

Addressing Inequalities in COPD and Lung Cancer: A Framework for Action

The Lung Health Equity Project Phase 1 Report



This report was developed by Lane Clark & Peacock LLP and initiated and funded by AstraZeneca. It presents the findings of research conducted in spring 2026 with input from a global expert steering committee, supplemented by a rapid evidence review from experts at LSE Health, London School of Economics and Political Science.

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Foreword





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Lung diseases are among the leading causes of death worldwide, yet they remain chronically underfunded and overlooked in policy and health system planning. World Health Assembly Resolution 78.5 on lung health has changed the terms of that neglect: it provides a clear mandate for integrated, multisectoral action to strengthen prevention, enable earlier diagnosis, improve access to care, and measure progress through clear, equity-focused targets.

The burden of lung disease is not distributed by chance. The populations most exposed to addressable risk factors, including tobacco use, ambient and household air pollution, and occupational hazards, are disproportionately those with the fewest resources to avoid them, and often the same populations face the greatest barriers to early detection, diagnosis and onward care. Risk and disadvantage compound one another across the life course, with consequences that extend well beyond health into household finances, labour markets and national economies.

Many of the tools needed to prevent, detect and manage lung diseases already exist. What has been missing is a consistent way to see where care gaps occur, which populations are most impacted, and where finite resources will have the greatest effect. The Lung Health Equity Framework presented in this report is a practical response: a structured, consensus-based and evidence-informed resource, designed to be applied and adapted at national and subnational level.

The findings that emerged from this process point to one overarching conclusion: inequality in lung health does not run along a single dimension. Alongside the compounding disadvantage experienced by people of lower socioeconomic status, rural populations and ethnic minorities, sex and gender shape who is underserved at each stage of the pathway. A framework that measures only one of these patterns will miss the other. The Lung Health Equity Framework is designed to measure both.

According to these findings, men with chronic obstructive pulmonary disease (COPD) bear the greater burden of risk-factor exposure and mortality in most settings, while women are more likely to be diagnosed at later stages and less likely to receive guideline-recommended care. In lung cancer, women are under-represented in screening programmes and clinical trials, even as the disease's epidemiology continues to shift – including a growing burden among female never-smokers.

The application of the framework to COPD and lung cancer is a deliberate choice: these two conditions carry a substantial share of the global lung disease burden, share major risk factors, and frequently occur in the same populations, with COPD itself an independent risk factor for lung cancer. Measuring them together exposes inequalities, and opportunities for integrated action, that single-disease approaches miss. The framework is designed to extend over time to asthma, tuberculosis and post-tuberculosis lung disease, and other respiratory conditions, in line with the integrated approach that Resolution 78.5 calls for.

The framework presented is intended as a resource for policy design, advocacy and health system planning. It will succeed if it helps shift the conversation from recognising inequalities in lung health to systematically measuring and closing them. We commend it to policymakers, health system leaders, researchers and advocates, and we look forward to the country applications that will test and improve it.





Acknowledgments

This policy report was initiated and funded by AstraZeneca, who commissioned Lane Clark & Peacock (LCP) to develop it with insights from an expert steering committee.

The Steering Committee contributed to the identification and prioritisation of key equity indicators across COPD and lung cancer pathways, reviewed findings from the evidence identified, and provided input on the selection of priority indicators, care gaps and underserved populations.

Insights from these discussions, alongside a targeted literature review and supplementary rapid evidence review conducted by George Wharton and Hunter Batjer, LSE Health, London School of Economics and Political Science, informed the development of this report and the policy recommendations presented within it.

AstraZeneca funded the Steering Committee meetings and engagement activities associated with this project. Steering Committee members received honoraria for their participation in advisory meetings that informed the output of this phase of the project.

AstraZeneca had no role in the selection or prioritisation of indicators or the interpretation of evidence, and final editorial control rested with the authors. This report was developed consistently with Article 5.3 of the WHO Framework Convention on Tobacco Control, and no contributor has interests in the tobacco industry.

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- **Professor Silvia Novello,** Full Professor of Medical Oncology and Head of Medical Oncology Unit, San Luigi, Hospital in Orbassano, University of Turin, Italy and President of Women Against Lung Cancer in Europe (WALCE)

Executive Summary

This report presents the findings of Phase 1 of the Lung Health Equity Project, and includes a presentation of a structured, consensus-based, evidence-informed framework designed to support identification of inequalities across COPD and lung cancer pathways. Globally relevant while adaptable to local contexts, the framework supports decision-making at global, national and subnational levels and provides a practical foundation for lung health policy, advocacy and health system planning.

It also highlights policy and health system interventions that have been shown to reduce variation in care at key pathway stages for underserved populations.

Key insights



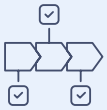
Underserved populations face repeated barriers. Certain populations experience barriers across multiple stages of the pathway, for example those of lower socioeconomic status, rural populations and ethnic minority groups. Here, the inverse care law applies: those with greatest need often face the highest barriers to receiving care. Alongside this compounding disadvantage, sex and gender also shape who is underserved at each stage of the pathway.



Established interventions may help to reduce health inequalities. Interventions are available across prevention, detection and management pathways. These should be designed to meet the needs of specific underserved populations, based on insight on the barriers they face and targeted, evidence-based approaches that have improved outcomes.



Data collection and disaggregation is a necessary condition. Without this, care gaps are invisible and neither investment nor interventions can be targeted appropriately to meet the needs of underserved populations.



A cross-disease perspective can reveal hidden inequalities. COPD, lung cancer, and other lung diseases share many underlying determinants, risk factors and barriers to care, and often co-occur in the same populations. Examining inequalities across diseases, rather than within individual conditions alone, can uncover common drivers of poor outcomes and identify opportunities for coordinated action.



Action is needed beyond the health system. Lung health inequalities are driven by factors that extend beyond healthcare. Coordinated action across sectors, including health, environment, housing, employment, education and transport, is needed to address the wider determinants that shape exposure to risk and access to care. Tackling these drivers upstream can reduce the future burden of lung disease, improve outcomes and reduce avoidable pressure on health systems.

Recommendations

1. **Apply the lung health equity framework at national and subnational levels,** using disaggregated data to map inequality, identify hotspots where clinical care gaps and social, behavioural and environmental risk factors converge, and inform targeted policy action.

2. **Invest in research to better understand risk factors** and how they may be evolving, including climate-driven exposures, emerging determinants, and never-smoker lung disease.

3. **Scale and adapt evidence-based interventions** for prevention, detection and treatment to reach underserved populations, tailoring delivery to the specific barriers these groups face and drawing on approaches demonstrated to improve outcomes.

4. **Invest in data infrastructure that enables disaggregation** by factors including sex, socioeconomic status, rurality, and ethnicity to inform policy development and health system interventions. Define a country-relevant minimum equity dataset and monitor data completeness.

5. **Develop national lung health strategies** including measurable equity objectives, with clear lines of accountability via named stakeholders, implementation timelines and periodic public reporting.

6. **Coordinate cross-sectoral action** across environment, housing, employment, education and transport to address the wider determinants of lung health, alongside healthcare-based prevention, detection and treatment.



Part 1

The need for action on inequalities in lung disease

1.1 Burden of lung disease and the global response

Lung diseases encompass both communicable and non-communicable diseases (NCDs) including tuberculosis, pneumonia, influenza, COVID-19, COPD, pulmonary fibrosis, asthma and lung cancer.[1] Non-communicable lung diseases alone account for more than 18 million deaths globally every year.[2]

The burden of lung disease is substantial and is increasing in some countries, reflecting demographic, environmental and behavioural factors.[3] Population ageing, tobacco use, exposure to indoor and outdoor air pollution, occupational hazards, and climate change are all contributing to increasing respiratory disease burden.[4] In 2023, chronic respiratory diseases accounted for 569.2 million cases globally, with COPD alone representing the third leading cause of death.[5,6]

