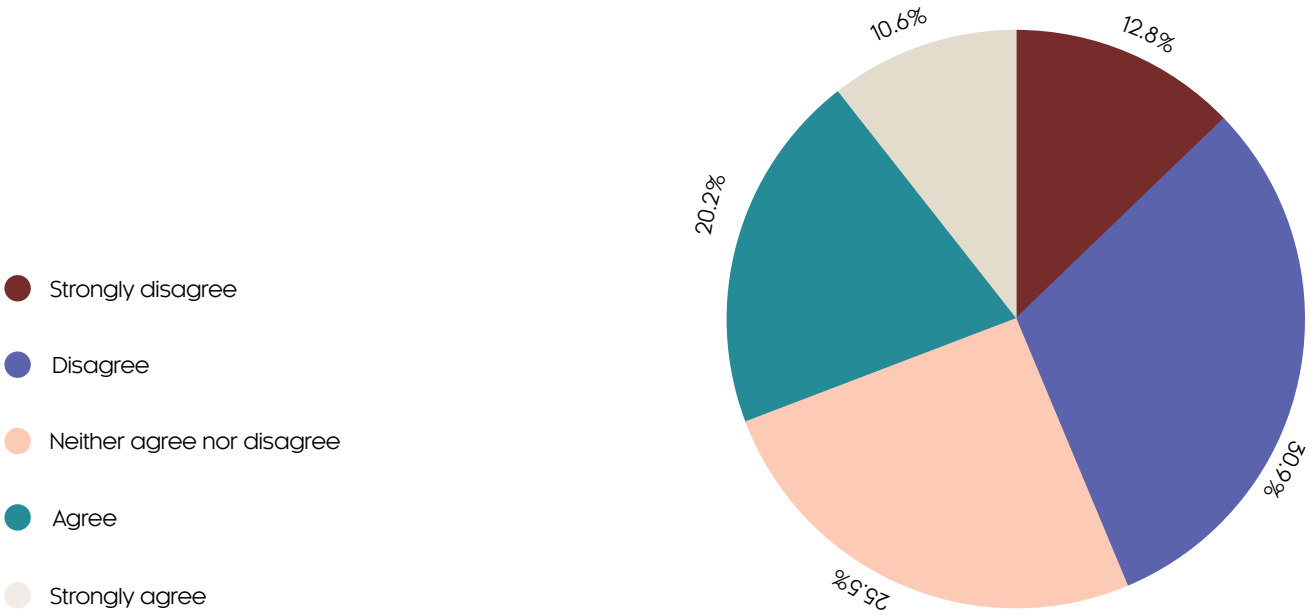
– Spanish respondent

"In theory there are integrated care routes but in practice their applicability is limited."

– Colombian respondent

CLEAR CARE PATHWAYS FOR COPD CARE AND MANAGEMENT

Figure 25 *There are clear care pathways for COPD care and management in my country's health system.*



4.6.13. Enforcing uniform care and quality standards

Experts strongly (84%) acknowledge that COPD care would improve if uniform standards for COPD care and quality assurance were enforced in their country's health system. The overall sentiment among respondents is that implementing uniform standards would ensure consistency in care, leading to earlier and more accurate diagnoses and the provision of evidence-based treatment, which would ultimately improve COPD care outcomes, with none of the experts disagreeing. However, in Brazil there is a highlighted importance of guideline adaptability to different contexts, while respondent from Denmark advocate for the need for cross-sector, coordinated approach along with uniform standards.

"Inclusion of COPD a mandatory part of the Primary Care Quality System."

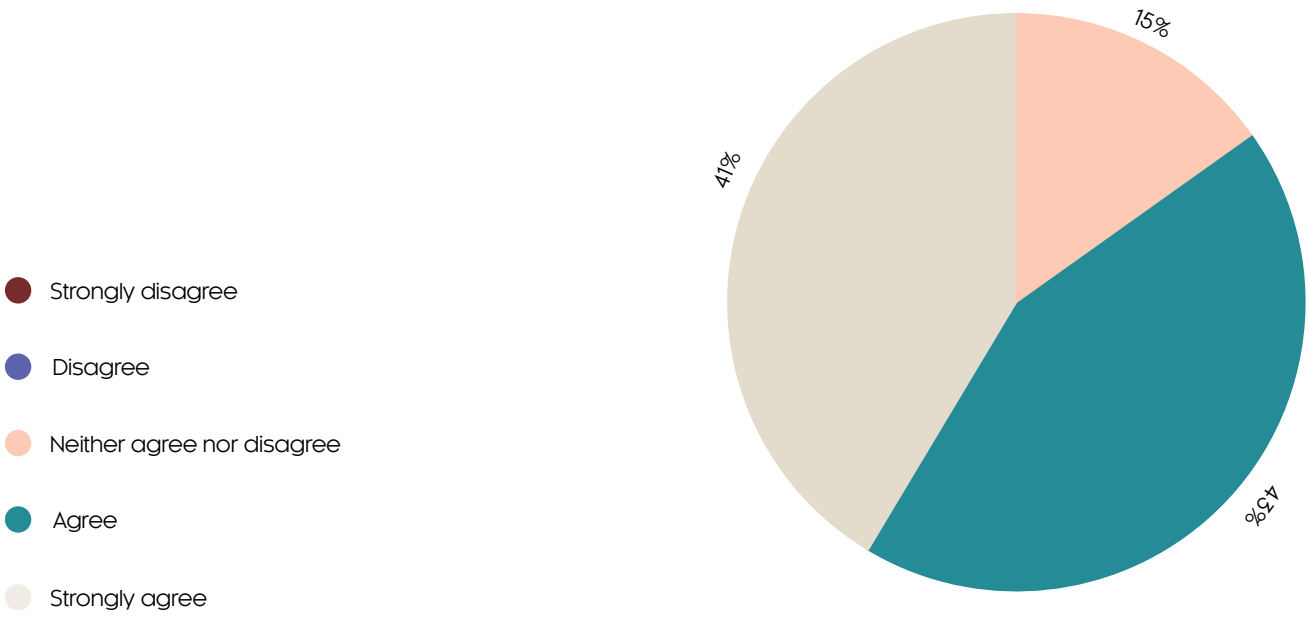
– Estonian respondent

"Uniform standards ensure that all healthcare providers use the same criteria and tools for diagnosing COPD, such as spirometry. This consistency can lead to earlier and more accurate diagnoses. Adopting standardised treatment guidelines, based on international best practices, ensures that all patients receive evidence-based care. This can include guidelines for the use of medications, non-pharmacological treatments like pulmonary rehabilitation, and lifestyle interventions."

– Ukrainian respondent

UNIFORM QUALITY STANDARDS

Figure 26 *COPD care would improve if uniform standards for COPD care and quality assurance were enforced in my country's health system.*



4.7. TELEMEDICINE AND DIGITAL HEALTH TOOLS FOR COPD

4.7.1. Patient access to digital health tools for COPD management

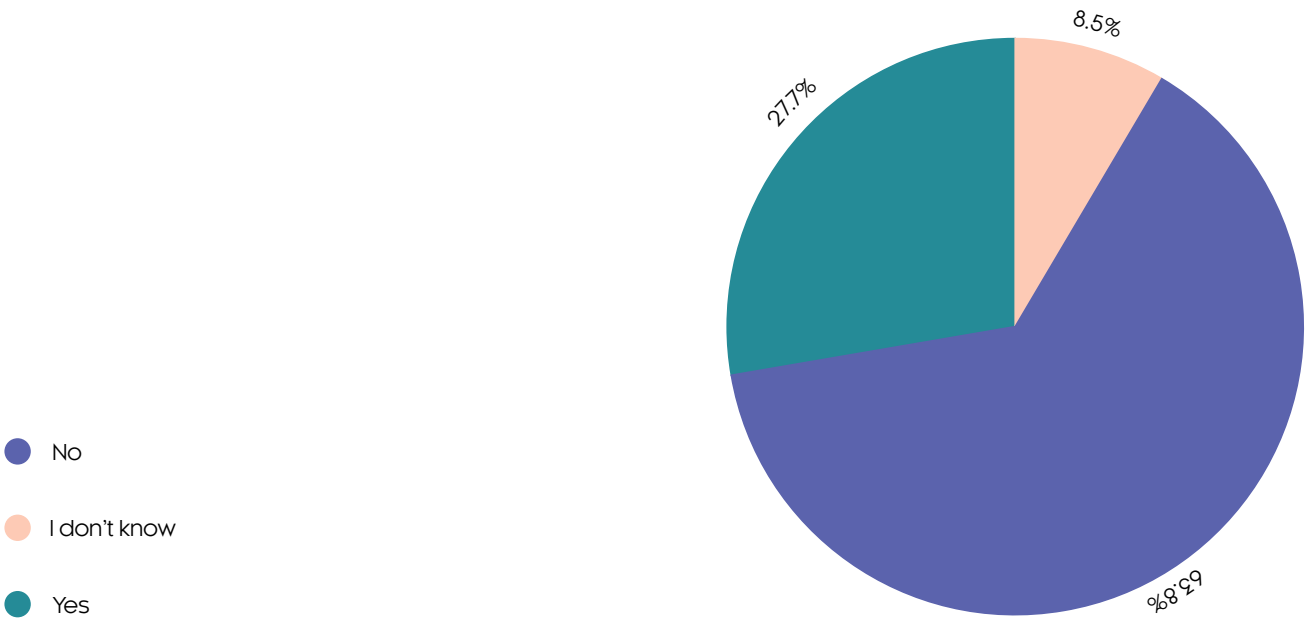
Around two-thirds of respondents recognised a significant lack of patient access to digital tools and/or platforms that aim to improve management of COPD. **Additionally, more than half (54%) of experts confirmed that costs for digital tools and resources are not covered or reimbursed by the public insurance scheme(s) in their country, with only 20% reporting full coverage or reimbursement by public insurance.** Respondents also acknowledged the role of health literacy and patient empowerment in the use of these services as a part of COPD care in their country.

"This really depends on the health literacy and activation of the patient and their carer, it is mostly self-sourced..."

– Australian respondent

ACCESS TO DIGITAL TOOLS AND/OR PLATFORMS FOR COPD MANAGEMENT

Figure 27 *Do patients have access to digital tools and/or platforms that aim to support improved management of COPD?*



4.7.2. Access to telemedicine and digital tools

Experts strongly acknowledge that increased access to telemedicine and digital tools, such as health monitoring apps, would improve patient outcomes. Despite relatively high optimism expressed, some answers discover concerns, most often expressed as neutral attitudes due to low levels of health literacy among patients, especially elderly individuals. Other respondents emphasise the need for stronger evidence on the effectiveness of these tools. There is also a recognition of the potential that these technologies could exacerbate inequalities due to digital exclusion. The Delphi study's findings indicate a strong potential for digital tools, but with considering the sociodemographic characteristics of patients, and accessibility of these services.

"Addressing challenges related to accessibility, privacy, and training is crucial to realising the full benefits of digital health technologies in improving COPD patient outcomes."

– Ukrainian respondent

"Telemedicine has been very helpful in remote regions of Scotland, so I think it has an important role in some situations. Technology such as monitoring apps will be useful for some people but not all and may increase inequalities due to digital exclusion."

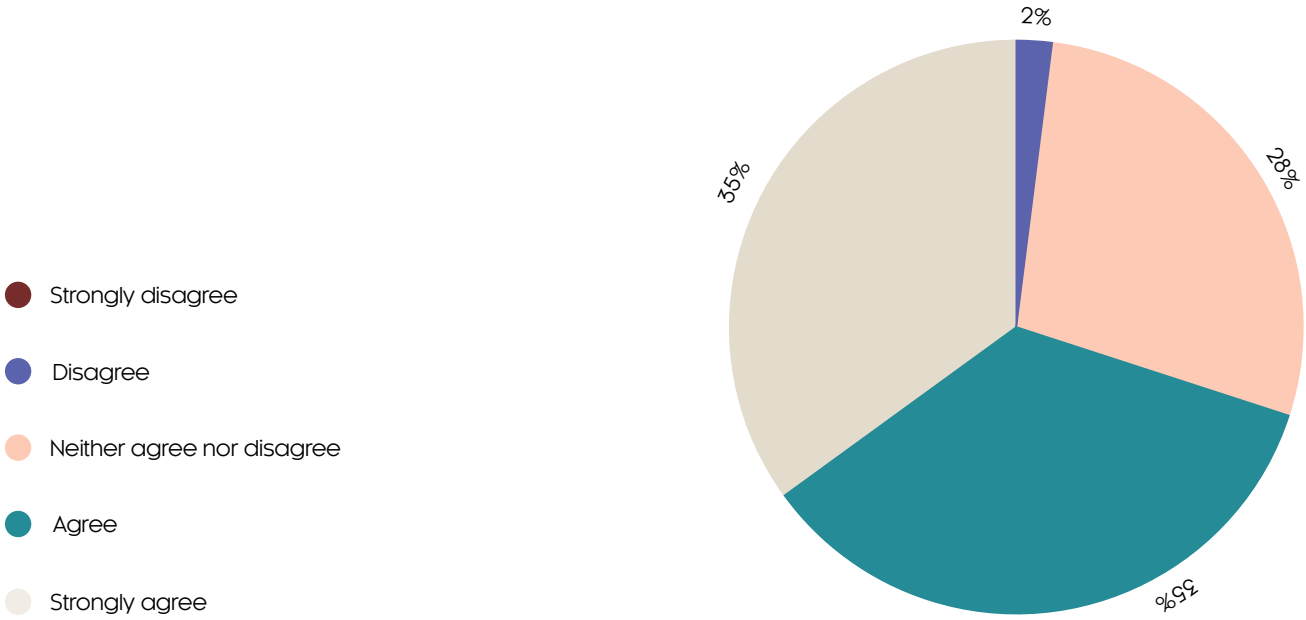
– UK respondent

"We need more evidence on the efficacy of such tools (and which of their components), and how they should be developed."

– Belgian respondent

DIGITAL HEALTH ACCESS

Figure 28 *Increased access to telemedicine and digital tools such as health monitoring apps would improve patient outcomes.*



4.7.3. Barriers to telemedicine and digital tools

Participants ranked the complexity of the use of digital tools and platforms, difficult technical implementation and inadequate or non-existent reimbursement model as the biggest barriers for a broader introduction and implementation of telemedicine and digital tools for COPD.

"Australia's experience with My Health Record was limited uptake from consumers, as the promotional messaging was not integrated for this audience. There was no patient activation and management by healthcare teams. Even though it is useful in both primary and tertiary care, it was not supported once it was implemented in the community. All of the response options are elements of implementation challenges... I wouldn't say they are too complex for HPs to learn and use, but HPs are time poor and reluctant to invest their time to learning new systems and ways of working."

– Australian respondent

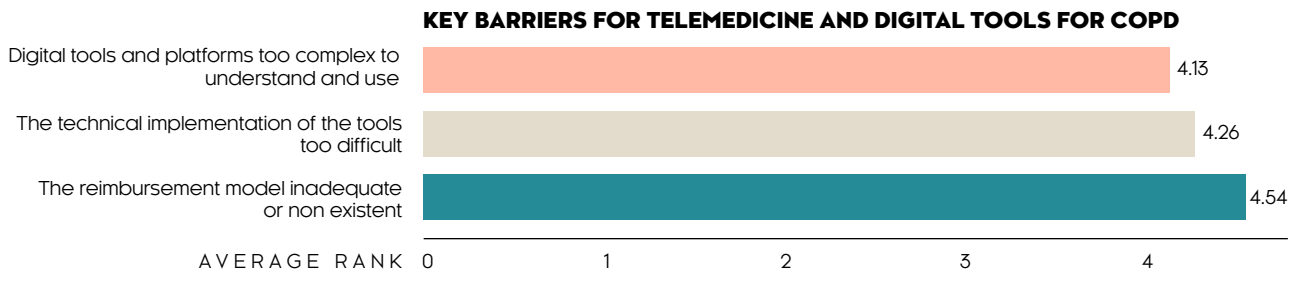
"Connecting digital tools with our health information system is expensive and not a priority of our ministry of health and government."

– North Macedonian respondent

"Some digital health platforms may have complex user interfaces that require significant time and effort to learn and navigate efficiently. Physicians may not receive adequate training on how to use digital tools effectively. This can lead to underutilization or misuse of the technology, impacting its potential benefits."

– Ukrainian respondent

Figure 29 *Which of the below are the top three barriers to achieving higher uptake and use of digital tools for COPD care?*



4.8. FUTURE OUTLOOK FOR COPD CARE

The responses indicate generally high consensus but varying levels of optimism about COPD care in the future.

4.8.1. COPD guidelines harmonisation by 2035

Experts highly agree that as of 2035, guidelines will be more harmonised internationally, there will be improved sharing of best practices, and improved implementation of COPD guidelines. Optimism is present among respondents in Australia, Canada, and Japan, however, experts from countries such as Portugal and the United Kingdom expressed the need for guidelines adaptability to local contexts for them to be successful, while Brazilian respondents share pessimism on this point due to socioeconomic differences, and insufficient action in LMICs.

"I think that nowadays there are important differences between different parts of the world. I don't think this will be different in 10 years from now. So, guidelines should be, in my opinion, more directed for each region instead of having global guidelines with global recommendations that are not so adequate for some parts of the world..."