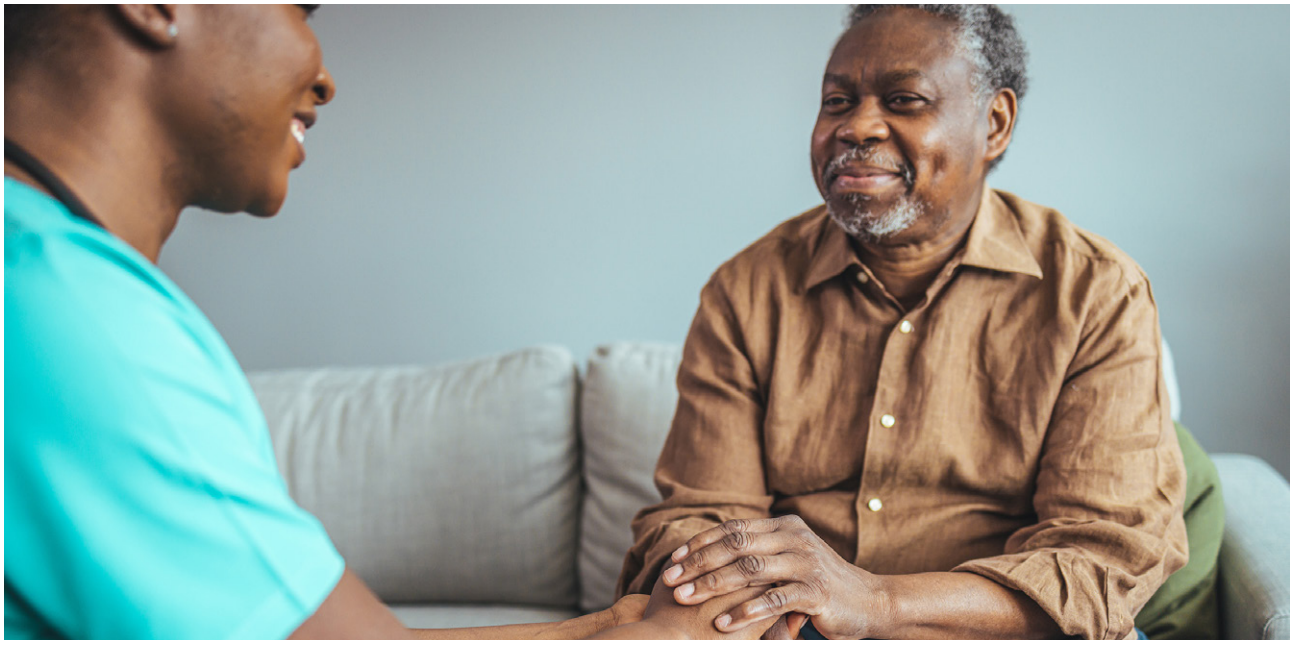
While low- and middle-income countries (LMICs) continue to shoulder a disproportionate share of mortality, significant inequalities in respiratory disease incidence, diagnosis and outcomes are also observed within high-income countries, particularly among socioeconomically disadvantaged populations, ethnic minority communities, and people living in rural and remote areas.

Tobacco use remains the leading risk factor for COPD and lung cancer globally, while ambient air pollution, household air pollution and occupational exposures contribute substantially to respiratory morbidity and mortality.[7] These risks are largely modifiable,[8,9] but they concentrate among already high-risk, underserved populations, requiring a coordinated response across prevention, earlier diagnosis, equitable access to care and the wider determinants of health.

1.2 The need for an equity-focused approach

Underserved population groups, such as people of lower socioeconomic status (SES), ethnic minorities and those living in low- and middle-income countries, are more likely to be exposed to common risk factors for lung diseases including tobacco smoke, air pollution, and occupational hazards. For instance, people in socioeconomically disadvantaged populations are up to 14 times more likely to develop chronic respiratory diseases (CRDs) than people within the highest socioeconomic status groups.[10] The number of people who die from CRDs is also higher among underserved communities, with data from England suggesting that CRDs are a major cause of the gap in life expectancy between the most affluent and most deprived communities.[11]

In 2025, the World Health Assembly adopted **Resolution 78.5, *Promoting and Prioritising an Integrated Lung Health Approach,*** establishing a clear mandate for coordinated action on lung diseases and recognising both their interconnected nature and their disproportionate impact on underserved populations. The resolution explicitly recognises the importance of addressing social and environmental determinants of health, reducing exposure to risk factors, strengthening integrated approaches to lung health, and improving access to services for populations experiencing the greatest barriers to care.



The resolution aligns closely with broader global commitments on **Universal Health Coverage (UHC),**[12] and the **2025 United Nations Political Declaration on Non-Communicable Diseases and Mental Health,**[13] both of which emphasise reducing health inequities, improving access to essential services and addressing the social determinants that drive inequality in health outcomes. Together, these global commitments reinforce the need to move from recognition to action, demanding evidence-based, targeted investment to deliver impact for underserved populations.

While no consistent, global approach exists to identify, measure, and track effective care at national and subnational level specifically for these populations, examples exist that demonstrate this is possible. In England, the NHS Lung Cancer Screening programme routinely reports variations in participation and outcomes by deprivation status, helping identify populations less likely to access screening services.[14] Similarly, environmental health studies have overlaid air quality data with measures of socioeconomic deprivation to demonstrate that disadvantaged communities are disproportionately exposed to ambient air pollution. These approaches show how disaggregated data can reveal inequalities that would otherwise remain hidden.

Inequality is also shaped by structural barriers within health systems. Access to primary care, specialist referral pathways, diagnostic services and transport can all influence whether individuals benefit from early detection and treatment. Evidence suggests that populations experiencing socioeconomic disadvantage, geographic isolation or cultural barriers are more likely to face delays throughout the care pathway, compounding existing inequalities in outcomes.

The **WHO World Report on Social Determinants of Health Equity (2025)** calls for disaggregated data to reveal how health risks, access, and outcomes are distributed across social groups, and to assess whether interventions are reducing inequities over time.[15]

Without disaggregated data, health systems can identify overall variation but may miss the populations falling behind. Moreover, existing approaches vary considerably, meaning cross-country comparison and accountability are currently not feasible.

An important note is that the absence of data on inequality should not be mistaken for the absence of inequality itself. In some settings, the populations experiencing the greatest barriers may be less likely to be captured in existing surveillance systems, meaning that where data are missing, care gaps are most likely to exist.

A practical framework is therefore needed to consistently drive data collection, measure inequalities across population groups and support targeted action across the lung health pathway. The Lung Health Equity framework responds directly to that need.

1.3 Focus on COPD and lung cancer

The research outlined in this report focuses on COPD and lung cancer. With an estimated 3.4 million deaths from COPD (6% of all deaths globally)[16] and 1.8 million deaths from lung cancer each year,[17] these conditions represent a major global health burden. COPD accounts for 82% of mortality from chronic respiratory diseases,[18] while lung cancer accounts for 25% of all cancer deaths globally.[19,20,21] Despite this burden and their shared risk factors, COPD and lung cancer receive less policy attention and investment than other major NCDs.[22,23] Persistent stigma, particularly where conditions are linked to smoking, limits public awareness, help-seeking behaviour, political prioritisation and investment.[24]

Exposure to shared risk factors for COPD and lung cancer, including tobacco smoke, air pollution, and occupational hazards, is disproportionately higher among underserved populations, such as women, ethnic minorities, people of lower SES, and those living in low- and middle-income countries.[25,26] The diseases also frequently coexist: an estimated 40–70% of people diagnosed with lung cancer show evidence of airflow obstruction, indicative of COPD,[27] while COPD is itself associated with an increased risk of developing lung cancer.[28] Never-smoker lung cancer also warrants explicit attention within an equity framing: in parts of East Asia it accounts for the majority of lung cancer cases in women, typically adenocarcinoma with targetable driver mutations, and it is poorly served by screening eligibility criteria built around smoking history.[29]

This overlap creates opportunities for more integrated and equitable approaches to prevention and early detection. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) recommendations recognise COPD as a significant risk factor for lung cancer and emphasise the need for risk-based assessment, targeted case-finding and consideration of eligibility for low-dose CT screening among people living with COPD.[30] Identifying populations at elevated risk of either disease may support earlier detection and prevention of the other, particularly among groups that experience barriers to healthcare access or are less likely to engage routinely with health services.[31]

The initial use case for the Lung Health Equity framework presented here focuses on COPD and lung cancer, but the framework has been designed to support broader application across lung diseases, including in asthma, tuberculosis (TB) and post-TB lung disease, bronchiectasis, occupational interstitial lung disease and paediatric respiratory conditions.

1.4 Report utilisation and country adaptation

This report presents the output of Phase 1 of the Lung Health Equity Project. Subsequent phases of the project will involve populating the prioritised indicator set with national and, where available, subnational data, enabling visualisation of inequalities and supporting the identification of areas where care gaps and risk factors converge and contribute to poor patient outcomes.

The framework is designed to be adaptable: national and subnational stakeholders are encouraged to apply it according to local data availability, health system priorities and policy context.



Part 2

Lung Health Equity Framework

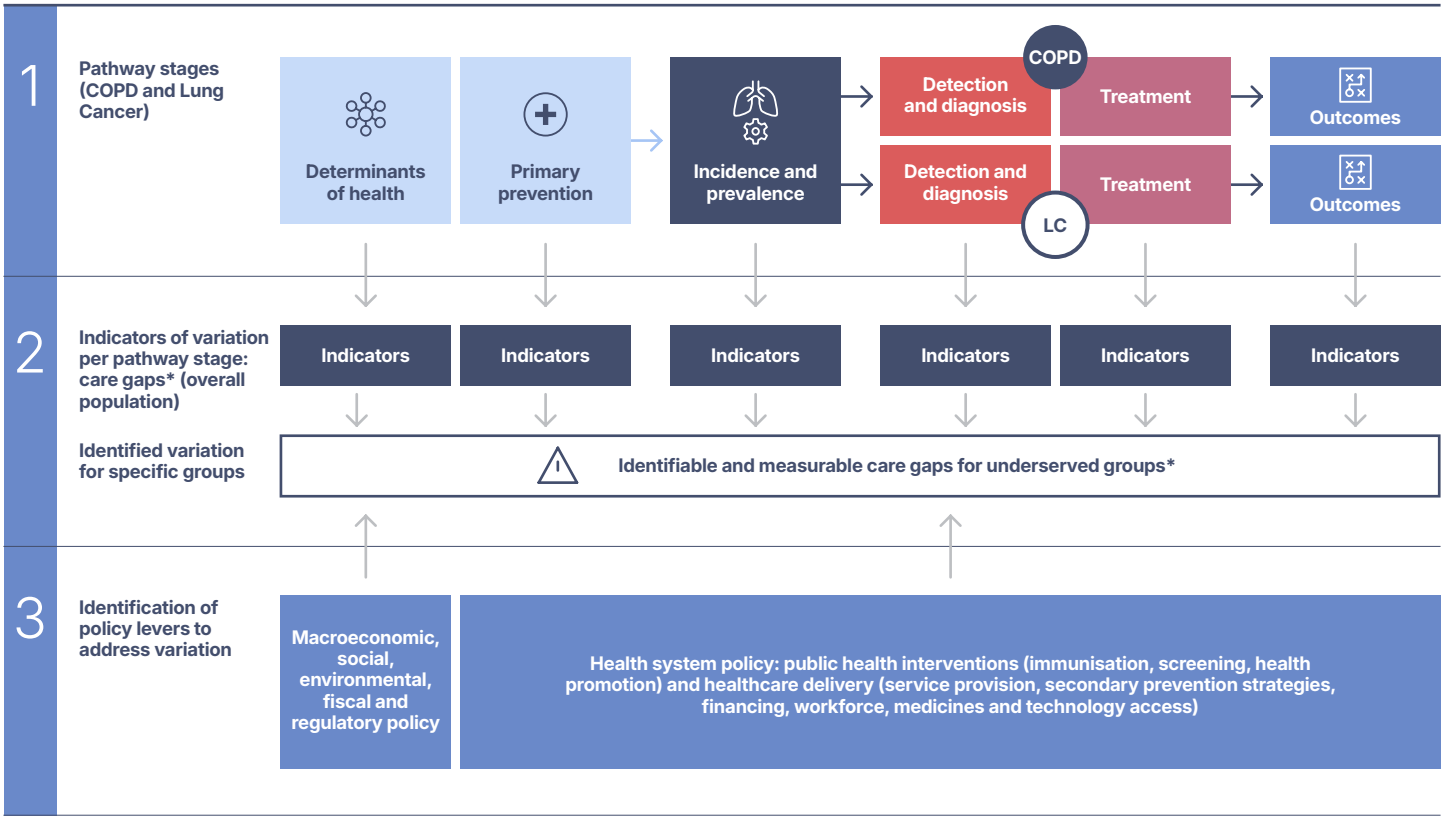
2.1 Development of the Lung Health Equity Framework

Building on the aims set out in part 1, Phase 1 of the Lung Health Equity Project established a standardised, consensus-based and evidence-informed framework for identifying, measuring and addressing inequalities in COPD and lung cancer (Figure 1). This section outlines the framework's structure. The findings that emerged from applying it to the global evidence base are presented in part 3, and a full methodology is provided in the Appendix.

The framework was developed through a targeted literature review (TLR) of published evidence on COPD and lung cancer, complemented by a review of international policy documents and guidelines, and validated through iterative engagement with a multidisciplinary Steering Committee of clinicians, patient advocates, health policy experts and health economists.

Steering Committee members reviewed the pathway stages, proposed structure and provided guidance on prioritisation of indicators, interventions and underserved populations.

Figure 1: Lung Health Equity Framework



*A measurable difference between the care received by a population and an agreed standard, such as clinical guidelines, national targets or outcomes achieved by the overall population. Within this framework, attention focuses on care gaps that fall disproportionately on underserved populations, distinguishing this equity analysis from a general quality-of-care audit.

The pathway shown in Figure 1 is intentionally high-level and does not assume a single route into the health system. Patients may be diagnosed through screening and case-finding programmes, symptomatic presentation, incidental findings or via emergency presentation. The relative importance of these routes varies considerably between settings, with important implications for equity and outcomes. The framework's indicators, including screening uptake, stage at diagnosis and emergency-route diagnosis, are designed to assess performance across these different entry points and should be applied in line with local care pathways and health system context.

The framework comprises:

- **Defined, high-level pathway stages for COPD and lung cancer**
  Designed to be relevant across differing country settings, this includes "upstream" determinants of health (for example environmental or behavioural determinants) that precede, but likely predict, patients' subsequent entry into and progress through health system pathways.

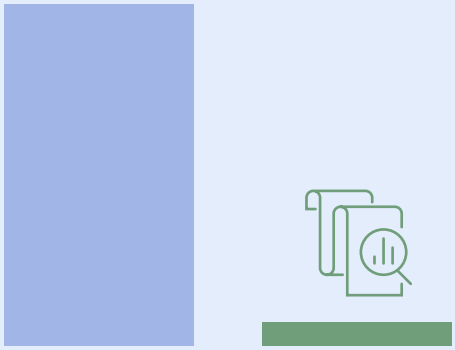
- **Prioritised set of indicators per disease and pathway stage**
  These can be measured to track progress in lung health equity at global, national, and subnational levels. Disaggregating data on indicators by characteristics such as income, geography, sex, ethnicity and education reveals disparities that are often hidden within overall population averages, enabling action to identify and address care gaps.

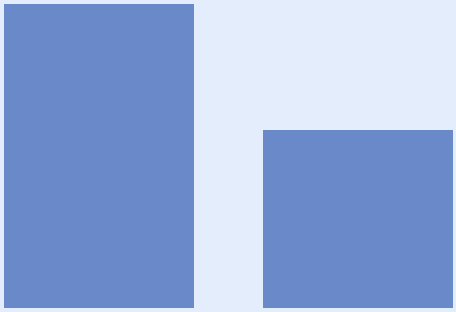
- **The key underserved populations identified for each indicator**
  This provides a starting point for cross-country or region comparison. While priority populations vary across settings, the principle remains consistent: inequalities can only be addressed if they are identified and measured.



2.2 Evidence base

The Phase 1 TLR drew on studies published between 2016 and 2026, alongside grey literature including clinical practice guidelines, WHO global health profiles and national health ministry publications. It identified indicators across the framework's six stages, assessed the weight of evidence for each, and mapped the underserved populations disproportionately affected at each stage. Policy recommendations were subsequently identified through a supplementary rapid evidence review conducted by George Wharton and Hunter Batjer at LSE Health, London School of Economics and Political Science.





5 **underserved populations consistently identified in the evidence base: people of low socioeconomic status, males, females, rural populations, ethnic minorities**

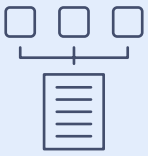
Of the **399 included studies, 100 COPD studies and 136 lung cancer studies** presented disaggregated data by underserved group.

Note: A key limitation of this review is the absence of identified lung cancer studies from Africa reporting disaggregated data on underserved populations. As a result, the evidence base cannot be considered globally validated, and application of the findings in African settings should be complemented by primary data collection and local validation. Data on migrant and refugee populations, frailty, primary language spoken, and mental health comorbidities also remain emerging rather than established within the evidence base.

Part 3

Priority equity indicators and policy recommendations across the pathway

This section presents each of the six pathway stages in turn. For each stage, the following information is presented:



The highest priority indicators identified within the evidence base during Phase 1 research



The underserved populations most frequently cited within the evidence base[*1]



Policy recommendations that emerge from the evidence

Throughout this section, **'additional considerations from expert input'** callouts capture indicators and framework principles flagged by members of the Steering Committee as important to lung health equity but not elevated by the prioritisation exercise. They are recommended for consideration for country application, where local context may make them particularly relevant.