– Portuguese respondent

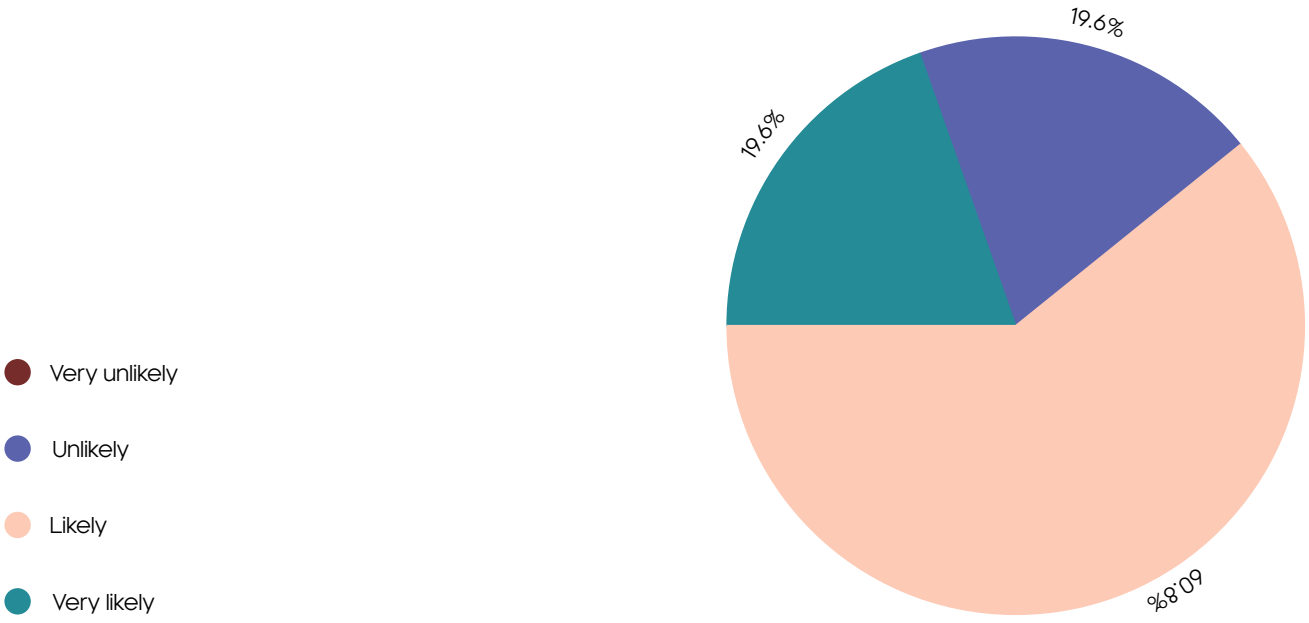
"After experiencing COVID-19, we learned that the response to COVID-19 in countries around the world was different from the response of the Japanese government. The Japanese people have begun to learn the differences. I believe that we will change those differences and bring Japan closer to the global standard."

– Japanese respondent

"There are still many socioeconomic differences that have a direct influence on the management of COPD, and I do not believe that this will be resolved in 10 years."

– Brazilian respondent

Figure 30 *Guidelines on COPD prevention, diagnosis, and management will become more harmonised on an international level by 2035.*



4.8.2. COPD strain on healthcare systems by 2035

Most experts (83%) expect that the burden of COPD in their countries will place significantly more strain on the country's healthcare system by 2035. The primary factors driving the **anticipated increased burden of COPD** are that smoking rates are expected to remain persistent or rising, ageing populations, and environmental factors such as air pollution. Some factors are context-specific however, with a few countries still using biomass cooking fuel, such as Gambia's case with the widespread use of woodstoves, or Argentina with high rates of underdiagnosis, expecting the health system exacerbation when COPD is diagnosed properly, like Brazil. Some countries, like Saudi Arabia and Singapore, expressed concerns regarding smoking trends, particularly regarding the potential increase in the use of water pipes and e-cigarettes. Others express cautious optimism that improved healthcare systems, better prevention strategies, and declining smoking rates might mitigate the expected increase in the burden of COPD, as Canada. However, these countries also acknowledge the ongoing challenges posed by an ageing and multimorbid population and environmental factors. Notably, the expected increase in the burden, for instance in Argentina's case might not be negative, as the country expects that this will be partly due to a decrease in under- and misdiagnosis. Overall, the responses suggest a general expectation that COPD will place a greater strain on healthcare systems worldwide by 2035, with the degree of impact varying depending on local factors such as demographics, smoking trends, and environmental conditions.

"COPD is already the 3rd cause of death worldwide, in Argentina there is 77% underdiagnosis and 60% misdiagnosis, just by improving the diagnosis will increase the number of patients to be treated..."

– Argentinian respondent

"Baby Boomers are dying at a rapid rate from all causes. That bubble of extreme smokers is coming to an end and will not be replaced by "vapers" or marijuana smokers for many, many years to come."

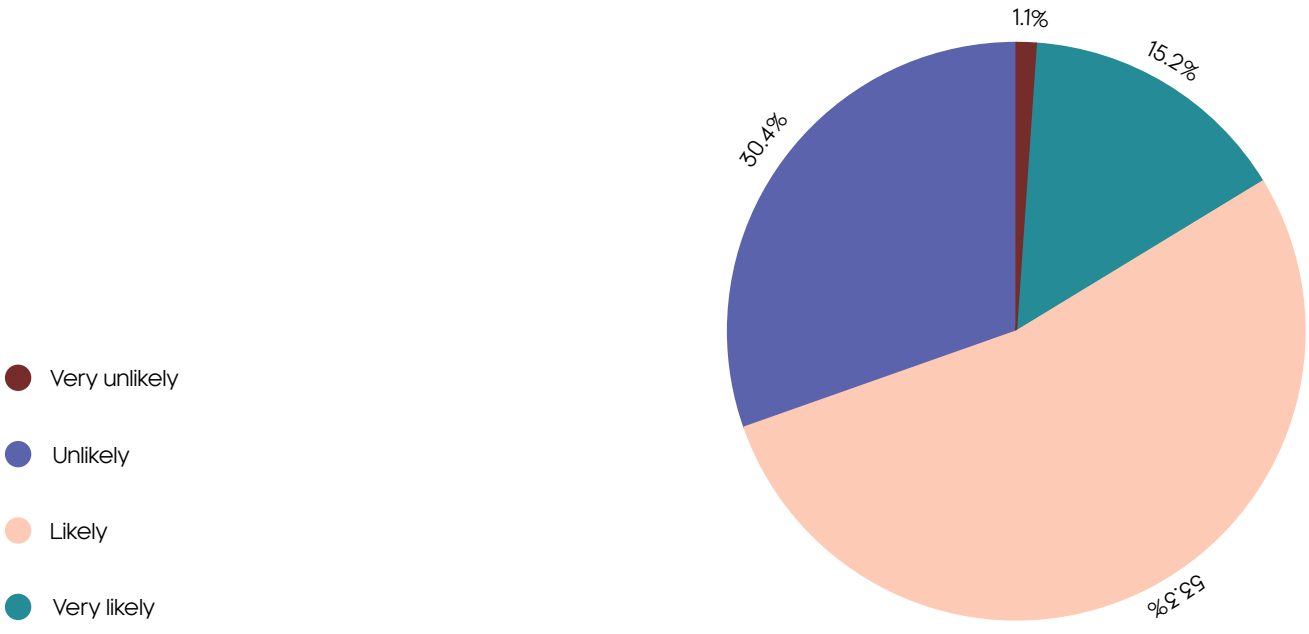
– Canadian respondent

"More elderly patients and continued smoking rates will continue to raise COPD numbers..."

– Belgian respondent

THE BURDEN OF COPD STRAIN ON HEALTHCARE BY 2035

Figure 31 *The burden of COPD in my country will place significantly more strain on my country's healthcare system by 2035.*



4.8.3. Improved sharing of best practices by 2035

There is a high sense of optimism regarding improved sharing of best practices and knowledge related to COPD diagnosis, care, and prevention between stakeholders across countries by 2035. In Asia, respondents from Japan and China are confident in future collaborations. Similar sentiment is expressed in Northern and Western Europe (Sweden, Denmark, Portugal, Spain) where there is already significant alignment with international standards and active engagement with global health bodies. However, in Southern Europe, there is still some pessimism, with Greece expressing internal systemic issues, and a lack of policy support. Some lower-middle-income countries as Pakistan and Brazil share stronger pessimism due to their country facing major economic challenges, lack of incentives, or limited healthcare resources.

"Right now, our stakeholders are not that much serious to this issue. That's why it doesn't seem like improving the situation in near future or in next ten years..."