Note: Inequality presents across the pathway in two distinct patterns. First, a compounding pattern, where socioeconomically disadvantaged, rural and ethnic minority populations face repeated barriers across the pathway. Second, a sex-specific pattern, where males are disproportionately exposed to key risk factors and COPD mortality, while women are more likely to experience later diagnosis and lower access to some aspects of guideline-recommended care. In lung cancer, women also remain under-represented in screening programmes and clinical trials despite a growing disease burden. Both patterns require systematic measurement and sex-disaggregated data throughout the pathway.

[1] (*Where specific underserved populations were not identified from the literature this is left blank. This does not imply absence of impact for specific groups and warrants additional research)

3.1 Determinants of lung health

Five determinants proposed for prioritisation are established risk factors for both COPD and lung cancer: socioeconomic status, tobacco use, occupational exposure, ambient air pollution, and indoor air quality.[32,33] The evidence indicates that some populations facing higher exposure to these risks also experience barriers to care, such as people of lower socioeconomic groups. The TLR identified 23 determinant indicators in total. Of these, 7 are prioritised across COPD and lung cancer, based on global applicability, measurability, and data availability:

Priority indicators	Underserved populations identified
Socioeconomic status (Area deprivation index, sociodemographic index, family income)	Lower SES
At risk occupation: historical exposure (Number of years exposed)	Males
Smoking: historical exposure (Number of pack years smoked)	Males
Current smoking rates (Rate of smoking)	Males (most settings; patterns vary regionally and female smoking is rising in several LMICs)
Second-hand smoke exposure (Percentage of non-smoking population regularly exposed to second-hand smoke)	Females
Indoor air quality (Household fuel energy type, Biomass fuel, indoor level of PM2.5, ventilation for indoor cooking)	Females, lower SES
Ambient air pollution (NO_2, NO, O_3, SO_2, PM2.5/PM10 concentrations, proximity to major roads)	Males, age (older age groups), previous TB diagnosis

Note: The framework identified a core set of globally relevant determinants, but their impact varies across countries and populations. Household air pollution from solid-fuel cooking remains a major driver of COPD in parts of China, India and sub-Saharan Africa.[34] Second-hand smoke exposure, including from waterpipe (shisha/hookah) use, is also an important but often under-recognised risk factor in parts of the Middle East, North Africa and South Asia.[35] Emerging determinants such as extreme heat, cold and humidity may become increasingly important in climate-vulnerable regions.[36] Determinants should be prioritised according to national relevance and population characteristics.

Additional considerations from expert review

Alongside the prioritised indicators, the Steering Committee's expert review flagged several determinants which, while not captured or ranked highly within the TLR process, warrant specific attention due to their disproportionate impact on underserved groups.

- **Post-tuberculosis lung disease (PTLD) and tuberculosis (TB) history:** Systematically misclassified as COPD in high-TB-burden settings (South Asia, sub-Saharan Africa, Southeast Asia), inflating apparent COPD prevalence while hiding a distinct and underserved patient population. TB history is recommended as a determinants-layer indicator in any application of the framework to high-TB-burden countries.
- **Radon exposure:** The second leading cause of lung cancer overall,[37] and the leading cause in never-smokers in high-income countries.[38] Home testing is inexpensive and remediation is cost-effective, but both are under-used in most countries.

Policy recommendations

Disaggregated data on key determinants should be collected to identify populations facing the highest cumulative risk and target interventions accordingly:

- **Strengthen tobacco control policies,** including taxation, smoke-free environments, cessation support and culturally or locally tailored interventions for populations with persistently high smoking prevalence.
- **Reduce exposure to ambient air pollution** through clean-air legislation, emissions standards and monitoring systems that identify communities experiencing the highest levels of exposure.
- **Improve indoor air quality,** including through clean cooking and heating initiatives, improved ventilation and housing policies that reduce exposure to household air pollution.
- **Limit occupational exposure to respiratory hazards,** including dusts, fumes, chemicals and other carcinogens, through stronger workplace regulation, enforcement and worker health programmes.
- **Use socioeconomic, environmental and health system data together** to identify communities where multiple risk factors converge and target prevention efforts accordingly.
- **Embed lung health considerations within wider policies,** recognising that poverty, education, housing quality and employment conditions play a critical role in shaping exposure to respiratory risk factors and long-term health outcomes.
- **Strengthen surveillance of emerging determinants,** including climate-related exposures such as extreme temperatures, as well as other emerging risk factors where the evidence base is growing but not yet fully established.
- **Strengthen primary care and community health infrastructure** in underserved areas to improve prevention, health promotion and early risk identification.

Country examples

Country examples throughout this section illustrate how individual indicators can drive real-world change. They are illustrative rather than exhaustive, intended to demonstrate how targeted interventions can be applied to close observable gaps for specific population groups.

INSPIRE Respiratory Health Program

Brazil

Indicator: Smoking rate

What it tells you: Whether preventive services are successfully helping reduce exposure to the leading risk factor for COPD and lung cancer, and whether smoking cessation support is reaching populations at greatest risk.

What moves it: Integrating smoking cessation services within routine respiratory care, combining behavioural support with access to diagnostics, specialist assessment and pharmacological treatment.

Who benefits: People who smoke living in socioeconomically vulnerable communities, who often face a higher burden of tobacco-related disease and greater barriers to accessing preventive services.

Country example: The INSPIRE Respiratory Health Program was established within the public health system in Botucatu, São Paulo State, to improve early detection of chronic respiratory diseases and strengthen prevention among high-risk populations. The programme combines spirometry, lung cancer screening, nutritional assessment, pulmonology consultations and multidisciplinary smoking cessation support within a single pathway. Among active smokers followed through the programme, 16.7% successfully quit smoking within three months, while more than 90% reported the highest possible satisfaction score with the service. The evaluation also highlighted important equity barriers, with 45.6% of non-adherent participants citing medication costs as a barrier, demonstrating the importance of addressing affordability alongside service provision.[39,40]



Air pollution exposure monitoring

Italy

Indicator: Air pollution

What it tells you: Whether health systems are identifying and responding to environmental drivers of respiratory disease, particularly in communities facing higher exposure to air pollution.

What moves it: Integrated environmental surveillance, population-level exposure modelling, predictive analytics, and the routine use of environmental and epidemiological data in public health planning.

Who benefits: Communities exposed to higher levels of air pollution, particularly socioeconomically disadvantaged populations living near industrial areas, transport corridors or other pollution hotspots.

Country example: The Apulia region has established a close working relationship between environmental monitoring bodies (ARPA Puglia) and health planning organisations (ARESS Puglia), enabling air quality, environmental exposure and epidemiological data to be analysed together to support prevention and health system planning. Air pollution monitoring networks operate across urban, industrial and rural settings, while health impact assessments have been used to estimate the mortality burden attributable to pollutants such as PM2.5, PM10 and NO_2. The region's epidemiology and care intelligence functions explicitly combine data on environmental determinants and population health to inform prevention strategies, resource allocation and action on health inequalities. This demonstrates how environmental and health data can be integrated to identify communities at greatest risk and support more targeted interventions.

Apulia's air quality monitoring network collects data across traffic, residential, industrial and rural locations, enabling environmental exposures to be assessed geographically alongside population health trends.[41]

Note: Health policies often address risk factors and care gaps as separate challenges, such as smoking, screening uptake, or access to treatment. In reality, these factors frequently cluster within the same populations and interact biologically. As a result, it can be helpful to view indicators alongside each other to understand populations facing multiple overlapping disadvantages.

Indicators: Smoking rates and air pollution exposure

Example: An analysis using data from the UK Biobank demonstrated that smoking and exposure to higher levels of mixed air pollution were associated with a greater risk of lung cancer and COPD than either factor alone. Compared with people who were non-smokers and had low air-pollution exposure, people who smoked and were in the high-air-pollution group had around four times the risk of lung cancer and four times the risk of COPD. The study also found evidence that the combined effects of smoking and air pollution were greater than the sum of their separate effects for both conditions.

These findings support the need to consider exposure to both risk factors among the same individuals when seeking to reduce the risk of lung cancer and chronic respiratory diseases.[42]

3.2 Primary prevention of lung diseases

The TLR identified primary prevention indicators in 16 COPD studies and 9 lung cancer studies, with 3 priority indicators emerging:

Priority indicators	Underserved populations identified
Smoking cessation uptake (Percentage of patients using cessation services)	Males, age (younger age groups)
Smoking cessation offered (Number of patients offered cessation services)	–
Vaccination rates: including pneumococcal, respiratory syncytial virus (RSV), influenza, COVID-19, herpes zoster	–

Additional considerations from expert review

The Steering Committee flagged additional primary prevention levers that sit outside the current shortlist but are central to reducing the future burden of lung disease:

- **Tobacco taxation and WHO Framework Convention on Tobacco Control (WHO FCTC) linked metrics:** A 10% increase in the price of tobacco products is estimated to reduce tobacco consumption by between 4% and 8%, with the greatest impact often observed among younger people and lower-income populations.[43] FCTC compliance and strength of taxation policy could serve as system-level indicators to accompany individual-level tobacco use metrics in future.