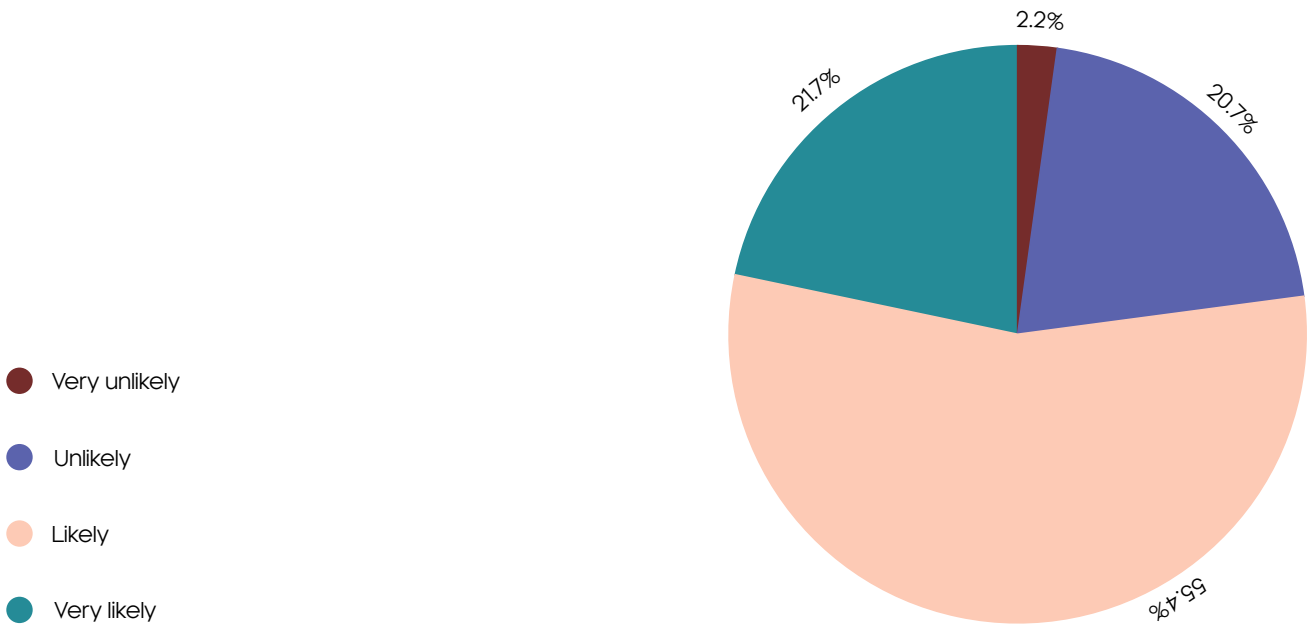
– Pakistani respondent

"The respiratory organisation I belong to in Portugal (GRESP) has been having a stronger collaboration, for example, with IPCRG. I believe this partnership, for example, will make stronger the sharing of practices and knowledge between different countries/regions...."

– Portuguese respondent

IMPROVED SHARING OF BEST PRACTICES BY 2025

Figure 32 *There will be improved sharing of best practices and knowledge related to COPD diagnosis, care, and prevention between stakeholders in my country with those in other countries by 2035.*



4.8.4. Improved implementation and execution of COPD plans and strategies by 2035

The majority (75%) of participants find that the implementation and execution of plans and strategies to address COPD in their country will significantly improve by 2035. The main reasons include proactive government investments, policy reforms, growing public awareness campaigns and training programs for healthcare professionals. Some experts, however, express cautious optimism, such as in Hungary and Italy, where there is a need for healthcare infrastructure improvements and more consistent care across regions. A small portion of respondents is less hopeful, with funding issues in the UK, regional differences in Spain, ineffective policies and fragmented national strategies in Greece, and limited recognition of COPD as a national health priority in Pakistan. The responses highlight the need for tailored strategies to address both HICs and LMICs.

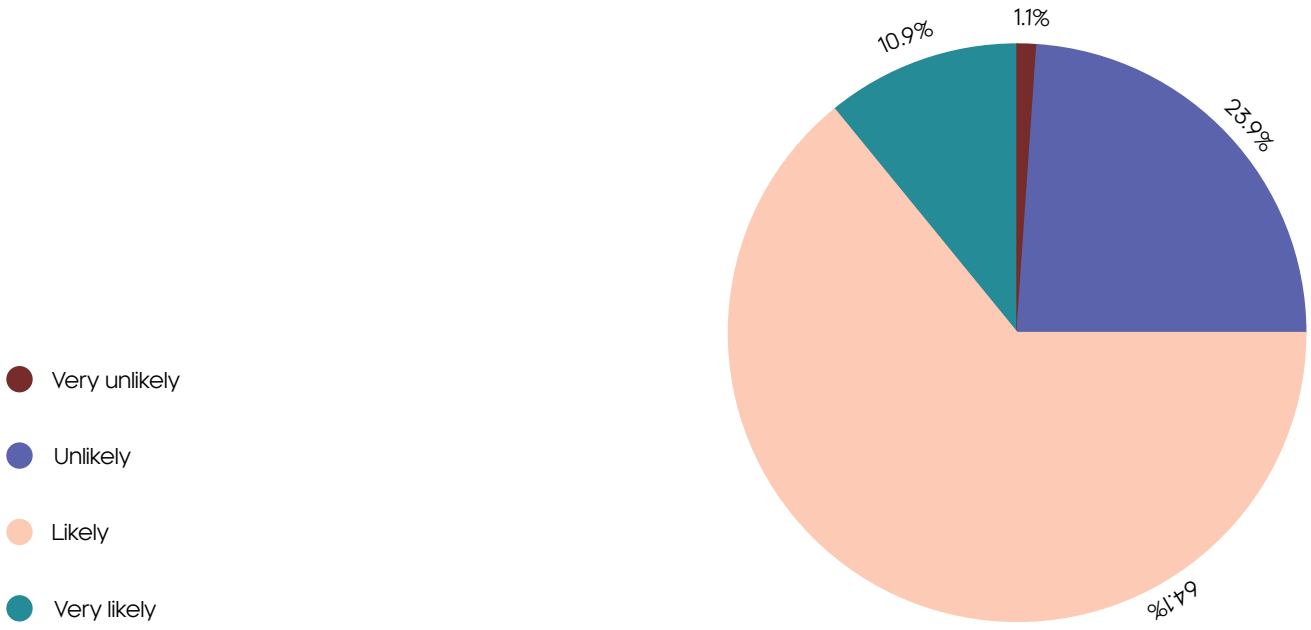
"...We know what needs to be done and we are going to focus our advocacy efforts on this, we can only hope that the resources needed to make the change will be prioritised by policy makers. It is constant effort and battle but when we combine evidence, with consumer voice it can be powerful difficult to treat, self-management is difficult, etc.) and will often lose out to other diseases..."

– Australian respondent

"At the moment, we do not see any intention from health authorities to update and implement a specific national strategy for COPD, despite it being a long-standing demand by patients and scientific societies. We do believe that some other regions could develop such strategies within that timeframe, but the fact that they are regional further deepens the healthcare disparities already detected in Spain between territories..."

– Spanish respondent

Figure 33 *Implementation and execution of plans and strategies to address COPD in my country will significantly improve by 2035.*



4.8.5. Competition for resources with other NCDs stakeholders

Experts predominantly (80%) agree on the high likelihood that stakeholders working to reduce the burden of COPD in their country will have to compete more aggressively against stakeholders working with other disease areas in their country for attention and resources. Respondents expect increased competition for resources from cardiovascular conditions, cancer, and diabetes due to a sentiment that COPD is often overshadowed by these conditions, especially in settings with very limited healthcare resources. A small part of the respondents, however, find that need will lead to the prioritisation of diseases in the future rather than rivalry.

"As cardiovascular diseases, metabolic diseases and cancers rank the top three causes of death in China, COPD ranks the third or fourth of causes of death. There will be conflict between different diseases."

– Chinese respondent

"Stakeholders should not compete, on the contrary, they should work in a more integrated way..."

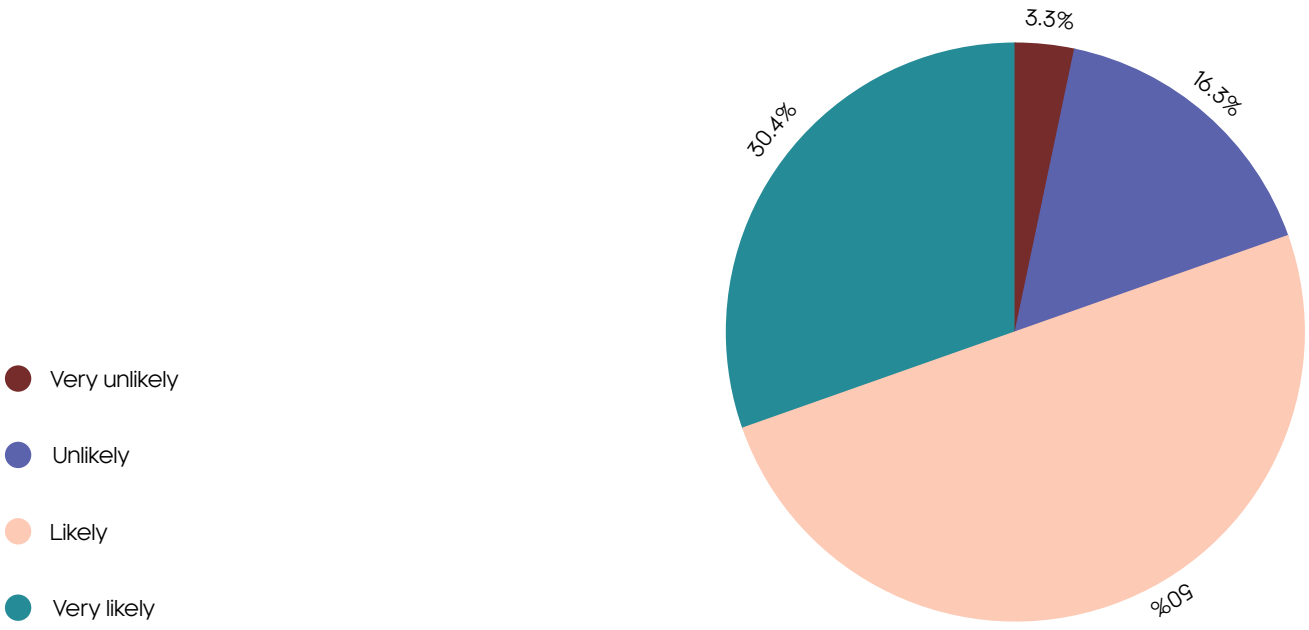
– Colombian respondent

"Stakeholders working to reduce the burden of COPD in Hungary will have to compete more aggressively due to limited healthcare resources, an aging population with increasing incidences of various chronic conditions, and the need to prioritise funding and attention among numerous pressing health issues."

– Hungarian respondent

COPD STAKEHOLDERS WILL COMPETE MORE AGGRESSIVELY FOR ATTENTION AND RESOURCES

Figure 34 *Stakeholders working to reduce the burden of COPD in my country will have to compete more aggressively against stakeholders working with other disease areas in my country for attention and resources in 2035.*



4.8.6. Introducing outcome-based financial incentives

More than half of the participants (59%) find that COPD care in their country would improve if an outcome-based financial incentive scheme was introduced for healthcare providers. However, there are some mixed views on the effectiveness of such schemes. One example from Denmark illustrates that despite financial incentives, spirometry use has not increased significantly, while other countries like the UK experienced regional differences in local outcome-based framework implementation.

"Implementing an outcome-based financial incentive scheme for COPD care in Ukraine has the potential to drive improvements in quality, efficiency, and patient outcomes. However, it requires careful planning, monitoring, and adjustment to ensure that it effectively motivates providers to deliver high-quality, patient-centred care while maintaining equity and accountability in the healthcare system."

– Ukrainian respondent

"Generally, GPs are given economic incentives to save costs, they are never assigned qualitative objectives, for example improving adherence."

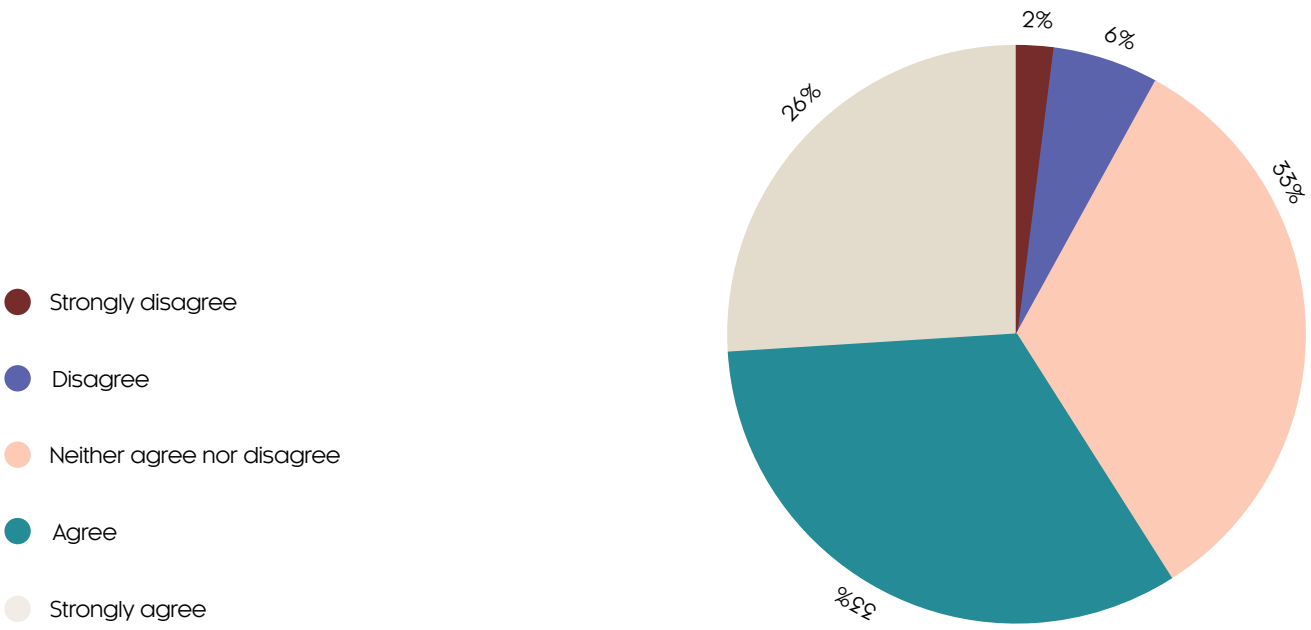
– Italian respondent

"In the UK, most regions have a financial incentive scheme (QOF). Scotland (and Somerset) have dropped QOF. It hasn't led to a clear drop in standards, but there is no longer a necessity to review patients with COPD and inevitably standards will drop in practices facing many demands."

– UK respondent

EFFECTIVINESS OF FINANCIAL INCENTIVES

Figure 35 *COPD care in my country would improve if an outcome-based financial incentive scheme were introduced for healthcare providers.*



5. Summary and discussion of main findings

5.1. Prevention, diagnosis and management

To prevent COPD, it is crucial to implement smoking cessation programs and environmental policies, while also raising awareness and reducing the stigma associated with the disease. Smoking cessation interventions remain critical for prevention, but they need to be more accessible for a higher uptake among patients. Furthermore, prevention efforts are often undermined by environmental factors, such as air pollution and occupational exposure. These are especially prevalent in some LMICs, where implementation of environmental policies is particularly lacking. A further issue is the lack of awareness of COPD symptoms and the perception of COPD as "self-inflicted" or "smokers' disease", leaving patients stigmatised.

Participants identified underdiagnosis as the most significant challenge. Underdiagnosis is often related to insufficient spirometry performed, especially in primary care, misdiagnosing COPD, regulatory restrictions and reimbursement and incentive issues. In many regions, access to diagnostic tools, particularly to spirometry, is seen as insufficient. In Europe, especially in Eastern and Southern parts, the critical issues are related to lack of access to diagnosis. Meanwhile in Africa and parts of Asia, the lack of awareness on COPD risk factors is more highlighted. A region-specific issue in the Middle East is misdiagnosis, often driven by clinical guidelines that fail to differentiate between asthma and COPD.

Management challenges are generally driven by fragmented care which is due to poor communication across care sectors, limited access to treatment and pulmonary rehabilitation, relatively low patient adherence to treatment, and stretched primary care. Experts consistently emphasise the need for better care integration, particularly improving communication between primary, secondary and tertiary care. The main challenges vary however regionally. In Eastern and Northern Europe, the highlight is on the need for better self-management support; in Southern Europe, the main concern is the limited availability of pulmonary rehabilitation; while in Western Europe, the primary issue is the low adherence to COPD care guidelines.

While COPD care is often influenced by resource allocation, the challenges faced in LMICs can differ from those in HICs. Problems persisting across both settings are related to health workforce shortages and regional disparities. However, COPD care in HICs seems to be more accessible at early stages,

while in low-resource settings receiving treatment is often delayed. Additionally, in LMICs, healthcare disparities are often linked to a lower allocation of resources to healthcare in general, whereas in HICs they are sometimes related to other factors despite physical accessibility. For example, in Estonia, despite care being physically accessible, certain psychological barriers persist.

5.2. Plans, strategies, and guidelines for COPD

Experts emphasise the importance of managing and mitigating COPD risk factors, prioritising primary prevention along with early and accurate diagnosis as top elements to be prioritised when improving global COPD care and prevention guidelines.