Policy recommendations

A more coordinated approach to population health and primary prevention is required across early pathway stages. Disaggregated data should be used to target preventative interventions towards those at greatest risk and most likely to be underserved. This includes:

- **Implementing and publicly funding smoking cessation programmes,** while bolstering awareness and engagement programmes to prevent smoking uptake. Prevention programmes are most effective when tailored to the needs of underserved populations rather than delivered through a one-size-fits-all approach. Evidence from smoking cessation initiatives shows improved uptake when interventions address cultural context, literacy barriers, affordability and local access challenges.[44]
- **Targeting vaccination programmes:** Strengthen uptake of recommended vaccinations, including influenza, pneumococcal, respiratory syncytial virus (RSV), COVID-19 and herpes zoster vaccines. Vaccination is used in relevant populations to reduce risk of respiratory infections, some of which may be associated with COPD exacerbations and healthcare utilisation. Targeted delivery through primary care and community outreach can improve coverage among groups least likely to access preventative healthcare and help reduce avoidable inequalities in lung health outcomes.

Country example

NHS Stop Smoking Services

United Kingdom

Indicator: Smoking cessation uptake

What it tells you: Whether smoking cessation services are successfully reaching populations with the highest smoking prevalence and greatest risk of tobacco-related disease, rather than simply being available to them.

What moves it: National programme design combined with strong local delivery, including free or subsidised nicotine replacement therapy (NRT), specialist behavioural support, community-based services, primary care referrals and low barriers to access.

Who benefits: Lower socioeconomic groups, who experience higher smoking prevalence and bear a disproportionate burden of smoking-related disease.

Country example: The NHS Stop Smoking Service seeks to reduce smoking-related health inequalities by providing accessible cessation support through healthcare and community settings. Evidence from a national equity analysis found that people who smoked from lower socioeconomic groups were more likely to have their smoking status assessed, receive cessation advice, be referred to services and make a quit attempt with specialist support than more affluent people who smoked. Although disadvantaged smokers were less likely to quit successfully once enrolled, the greater reach of the programme meant that its overall population impact was highest among lower socioeconomic groups, which the cited analysis observed as a positive equity effect.[45]

3.3 Incidence and prevalence

Incidence and prevalence provide the baseline picture of lung disease burden within a population. When analysed and disaggregated by factors such as sex, age, socioeconomic status, geography and smoking status, they can show where the burden of COPD and lung cancer is greatest and which populations may be underserved.

These measures do not, in themselves, point to a single policy response. Rather, they help identify where action is needed and provide a basis for assessing whether interventions across prevention, detection, diagnosis and treatment are effective at reducing inequalities over time. The determinants and primary prevention indicators set out in the preceding sections are among the factors that influence future incidence and prevalence.

The TLR identified incidence and prevalence indicators in 51 COPD studies and 62 lung cancer studies, with 4 priority indicators emerging:

Priority indicators	Underserved populations identified
COPD	
Prevalence (Age-standardised prevalence)	Ethnic minorities, males
True prevalence (Ratio of diagnosed to true prevalence, the 'diagnostic gap')	Age (older age groups), males
Age-standardised incidence (Rate per 100,000 population)	Age (older age groups), males
Lung cancer	
Incidence by sex (Sex standardised rate per 100,000 population)	–

Additional considerations from expert review

The Steering Committee flagged additional primary prevention levers that sit outside the current shortlist but are central to reducing the future burden of lung disease:

- **COPD severity distribution (GOLD stage) at the point of diagnosis** is a marker of system equity performance. Based on observed evidence from this research, later-stage diagnoses appear to concentrate in rural populations and women. While this indicator was captured in the COPD Outcomes priority indicator list, its use at diagnosis is recommended only for country application in settings where diagnostic pathway equity is a specific concern.



3.4 Detection and diagnosis

Early detection and diagnosis of lung disease are critical to ensure timely access to care and treatment for patients. While primary prevention remains important for reducing longer-term disease burden and inequalities, targeted detection and diagnosis among high-risk populations may result in nearer term benefits more closely aligned with typical 5 year policy cycles.

For lung cancer, early diagnosis can significantly improve prognosis and survival prospects (when diagnosed at stage 1, five-year survival typically exceeds 80%).[46]

Evidence from the NELSON and NLST trials shows that LDCT screening may reduce lung cancer mortality by approximately 20–24%, with benefits emerging over 6.5–10 years,[47,48] while evidence from targeted COPD case-finding programmes indicates that structured care coordination may reduce exacerbations and hospitalisations within the first year alone.[49]

The TLR identified 6 COPD indicators and 12 lung cancer indicators for this stage. Priority indicators include:

Priority indicators	Underserved populations identified
COPD	
Global Initiative for Chronic Obstructive Lung Disease (GOLD) stage at diagnosis (Percentage of patients diagnosed stage I, II, III, IV per 100,000)	Rural populations, females
COPD diagnostic equipment access (Case-finding rate in symptomatic at-risk adults with post-bronchodilator spirometry)	Rural populations
Time to diagnosis from first symptoms (Time in days to diagnosis from first symptoms)	–
Use of GOLD-recommended diagnostic testing (Percentage of patients with suspected COPD who undergo spirometry in line with GOLD recommendations)	Age (younger age groups), males

Lung cancer **Screening rate in high-risk populations** (Percentage of eligible individuals up to date with screening)	Lower SES, females, uninsured individuals
Stage at diagnosis (I, II, III, IV or Tumor, Node, Metastasis [TNM]) (Percentage of patients diagnosed at each stage)	Ethnic minorities, lower SES, males, uninsured individuals
Time to diagnosis from first symptoms (Median time to diagnosis from first presentation of symptoms to healthcare provider)	Lower educational status, longer travel time
Biomarker testing uptake (Percentage of eligible lung cancer patients receiving complete guideline-concordant biomarker testing [including molecular/genomic])	Lower SES
Emergency-route diagnosis (Diagnoses in emergency department as a percentage of all diagnoses)	–

Additional considerations from expert review

- **Equity-focused clinical trial recruitment:** Evidence from the European 4-IN-THE-LUNG-RUN study highlights the importance of tailoring recruitment approaches to the needs of underserved populations. The study found that paper-based invitation methods reached a higher proportion of eligible individuals from lower socioeconomic groups (42.8%) than either standard online approaches (37.0%) or tailored digital approaches (38.6%), suggesting that screening programmes should carefully consider how recruitment and communication strategies influence equity of access.[53]

- **COPD-to-lung cancer screening cross-referral:** COPD is associated with a 2- to 7-fold hazard ratio for lung cancer independent of smoking history.[50] Policymakers should explore implementing a coordinated, risk-based approach to identification and detection of lung diseases. People with COPD face a significantly higher risk of developing lung cancer, yet the review did not identify any country that has implemented referral pathways for COPD patients to participate in formal lung cancer screening programmes at-scale.[54]

- **Risk-based lung cancer screening eligibility (e.g. PLCOm2012):** Fixed eligibility thresholds (age 50+, 20 pack-years) may under-identify high-risk groups.[51]

The findings show that people most at risk of lung disease are often the least likely to access screening or receive an early diagnosis, resulting in missed opportunities for timely intervention and better outcomes. Approximately 81% of people with COPD globally are undiagnosed,[52] yet quality-assured spirometry is absent in most LMIC primary care settings. Decentralised models, such as mobile, community-based spirometry services, have an important role to play in filling this gap.



Policy recommendations

- **Integrating lung health checks into lung cancer screening programmes** to support detection of COPD and other chronic respiratory disease in identified high-risk individuals, as well as in general health checks targeting high-risk populations.
- **Creating specific referral pathways** for those already diagnosed with COPD and meeting existing eligibility criteria to access regular lung cancer screening.
- **Proactive primary care case-finding for people at higher risk of COPD exacerbations or lung cancer,** using data analytic tools which account for exposure to risk factors or symptom history.
- **Implementing mobile screening for lung cancer** to reduce geographic barriers, as part of an end-to-end pathway that includes timely diagnostic confirmation, specialist referral and treatment.
- **Increasing the availability of effective detection models** for COPD and lung cancer, including mobile, primary care and community-based models for rural populations, tailored to their needs.
- **Expanding access to frontline imaging and molecular diagnostics in LMIC and regional settings,** including decentralised chest imaging in primary care and investment in pathology and biomarker testing infrastructure; recognising that late-stage and emergency-route presentation remains the dominant barrier to survival in these contexts.