The alignment of national COPD plans with broader global frameworks, such as SDGs and WHO's "Health in All Policies" initiative, is strongly supported by respondents. However, successful implementation of the strategies lies in carefully adapting them to the local context, as regional differences and complexities show that "one-size-fits-all" approach is unlikely to result in positive outcomes, a concern highlighted across various topics in the Delphi study. This is further demonstrated by a slightly smaller consensus on outcome-based financial incentives, with some countries suggesting that this strategy may not be effective in every context based on experiences of local implementations.

5.3. COPD policy implementation and challenges

Although a slightly higher number of participants agreed that policies for COPD diagnosis and management are consistent across their country, different answers to that question even within the same country indicate lack of alignment, availability and accessibility of information. This further demonstrates that despite a theoretical agreement in approach there are significant obstacles in implementation, as well as regional differences within several countries. In fact, many participants have agreed on regional disparities highly affecting COPD care. A significant portion of the experts support the enforcement of unified standards for COPD care across the national health systems, whereas one part of those who do not support this would add a component of local adaptation. In other words, there is a high consensus on the importance of evidence based universal care guidelines for improved COPD outcomes. Findings highlight that strong tobacco policies are not sufficient to reduce smoking rates, and that implementation most often plays a more significant role. Expanding access to spirometry and smoking cessation programs is seen as a crucial and cost-effective improvement opportunity. Additionally, policymakers generally have a low awareness of COPD, impacting its reprioritisation compared to other NCDs in policies, but also financial allocations globally despite the high burden, societal and economic costs.

5.4. Patients, access to care, and equity

Patients with COPD face varied challenges, with many experiencing limited access to personalised treatment, inconsistent self-management support, and a lack of cohesive care across healthcare settings. Stigma around COPD, often viewed as a "self-inflicted" condition, further compounds these difficulties, as patients may feel discouraged from seeking timely help. Access to care is often related to socioeconomic challenges and geographical disparities, especially in rural and underserved areas often prevent patients from receiving the com-

prehensive care and rehabilitation services, potentially affecting long-term health outcomes. Additionally, limited access to their own health data prevents patients from fully engaging in their care, hindering informed decision-making and adherence. Furthermore, inadequate education and support around disease management leave patients under-informed and struggling with adherence, contributing to a fragmented experience of care that calls for more standardised, patient-centred approaches. Finally, an important finding is that accessible care according to policy does not always mean equitable and accessible care.

5.5. Telemedicine and digital tools for COPD management

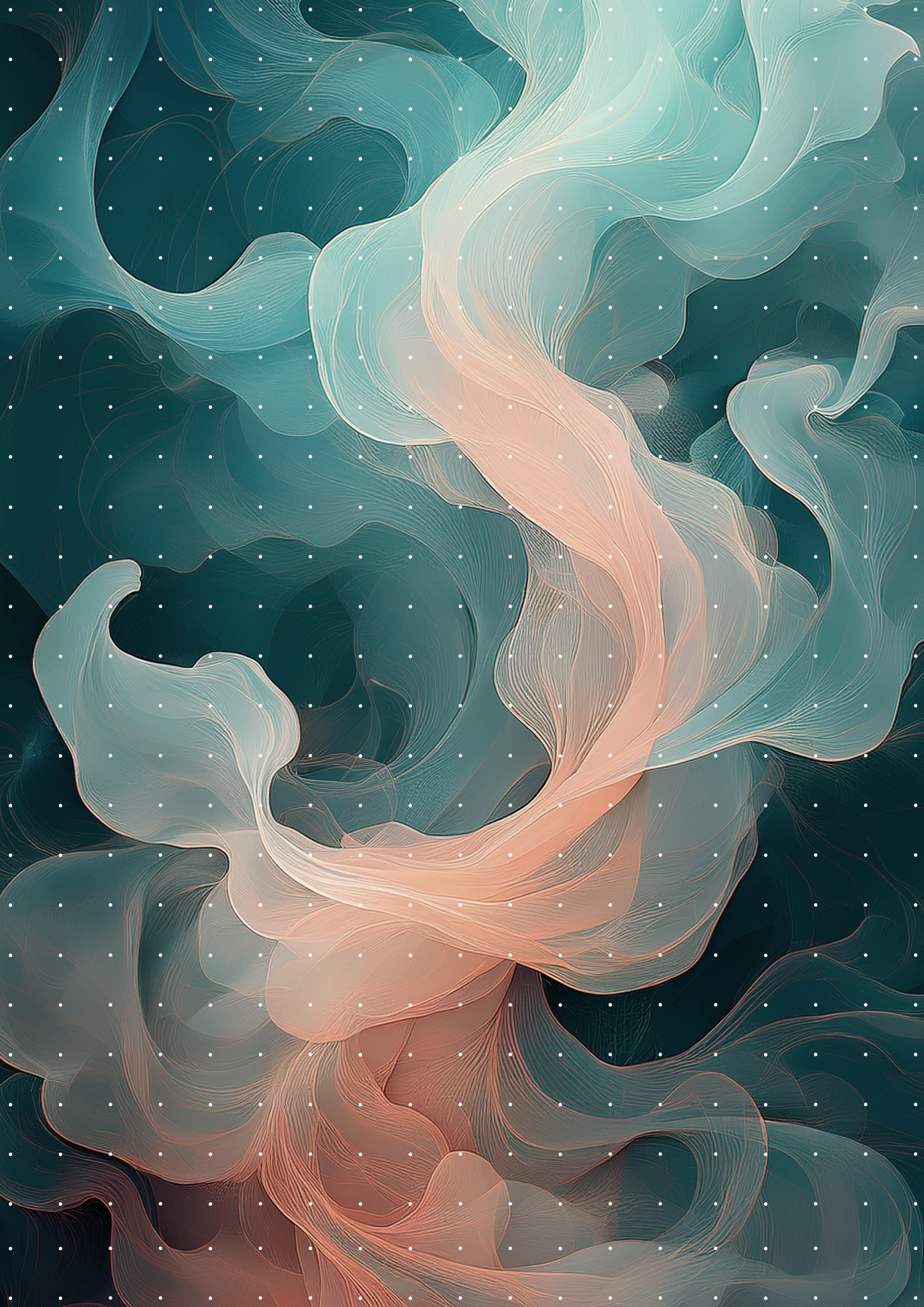
Attitude towards potential of telemedicine and digital tools (e.g. health monitoring apps) to enhance COPD patient outcomes was generally optimistic. However, important factors to consider are accessibility, health literacy and digital inclusion of all parts of the population to prevent widening health disparities with inadequate implementation. Similarly, the creation of patient-related outcome databases was highly supported, but with careful, clear implementation, staff training and quality assessment strategy.

5.6. Future outlook for COPD care

A high optimism for international harmonisation of standards is anticipated. This optimism is particularly high in some parts of Asia as Japan and China, but also in Northern and Western Europe –particularly in Sweden, Denmark and Spain.

Experts are also generally highly concerned about the rising burden of COPD and its strain on their national health systems, due to persistent smoking rates, environmental factors, and aging populations. This indicates the importance of early action for prevention of even higher future costs of COPD, but also comprehensive disease management. The burden and costs of COPD will be further exacerbated if the social determinants of health, such as socioeconomic status and geographical disparities in access to care, are not tackled.

However, optimism is widely present related to the implementation of COPD strategies and plans in the future, highlighting proactive government initiatives and a growing public awareness of the issue.



Appendix A

DELPHI ROUND I QUESTIONNAIRE

Section 1 – Respondent information
Please provide the following information in the fields below.

- Title
- Name
- Organisational affiliation(s)
- Email address
- Country (please select the country on behalf of which you are responding to the survey questions)
- Stakeholder category (Please select which category best describes your role)

    - Policymaker
    - Civil servant/representative of a public institution or authority
    - Healthcare Professional (Respiratory specialist)
    - Healthcare Professional (Primary care)
    - Patient Advocacy Group Representative
    - Patient
    - Carer
    - Healthcare Researcher (please specify research area(s) below)
    - Other

- I am submitting a response to this survey with other members of my organisation (Yes/no)

    - IF YES to above: Please specify the names of the respondents in the fields below.

Section 2 – Experiences with the prevention, diagnosis, and management of COPD

In this section you are asked to respond to a series of open questions. Please provide answers that are as comprehensive as possible.

1. What are the most important challenges related to COPD prevention, diagnosis, and management you see in your country today? Please provide up to three challenges. *(Open-ended)*

2. What are the greatest opportunities to improve COPD outcomes and approaches to how COPD is diagnosed, prevented, and managed in your country today? Please provide up to three opportunities. *(Open-ended)*

3. What are the strongest healthcare practices for COPD prevention, diagnosis, and management that are currently implemented in your country? *(Open-ended)*

4. Are there any major weaknesses in the prevention, diagnosis, and management of COPD in your country? *(Open-ended)*

Section 3 – Policy changes and priorities

In this section you are asked to respond to a series of open questions. Please provide answers that are as comprehensive as possible.

5. Which stakeholders are most influential in the development, implementation, and execution of policies, strategies, and guidelines that impact COPD patient outcomes and COPD prevention, diagnosis, and management in your country? Examples could be patient associations, medical societies, industry actors, etc.) *(Open-ended)*

6. Are policies and initiatives to support COPD diagnosis, prevention, and management similar or the same throughout your country? *(Yes, there are few or no differences/No, there are several clear differences/No, there are many differences/I don't know)*

    a. (Comment field to provide rationale on answer selection)

7. Are there any obvious activities or initiatives that decision makers in your country should engage in to improve COPD outcomes for patients and the burden of COPD on the health system? *(Open-ended)*

8. What health system-level changes are needed to improve COPD diagnosis and management in your country? *(Open-ended)*

9. Which three things should policymakers in your country prioritise over the next ten years to improve COPD patient outcomes and the country's approach to prevention, diagnosis, and management of COPD? *(Open-ended)*

Section 4 – Plans, strategies, and guidelines for COPD

In this section, you are asked to provide both knowledge related to plans,

strategies, and guidelines related to COPD care as well as offer your expert perspective on their level of implementation and alignment. For questions related to your perspectives, please provide as much support as possible for your answer.

10. My country has a strategy or national plan that addresses the burden of non-communicable diseases (NCDs) (or a dedicated respiratory health strategy that explicitly and comprehensively addresses COPD). *(Yes/No/I don't know)*

    a. If possible, please provide a link to the policy or strategy. *(Field to provide link)*

    b. Is the strategy or plan linked to the United Nations' Sustainable Development Goals (SDGs)?

    c. Is COPD specifically addressed in the strategy?

11. I would characterise the level of implementation of the policy or strategy in the following way:

    a. There is a high level of implementation.
    b. There is a moderate level of implementation.
    c. There is a low level of implementation.
    d. There is no implementation.
    e. I don't know.
    i. Comment field to provide rationale on answer selection)

ALTERNATIVE QUESTION 11 IF "NO" TO QUESTION 10: I believe COPD prevention, diagnosis, and management in my country would improve if my country had a plan or strategy for COPD. *(Likert scale – Fully agree-Fully disagree / I don't know)*

12. Which, if any, additional or alternative strategies or plans could make a positive difference for COPD prevention, diagnosis, and management in your country? *(Open question)*

13. My country has specific guidelines for COPD care and treatment. *(Yes/No/I don't know)*

    a. If possible, please provide a link to the guidelines. *(Field to provide link)*

    b. Were stakeholders working in primary care involved in the development of the guidelines?

    c. Which other types of stakeholders or organisations were involved in the creation of the guidelines? *(Select radio buttons based on selections at beginning of survey + I don't know)*
    d. Do the guidelines include elements related to treatment for tobacco dependence? *(Yes/no/I don't know)*

14. **(IF YES TO QUESTION 13)** I would characterise the guidelines' level of alignment with Global Initiative for Chronic Obstructive Lung Disease's (GOLD) guidelines in the following way:

    a. There is a high level of alignment.
    b. There is a moderate level of alignment.
    c. There is a low level of alignment.
    d. There is no alignment.
    e. I don't know.
    i. (Comment field to provide rationale on answer selection)

15. **(IF YES TO QUESTION 13)** I would characterise adherence to the care guidelines in healthcare settings in my country in the following way:

    a. There is a high level of adherence.
    b. There is a moderate level of adherence.
    c. There is a low level of adherence.
    d. There is no adherence.
    e. I don't know.
    i. (Comment field to provide rationale on answer selection)

16. In your view, what elements should a robust COPD guideline contain? (E.g., management of multimorbidity, focus on frailty, and preventive interventions). *(Open, optional)*

17. Please add any additional comments you have on guidelines for COPD diagnosis, prevention, and management in your country.
    (Open, optional)

Section 5 – Patients, access to care, and equity

In this section, you are asked to provide both knowledge related to patients' access to care and healthcare design as well as offer your expert perspective on your country's capacity to address patient care needs. For questions related to your perspectives, please provide as much support as possible for your answer.

18. It is a standard practice in my country healthcare system to develop personalised treatment and self-management plans for COPD patients.
    (Yes / No / I don't know)

    a. (Comment field to provide rationale on answer selection)

19. It is a standard practice in my country healthcare system to record COPD patient data.

    a. Yes, it is recorded in a national database
    b. Yes, it is recorded in a regional database
    c. Yes, it is recorded into a database that is not accessible outside of an individual practice
    d. No, it is not recorded
    i. (Comment field to provide rationale on answer selection)

20. **(IF YES TO QUESTION 18):** In general, I believe that the recording of data meets sufficiently high standards of accuracy and usability. *(Likert scale Fully agree-Fully disagree / I don't know)*

21. Patients generally adhere well to treatment plans. *(Likert scale – Fully agree-Fully disagree / I don't know)*

    a. (Comment field to provide rationale on answer selection)

22. Patients are generally given the educational and material support they need to manage their COPD after diagnosis. *(Likert scale – Fully agree-Fully disagree / I don't know)*

    a. (Comment field to provide rationale on answer selection)

23. Patients generally have significant barriers to accessing adequate COPD care (i.e. clinical interventions, hospital care, or seeing the doctor or getting home care) in my country. *(Likert scale – Fully agree-Fully disagree / I don't know)*

    a. (Comment field to provide rationale on answer selection)

24. Patients generally have significant barriers to accessing medication for COPD in my country. *(Likert scale – Fully agree-Fully disagree / I don't know)*

    a. (Comment field to provide rationale on answer selection)

25. The following factors are significant barriers to access to COPD care for patients in my country (select all that apply):

    a. Socioeconomic status
    b. Sex/gender
    c. Sexual orientation
    d. Ethnicity
    e. Religion
    f. Geography (distance)
    g. Lack of insurance coverage
    h. Lack of affordable care and treatment options
    i. (Comment field to provide rationale on answer selection)

26. Access to and quality of care is similar across the entirety of my country (i.e., there are no significant regional differences in access to and quality of care within the country). *(Likert scale – Fully agree-Fully disagree / I don't know)*

    a. (Comment field to provide rationale on answer selection)

27. Healthcare professionals in primary care settings generally have adequate resources to accurate and effectively diagnose and manage COPD in my country. *(Likert scale – Fully agree-Fully disagree / I don't know)*

    a. (Comment field to provide rationale on answer selection)

28. There are clear care pathways for COPD care and management in my country's health system. *(Likert scale – Fully agree-Fully disagree / I don't know)*

    a. (Comment field to provide rationale on answer selection)

29. Do patients have access to digital tools and/or platforms that aim to support improved management of COPD? *(Yes/No/I don't know)*

    a. **IF YES** – Please provide any additional information about the tools and resources here. *(Open-ended)*

    b. **IF YES** – Are costs for these tools and resources covered or reimbursed by the public insurance scheme(s) in your country? *(Yes, fully covered/Yes, partially covered/No, not covered/ I don't know)*

Section 6 – Future perspectives on COPD care

In this section, you are asked to provide your expert perspective on the future of COPD care in your country. Please indicate how likely you believe the outcomes in the following statements are. Note that you asked to provide responses based on what you believe to be most likely and not most preferable.

30. Guidelines on COPD prevention, diagnosis, and management will become more harmonised on an international level by 2035. *(Likert scale – Very likely-Very unlikely / I don't know)*

    a. (Comment field to provide rationale on answer selection)

31. The burden of COPD in my country will place significantly more strain on my country's healthcare system by 2035. *(Likert scale – Very likely-Very unlikely / I don't know)*

    a. (Comment field to provide rationale on answer selection)

32. There will be improved sharing of best practices and knowledge related to COPD diagnosis, care, and prevention between stakeholders in my country with those in other countries by 2035. *(Likert scale – Very likely-Very unlikely / I don't know)*

    a. (Comment field to provide rationale on answer selection)

33. Implementation and execution of plans and strategies to address COPD in my country will significantly improve by 2035. *(Likert scale – Very likely-Very unlikely / I don't know)*

    a. (Comment field to provide rationale on answer selection)

34. Stakeholders working to reduce the burden of COPD in my country will have compete more aggressively against stakeholders working with other disease areas in my country for attention and resources in 2035. *(Likert scale – Very likely-Very unlikely / I don't know)*

a. (Comment field to provide rationale on answer selection)

Section 7 – Consent and release

35. I consent to having my responses published in an anonymised format in final reporting based on the data collected through this survey form. *(Yes/no)*

36. I consent to being contacted by the Copenhagen Institute for Futures Studies (CIFS) if CIFS would like to acquire additional permission to use my responses in other related outputs related to this study. *(Yes/no)*

37. I am interested in participating in an additional and separate global foresight study on the future of respiratory health conducted by the Copenhagen Institute for Futures Studies. *(Yes/no)*

DELPHI ROUND II QUESTIONNAIRE

Section 1 – Respondent information

Please provide the following information in the fields below.