Country examples

NHS England Lung Cancer Screening Programme

England

Indicator: Lung cancer screening rate in high-risk populations

What it tells you: Whether lung cancer screening programmes are successfully reaching the people most likely to benefit, particularly underserved populations at highest risk of developing lung cancer.

What moves it: Targeted invitations based on risk, community outreach, mobile screening services and the use of LDCT scanning delivered in accessible, community-based settings.

Who benefits: People who currently or previously smoked, people living in socioeconomically deprived communities, and other underserved populations that are traditionally less likely to access preventive healthcare.

Country example: England's National Health Service (NHS) Lung Cancer Screening Programme, building on the earlier Targeted Lung Health Check programme, is designed to reach communities with the highest lung cancer burden. The programme uses targeted invitations for eligible high-risk individuals, supported by community engagement and mobile LDCT scanning units located in easily accessible locations. More than two million people have been invited for lung health assessments and screening. Importantly, the proportion of lung cancers diagnosed at an early stage among people living in the most deprived areas has increased substantially, with the most deprived socioeconomic quintile now accounting for the highest proportion of early-stage diagnoses of any quintile. This demonstrates how proactively targeting underserved populations can improve both screening uptake and equity in outcomes.[55,56]



National Lung Health Initiative 2025–2030

Malaysia

Indicator: Diagnosis rate via case-finding in symptomatic at-risk adults (quality-assured spirometry availability)

What it tells you: Whether primary care services have the diagnostic capacity needed to identify COPD and other chronic respiratory diseases earlier, reducing delays in diagnosis.

What moves it: Investment in diagnostic equipment, workforce training and clear referral pathways between primary and specialist care.

Who benefits: Rural and remote communities, and populations with limited access to specialist respiratory services.

Country example: In response to a high respiratory disease burden, Malaysia launched the National Lung Health Initiative 2025–2030, aligning efforts across tobacco control, early detection and integrated care for TB, lung cancer, COPD and asthma. Early implementation has expanded AI-assisted chest X-ray screening to more than 150 primary care clinics, while spirometry availability for COPD diagnosis in public clinics is expected to increase from 15% to 50%. The initiative also includes community outreach and services targeted at underserved and remote populations.[57]

National Lung Cancer Screening Programme

Australia

Indicator: Lung cancer screening rate in high-risk populations

What it tells you: Whether a screening programme is successfully reaching populations at highest risk of lung cancer, particularly those who face structural barriers to early diagnosis, such as Aboriginal and Torres Strait Islander peoples, people living in rural and remote areas, and individuals of lower SES.[58]

What moves it: A nationally funded LDCT screening programme designed with an equity focus, including culturally safe care pathways, community-led engagement, and mobile screening services that improve access for underserved populations.

Who benefits: Aboriginal and Torres Strait Islander peoples, rural and remote communities, and other high-risk populations who experience higher lung cancer incidence and mortality rates and are more likely to face barriers to timely diagnosis and treatment.[59]

Country example: Australia launched its National Lung Cancer Screening Programme in July 2025, offering free LDCT screening to high-risk adults aged 50–70 years.[60] The programme was co-designed with Aboriginal and Torres Strait Islander communities and incorporates community-led outreach and mobile screening services to improve access in rural and remote settings. The programme aims to increase screening participation and reduce inequalities in access, in order to improve the overall cost-effectiveness and impact.[61] Programme performance is tracked across 13 key indicators including participation rates and stage at diagnosis. Indicator reporting will be disaggregated for key underserved population groups, enabling equity in access and outcomes to be identified and monitored over time.[62]

RISP (Rete Italiana Screening Polmonare)

Italy

Indicator: Lung cancer screening rate in high-risk populations (with links to smoking cessation uptake and stage at diagnosis)

What it tells you: Whether lung cancer screening programmes are successfully identifying and engaging people at highest risk of disease and creating opportunities for both early diagnosis and risk reduction.[63]

What moves it: National screening infrastructure, targeted identification of high-risk populations, access to low-dose computed tomography (LDCT) screening, integration of smoking cessation services, and consistent quality standards across participating centres.

Who benefits: People who currently or previously smoked heavily, including populations at elevated risk of late diagnosis and lung cancer mortality who may otherwise have limited engagement with preventative healthcare services.

Country example: The Rete Italiana Screening Polmonare (RISP) is a Ministry of Health-supported national lung cancer screening initiative involving 18 centres across 15 Italian regions and aiming to recruit 10,000 high-risk participants.[64] The programme combines primary prevention through smoking cessation support, including counselling and pharmacological treatment, with secondary prevention through LDCT screening for eligible people who currently or previously smoked. The initiative was specifically established to develop a nationwide, high-quality lung cancer screening programme comparable to established population screening programmes such as those for breast, colorectal and cervical cancer. Alongside evaluating different screening intervals and risk-based approaches, RISP seeks to improve early-stage detection of lung cancer while reducing future disease burden through integrated smoking cessation interventions. RISP demonstrates how prevention and early detection can be delivered through a single pathway. By combining smoking cessation support with LDCT screening for high-risk populations, the programme addresses both current disease risk and future disease burden. This integrated approach may be particularly valuable for populations with high smoking prevalence, helping to reduce inequalities in both lung cancer outcomes and access to preventative services.



3.5 Treatment and management

Effective approaches to the management of COPD and lung cancer are available, but access and implementation remain uneven. In COPD, variation in access to recommended care and medicines can create challenges for people seeking to manage their condition. Research indicates that many people do not have consistent access to the medicines and wider services they need.[65,66]

Pulmonary rehabilitation is also not routinely accessible, with fewer than 3% of eligible patients reporting they have received it.[67] In lung cancer, advances in diagnostics have expanded the options available to some patients. However, access to these options varies considerably across and within countries. In particular, gaps in access to biomarker testing may limit the ability of healthcare systems to identify the most appropriate care pathways for eligible patients. Further challenges remain in ensuring timely access to supportive and palliative care for people with poorer prognoses.

The TLR identified 14 COPD indicators and 14 lung cancer indicators at this stage. Priority indicators include:

Priority indicators	Underserved populations identified
COPD	
Disease control (Percentage of patients uncontrolled [experiencing ≥2 moderate or ≥1 severe exacerbation/year or high symptom burden per GOLD] after receiving guideline-recommended therapy)	Males, ethnic groups, rural populations
Uptake of guideline-recommended therapy (Percentage of eligible patients receiving guideline-recommended therapy)	Females, lower educational status, lower SES, ethnic minorities
Time to specialist referral (Median number of days from GP/primary care referral to first specialist [pulmonologist/respiratory physician] consultation)	Males, ethnic groups, rural populations
Time to treatment (Time to guideline-recommended therapy in eligible patients)	–
Healthcare resource use: hospitalisations (Percentage of patients hospitalised for COPD)	Lower SES
Pulmonary rehabilitation (Percentage of eligible patients undergoing pulmonary rehabilitation)	–
Healthcare resource use readmissions (Percentage of patients readmitted within 30 or 90 days)	–
Emergency department presentations (Percentage of patients presenting at ED with COPD complications)	Lower SES
Medical oxygen access (Percentage of patients with access to medical oxygen)	–

Lung cancer	
Treatment of eligible patients (Percentage of eligible patients receiving any treatment)	Ethnic groups, uninsured or publicly insured individuals, lower SES
Access to radiotherapy (Percentage of eligible patients accessing radiotherapy)	Race/ethnic groups, lower SES, age (older age groups)
Time from diagnosis to starting treatment (Percentage of eligible patients being treated within guideline-recommended timeframe)	Lower SES, uninsured individuals
Uptake of guideline-recommended therapy (Percentage of eligible patients receiving guideline-recommended therapy)	Lower SES, rural populations
Timely surgery (Percentage of eligible patients undergoing surgery within nationally recommended timeframe)	–
Resection for Stage I / II Non-small cell lung cancer (NSCLC) (Percentage of patients with stage I/II NSCLC undergoing surgical resection)	Lower SES
Receipt of biomarker-matched therapy (Percentage of eligible patients receiving biomarker-matched therapy)	–
Availability of multidisciplinary team (MDT) (Percentage of patients with access to MDT)	–



Additional considerations from expert review

COPD

- **Use risk stratification to identify diagnosed COPD patients at highest risk of exacerbation and hospitalisation:** Prior exacerbation history, symptom burden and comorbidity burden are established predictors and can be operationalised using routine primary care data. Ensure high-risk patients have access to structured management pathways including guideline-directed therapy, pulmonary rehabilitation and proactive follow-up.

- **Written exacerbation action plans:** Support early recognition and appropriate self-management of acute exacerbations, helping patients respond promptly when symptoms worsen. Recommended for country application where primary care infrastructure supports structured chronic disease management.

Lung cancer

- **Early integrated palliative care:** The 2010 Temel et al. randomised trial (NEJM) demonstrated that early palliative care alongside standard oncology care is associated with improved survival and quality of life.[68] Access remains inconsistent even in high-income settings and is largely absent in LMICs.

- **Surveillance for recurrence and second primary tumours:** Structured follow-up protocols exist but are applied inconsistently, particularly outside specialist centres. Recommended for country application where lung cancer registries support longitudinal follow-up.

- **Sex representation in lung cancer clinical trials:** Women constitute only 38.7% of non-small cell lung cancer (NSCLC) trial participants globally,[69] generating treatment evidence that does not reflect the patient population, particularly for never-smoker adenocarcinoma with targetable driver mutations, which is predominantly female.

    - **The Evaluating Needs and Gaining Equality in Clinical Trials for Gender Equity (ENGAGE) study** was established to evaluate why women remain underrepresented in lung cancer clinical trials. The study will examine whether trials are offered equally to men and women and investigate patient, clinician and system-level barriers to enrolment.[70]

- **Patient navigation – service availability:**[71] Evidence from other cancers demonstrates that navigation improves uptake to screening and speeds time to diagnosis. It also helps patients adhere to and complete their treatment, reducing non-compliance and providing continuity across all stages of their care journey. Patient navigation is especially important for people facing socioeconomic disadvantage, who are often more likely to encounter barriers that make it more challenging to get assessed, obtain answers quickly, and maintain compliance.

- **Molecular testing turnaround time:** The equity gap in precision oncology typically sits between the point at which testing is ordered and the point at which the result is received in time to influence first-line treatment.

- **Biomarker testing availability at treatment centres:** Complements testing uptake; availability gaps are a structural equity issue in publicly funded systems and LMICs.



Policy recommendations

Across both COPD and lung cancer, underserved populations are less likely to receive timely, evidence-based and guideline-directed treatment, and more likely to experience avoidable hospitalisations, emergency care and poorer outcomes. Addressing these inequalities requires investment in the systems, workforce and diagnostic infrastructure needed to deliver high-quality care consistently across settings. This includes:

- **Bringing respiratory services closer to communities** by expanding primary and community-based care, including hybrid models that combine face-to-face care with digital follow-up and remote pulmonary rehabilitation.
- **Strengthening integrated care between primary and secondary services** through coordinated referral pathways, shared care plans and multidisciplinary teams including patient navigators and nurse educators.
- **Broadening and streamlining access to specialist respiratory care** by investing in innovative models of care, including hub-and-spoke models, digital management and monitoring tools where appropriate.
- **Implementing and funding patient navigation** as a core component of lung disease care, to help patients and their families move through fragmented pathways from screening and diagnosis through to treatment and follow-up.
- **Proactively case-finding to identify COPD patients who remain uncontrolled on treatment** and at continued risk of moderate or severe exacerbations.
- **Strengthening follow-up care and rehabilitation programmes** after diagnosis, treatment initiation and hospital discharge to reduce avoidable readmissions.
- **Strengthening equitable access to nationally recommended medicines and services** to deliver them, in line with the WHO NCD Global Action Plan target of 80% availability of essential medicines in all countries.
- **Investing in the lung cancer workforce,** informed by data analysis to identify geographies with higher unmet need.

Country examples

Best Care COPD Programme

Canada

Indicator: Healthcare resource use: COPD hospitalisations

What it tells you: Whether people with COPD are receiving effective ongoing management in primary and community care, leading to a reduction in hospital admissions.

What moves it: Integrated respiratory care pathways, proactive follow-up, coordinated care between primary and specialist services, patient education and support for self-management.

Who benefits: People living with COPD who are at increased risk of avoidable hospital admission, particularly those in rural communities, lower-income populations and areas with limited access to specialist respiratory services.

Country example: Canada's Best Care COPD Programme was developed to improve management of COPD through a coordinated model linking primary and specialist care. The programme embeds a Certified Respiratory Educator and case manager within primary care settings to support evidence-based disease management, patient education, care planning and follow-up. Evaluation of the programme found a reduction of 9.1 COPD-related hospitalisations per 1,000 patients per month and 19 fewer emergency department visits per 1,000 patients per month after implementation. By supporting patients earlier and closer to home, the programme reduced reliance on acute care services while improving continuity of care.[72,73]

National Basic Public Health Services NBPHS

China

Indicator: Number of patients receiving routine follow-up

What it tells you: Whether chronic disease management is proactive and preventative, rather than relying on patients seeking care only when symptoms worsen or exacerbations occur.[74]

What moves it: Embedding COPD within national primary care infrastructure, supported by routine follow-up protocols, access to spirometry, standardised screening tools, workforce training and funded community-based care.

Who benefits: People at risk of delayed diagnosis, poor disease control and avoidable hospitalisations, particularly those living in rural areas and populations with limited access to specialist respiratory care.

Country example: In 2024, China became the first country to include COPD within its National Basic Public Health Services (NBPHS) programme, placing COPD alongside conditions such as hypertension and diabetes within a nationally funded chronic disease management framework.

The programme provides free annual screening and routine follow-up through primary care, supported by the introduction of standardised screening questionnaires (COPD-SQ), portable spirometers and training for community healthcare workers. China also launched a national initiative to improve the use of lung function testing and expand early detection capacity in primary care settings. Within the first two years, 1.5 million people were screened, with those identified as high-risk receiving smoking cessation support, health education, ongoing follow-up and repeat spirometry after one year. The programme was designed in response to widespread underdiagnosis, with an estimated 100 million people living with COPD in China and only around 10% ever having received a pulmonary function test.[75]

WeChat-Enabled Pulmonary Rehabilitation Follow-up

China

Indicator: Uptake of pulmonary rehabilitation

What it tells you: Whether patients remain engaged with recommended treatment and rehabilitation programmes after diagnosis, rather than dropping out of care once initial treatment has been accessed.

What moves it: Integrating disease management, symptom monitoring and rehabilitation support into digital platforms that patients already use routinely, reducing barriers to follow-up and improving adherence.

Who benefits: People living with COPD who require ongoing pulmonary rehabilitation, particularly those who may face barriers to attending in-person appointments or engaging with traditional follow-up services.

Country example: In China, researchers evaluated the use of WeChat, the country's most widely used social messaging platform, to support people with COPD undertaking Baduanjin exercise, a recognised form of pulmonary rehabilitation. In a retrospective randomised controlled study, patients receiving WeChat-based follow-up were compared with those receiving conventional telephone follow-up. The WeChat group demonstrated significantly better COPD Assessment Test (CAT) scores, indicating improved quality of life and symptom control. Participants also reported the highest satisfaction levels and showed greater enthusiasm, engagement and adherence to the rehabilitation programme, resulting in improved exercise participation and lung function outcomes. By embedding care management within an existing platform rather than requiring patients to adopt a new digital tool, the programme successfully strengthened long-term engagement with guideline-recommended care.

European Program for ROutine testing of Patients with Advanced lung cancer (EPROPA)

Italy

Indicator: Molecular testing and treatment of eligible patients

What it tells you: Whether people with advanced lung cancer can access timely molecular testing needed to identify actionable mutations, guide personalised treatment decisions and determine eligibility for targeted therapies and clinical trials.

What moves it: Investment in molecular diagnostic infrastructure, centralised testing networks, multidisciplinary molecular tumour boards, and pathways that reduce geographic and financial barriers to testing and clinical trial participation.

Who benefits: Patients with advanced non-small cell lung cancer (NSCLC), particularly those treated outside major specialist centres or in settings where access to molecular diagnostics and clinical trials may be limited.

Country example: The European Program for Routine testing of Patients with Advanced Lung Cancer (EPROPA) was founded and promoted by WALCE (Women Against Lung Cancer in Europe) and coordinated through the University of Turin to reduce inequalities in access to molecular testing and precision medicine.[77] The programme provides free comprehensive genomic profiling for patients with advanced NSCLC and links testing results to access to targeted therapies and clinical trials across Europe. Between 2021 and 2023, 555 patients were enrolled through 20 centres across five countries. The programme achieved an average molecular testing turnaround time of eight days, identified 264 actionable molecular alterations, and facilitated enrolment of 30 patients into clinical studies following review by a molecular tumour board.[78] Access to molecular testing is often uneven, particularly outside specialist cancer centres. EPROPA demonstrates how coordinated testing networks can reduce inequalities in access to precision medicine by ensuring that molecular profiling, clinical trial opportunities and biomarker-matched therapies are not determined by geography alone.