- Title
- Name
- Organisational affiliation
- Email address
- Country (please select the country on behalf of which you are responding to the survey questions)
- Stakeholder category (Please select which category best describes your role)
    - Public Policymaker
    - Civil servant/representative of a public institution or authority
    - Healthcare Professional (Respiratory specialist)
    - Healthcare Professional (Primary care)
    - Patient Advocacy Group Representative
    - Patient
    - Carer
    - Healthcare Researcher (please specify research area(s) below)
    - Other
- I am submitting a response to this survey with other members of my organisation *(Yes/no)*
    - **IF YES** to above: Please specify the names of the respondents in the fields below.

Section 2 – Challenges in COPD care

In this section you are asked to respond to a series of closed and ranking ques-

tions. You may optionally provide additional rationale for your selections. Please provide answers that are as comprehensive as possible.

1. Please indicate which three challenges are the most important to address in order to improve COPD care in your country:

    a. Underdiagnosis (E.g., inadequate access to spirometry due to either regulatory restrictions or lack of reimbursement policy)
    b. Inadequate focus on supporting patients' self-management
    c. Inadequate collection and sharing of patient health data among HCPs/health system organisations
    d. Inadequate awareness of risk factors among the general population (including occupational risk factors)
    e. Inadequate management of exacerbations
    f. The negative social stigmatisation of COPD
    g. Exposure to indoor air pollution in the home such as biomass cooking fuel
    h. Exposure to outdoor air pollution
    i. Inadequate or non-existent lung function screening programmes
    j. Inadequate access to pulmonary rehabilitation
    k. Inadequate access to smoking cessation services (e.g., WHO essential medicines including nicotine replacement therapy)
    l. Non-differentiation of asthma and COPD in clinical/diagnostic settings
    m. Low or inconsistent adherence among healthcare providers to COPD care guidelines
    n. Inadequate supply of COPD medications
    o. Unaffordability of COPD medications
    p. Inadequate access to surgical interventions for COPD care
    q. Inadequate focus on or management of multimorbidity related to COPD
    r. Inadequate access to vaccines recommended for people with COPD (e.g., influenza, RSV, COVID-19, herpes)
    s. Other (please specify)

Section 3 – COPD guidelines and care approaches

In this section you are asked to respond to a series of closed and ranking questions. You may optionally provide additional rationale for your selections. Please provide answers that are as comprehensive as possible.

2. Which are the top three elements that should be prioritised for the strongest possible guidelines for COPD care and prevention?

    a. Emphasis on primary prevention
    b. Emphasis on early and accurate diagnosis
    c. Emphasis on the role of multimorbidity
    d. Improved care pathways for connecting between primary and secondary care
    e. Practical approaches to smoking cessation

f. Improved access to pulmonary rehabilitation and long-term physical activity
g. Emphasis on the role of frailty
h. An overall simplification of guidelines
i. Emphasis on management and mitigation of risk factors
j. Management of end-stage COPD
k. Emphasis on management and care for exacerbations
l. Lung function screening
m. Application of telemedicine tools and platforms
n. Recommendations for follow-up after exacerbations
o. Approaches for achieving improved patient adherence
p. Role and implications of polypharmacy
q. Checking patient inhaler technique
r. Emphasis on patient endotyping and phenotyping
s. Clear stratification of disease severity and designated care approaches
t. Increased attention to patient education for self-management
u. Other (please specify)

3. National COPD plans would be more effective and implementable if they were directly linked to globally recognised concepts such as the United Nations' Sustainable Development Goals (SDGs) or the WHOs Health in All Policies approach to policymaking.

    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree

4. The barriers to effective COPD diagnosis in my country are (select all that apply):

    a. Lack of education of health professionals
    b. Lack of respiratory specialists
    c. Ineffective reimbursement model
    d. Lack of diagnostic tools (including spirometry)
    e. Inadequate patient data recording and reporting
    f. Lack of clear care pathways
    g. Other (please define)

5. Please provide what you believe are the top three elements that are needed for robust COPD care pathways *(open question)*. (Note: these elements do not have to specific to your country.)

6. Please provide what you believe are the top three elements that are needed to improve patient adherence to treatment plans *(open question)*. (Note: these elements do not have to specific to your country.)

7. Please provide information about any existing initiatives related to COPD in your country that you believe have a positive impact on COPD care. If possible, please provide links to the initiatives. *(Open question)*.

Section 4 – Policymaking opportunities for COPD

In this section you are asked to respond to a series of closed and ranking questions. You may optionally provide additional rationale for your selections. Please provide answers that are as comprehensive as possible.

8. Which are the top three measures that policymakers should prioritise for improved COPD care and patient outcomes?

    a. Increased support for lung function testing at the primary care level
    b. Increased support for COPD screening
    c. Improved implementation and enforcement strategies for tobacco control policies (including anti-vaping legislation)
    d. Increased coverage of evidence-based smoking cessation programmes (e.g., counselling and pharmacotherapy)
    e. Provision of incentives for improved implementation of or adherence to guidelines and strategies for COPD
    f. Increased coverage for pulmonary rehabilitation
    g. Incentivisation of training of healthcare professionals for COPD care
    h. Increased support for COPD research
    i. Increased support for patient organisations
    j. Increased support for home care
    k. Increased support for telemedicine and digital tools for COPD care
    l. Improved management of air quality/pollution control
    m. More robust vaccination strategies
    n. Introduction of performance indicators for healthcare providers and points of care
    o. Introduction of reimbursement models that incentivise improved patient outcomes for COPD
    p. Increased support for public awareness campaigns for COPD
    q. Development and implementation of clearer care pathways for COPD
    r. Development of more specialised care centres
    s. Improved access to biologics for COPD care
    t. Public insurance coverage for patient transportation to points of care
    u. Elimination of out-of-pocket expenditures for all COPD interventions
    v. Increased support for use of multidisciplinary care teams
    w. Support for COPD nurse-led clinics
    x. Supporting wider availability of affordable generic pharmacological treatments
    y. Increased investment in self-management resources and educational tools for patients
    z. Increased support for information and data sharing between points of care and between healthcare providers
    a. Incentivising increased focus on the role of multimorbidity in COPD care

9. The level of awareness about COPD among policymakers in my country is best characterised as:

    a. High level of awareness
    b. A moderate level of awareness
    c. A low level of awareness
    d. No awareness
    e. I don't know

10. COPD care would improve if uniform standards for COPD care and quality assurance were enforced in my country's health system.

    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree

11. COPD care in my country would improve if an outcome-based financial incentive scheme were introduced for healthcare providers.

    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree

Section 5 – Telemedicine and digital tools for COPD

In this section you are asked to respond to a series of closed questions. For some questions, you have the option to provide rationale for your responses. Please provide as much detail as possible.

12. Increased access to telemedicine and digital tools such as health monitoring apps would improve patient outcomes.

    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree

13. Which of the below are the top three barriers to achieving higher uptake and use of digital tools for COPD care?

    a. The tools are too expensive
    b. The technical implementation of the tools is too difficult
    c. There are too few resources to train physicians
    d. The reimbursement model is inadequate or nonexistent
    e. Digital tools and platforms are too complex for most healthcare professionals to understand and use
    f. Digital tools and platforms are too complex for most patients

to understand and use
g. Digital infrastructure is inaccessible for patients (e.g., data plans are too expensive, smartphones/computers are not accessible)
h. Digital tools and platforms do not accommodate patients' physical impairments and disabilities (e.g. arthritis, visual and hearing impairments)
i. There are insufficient digital safety and security measures for protecting personal data

14. The creation of a patient-reported outcomes database would have a positive impact on COPD care in my country.

    a. Strongly agree
    b. Agree
    c. Neither agree nor disagree
    d. Disagree
    e. Strongly disagree

15. Which of the below are barriers to accurate data recording and sharing for COPD care in your country?

    a. Lack of digital infrastructure (e.g., there is no electronic health record system or the system is not interoperable)
    b. Lack of competencies among healthcare professionals
    c. Lack of time among healthcare professionals
    d. Lack of financial incentives or disincentives
    e. There are insufficient digital safety and security measures for protecting personal data
    f. Other (please define)

Section 6 – Consent and release

16. I consent to having my responses published in an anonymised format in final reporting based on the data collected through this survey form. *(Yes/no)*

17. I consent to being contacted by the Copenhagen Institute for Futures Studies (CIFS) if CIFS would like to acquire additional permission to use my responses in other related outputs related to this study. *(Yes/no)*

18. I am interested in participating in an additional and separate global foresight study on the future of respiratory health conducted by the Copenhagen Institute for Futures Studies. *(Yes/no)*

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