3.6 Outcomes

Short and long-term patient outcome indicators support monitoring of changes following policy or health system interventions over time.

The TLR identified 11 COPD outcome indicators and 14 lung cancer outcome indicators, spanning clinical survival, patient-reported outcomes, economic burden, and avoidable mortality. Priority indicators include:

Priority indicators	Underserved populations identified
COPD	
Exacerbations (Exacerbation rate per patient-year [moderate and severe])	–
Avoidable mortality (Percentage of COPD deaths which could have been avoided)	–
Mortality rate (Age-standardised mortality rate)	Males
COPD-specific patient-reported outcome measures (PROMs) (Patient score on patient-reported outcome measures: SGRQ, CRQ, SF-CRQ, CAT, EXACT)	–
5-year mortality rate (Percentage of COPD patients dying within 5 years of diagnosis)	Age (older age groups), males
Lung cancer	
Stage-specific survival (I, II, III, IV) (Survival at 1, 3 and 5 years, specific to stage at diagnosis)	–
1-year mortality rate (Percentage of patients dying within 1 year of diagnosis)	Females
5-year mortality rate (Percentage of patients dying within 5 years of diagnosis)	People who smoke
Stage-specific mortality rates (Stage stratified percentage of patients dying within 5 years of diagnosis)	–
Age-standardised mortality rate (Per 100,000 population)	–
Avoidable mortality (Percentage of deaths which could have been avoided)	–
Patient-reported outcome measures (PROMS) (Patient scores on EORTC QLQ-C30, LCSS)	–

Additional considerations from expert review

- **Lung cancer as a secondary diagnosis in COPD patients:** Framed by expert review as a system-level failure to operationalise the COPD-to-LC cross-referral pathway. While this indicator fell below the Steering Committee shortlisting threshold, it could be considered for country application in settings with organised lung cancer screening programmes, where it functions as a direct measure of integration between COPD and lung cancer pathways.

- **Patient-reported outcome measures (PROMs):** In addition to the standardised PROMs captured in the prioritisation process, which indicate symptom burden, physical functioning, emotional wellbeing and impact on daily life, a robust patient-centred indicator set should also cover additional patient experience measures (PREMs) including: access and affordability, including direct treatment costs and travel burden; social and emotional wellbeing, including experience of stigma; patient involvement and self-management including understanding of treatment and administration and evidence of shared decision-making.

Policy recommendations

- **Identifying avoidable mortality:** Distinguish mortality into preventable deaths (avoidable through public health interventions) and treatable deaths (avoidable through timely access to high-quality care) to identify where inequalities arise across the pathway and target interventions accordingly.

- **Addressing comorbidities through integrated care:** Monitor and manage major comorbidities that contribute to avoidable mortality, particularly cardiovascular disease in people living with COPD. Integrated care models that bring together respiratory, cardiovascular and primary care services can improve risk identification, support earlier intervention and reduce preventable hospitalisations and deaths.

- **Embedding patient-reported outcomes and experiences in routine care:** Incorporate standardised PROMs and PREMs into routine COPD and lung cancer care and disaggregate results by socioeconomic status, geography, sex and ethnicity to identify inequalities and target improvements.

- **Using disaggregated mortality data:** Analyse mortality indicators by factors such as socioeconomic status, geography, sex and ethnicity to identify populations experiencing a disproportionate burden of avoidable mortality and direct resources where they can have the greatest impact.

- **Investing upstream in prevention:** Use preventable mortality data to inform investment in risk reduction, prevention and early intervention strategies. The substantial burden of preventable mortality across both COPD and lung cancer highlights the opportunity to improve outcomes and reduce inequalities before disease progresses.

Part 4

From framework to country application

The Lung Health Equity Framework is designed for practical application at national and subnational level.

This section outlines the four-step methodology for policymakers, researchers and health system leaders to follow when applying the framework within local settings and contexts.

Step 1

Establish the baseline: What is happening at population level?

Use the framework's **incidence, prevalence, and determinants indicators** to understand the overall burden and exposure landscape in your setting.

Action	Indicators to populate
Quantify COPD and lung cancer burden	Age-standardised COPD prevalence and incidence; LC incidence by age and sex
Identify the diagnostic gap	Ratio of diagnosed to true COPD prevalence
Map exposure to modifiable risk factors	Current smoking rates; PM2.5 levels; household fuel type; occupational exposure rates
Understand severity at presentation	COPD severity distribution (GOLD stage); LC stage at diagnosis

Key question: How large is the problem, and how much of it is currently visible to the health system?

Step 2

Disaggregate: Who has worse outcomes?

Apply the framework's identified **underserved group strata** to every indicator. The research identifies five consistently affected groups, but local assessment should test which are most relevant in context.

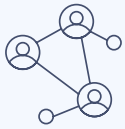
Disaggregation dimension	What to look for
Socioeconomic status	Are diagnosis rates, treatment uptake, and outcomes worse in more deprived areas?
Sex	Are women being diagnosed later? Are men over-represented in hospitalisations and mortality?
Geography (rural vs urban)	Is there variation in spirometry access, screening uptake, specialist density, or time to treatment?
Ethnicity/race	Are ethnic minority populations presenting at later stages or receiving lower rates of guideline-concordant therapy?
Age	Are younger patients missing from case-finding? Are older patients excluded from treatment?

Step 3

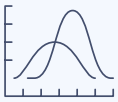
Identify: Where do inequalities accumulate?

The framework's pathway structure helps identify whether the same group experiences gaps at multiple stages. This is the critical equity insight: populations exposed to higher rates of risk factors, delayed diagnosis and late treatment may experience compounding disadvantage that single-indicator monitoring misses.

To do this:



Map underserved populations and identify those appearing in several pathway stages.



Quantify the gap: calculate the difference between their indicator values and the population average.

Where data availability permits, this identification step lends itself to subnational mapping, enabling policymakers to visualise the geographic distribution of inequality and pinpoint hotspots where multiple care gaps and risk factors converge within the same populations.

Pathway stage	Indicator	If this shows a gap for the same group...
Determinants	Smoking rates, air pollution exposure	...the group is likely over-exposed to risk
Detection	Diagnosis rate, stage at diagnosis, screening uptake	...the group may be receiving diagnoses too late
Treatment	Uptake of guideline-recommended therapy, time to treatment	...the group may not be receiving optimal treatment
Outcomes	Mortality rate, disease progression, avoidable mortality	...there may be more premature deaths in the group



Key question: Where is inequality compounding across the pathway, and where can interventions have the greatest impact?

Step 4

Act: Target action and monitor progress

Use the assessment findings to direct investment and intervention design. Applied as an improvement cycle, the framework supports action and accountability: establish the baseline, identify the equity gap, set a measurable target, assign accountability, implement the intervention, re-measure, and assess whether the gap has narrowed.

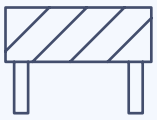
For example, if your assessment finds:



High smoking rates concentrated in specific SES/ geographic groups: targeted cessation programmes could be implemented.



Late COPD diagnosis in certain groups: strengthen primary care case-finding and diagnostic pathways.



COPD patients not referred to LC screening despite eligibility: implement cross-referral pathways to improve screening uptake.



Key question: Which actions are most likely to reduce inequalities, and are they delivering measurable improvements?

A practical starting point

A small set of routinely collected indicators can provide a strong foundation for assessing lung health equity, including:

	Smoking prevalence		**COPD GOLD stage at diagnosis**
	Air pollution exposure (outdoor and indoor)		**Lung cancer screening uptake**
	COPD prevalence		**Uptake of guideline-recommended treatment**
	Lung cancer incidence		**COPD hospitalisation rates**
	Lung cancer stage at diagnosis		**Lung cancer and COPD mortality rates**

Taken together, these indicators provide a practical starting point for identifying inequalities, prioritising action and monitoring progress towards more equitable lung health outcomes.



Conclusion

COPD and lung cancer are major and growing causes of global mortality, but their burden is distributed unequally. People most exposed to tobacco, air pollution, poor housing and occupational hazards are often those with the least ability to avoid them. The insight presented in this report indicates that socioeconomic disadvantage, rurality and ethnicity are repeatedly associated with barriers across prevention, diagnosis and treatment and poorer health outcomes. Sex and gender also matter, and national averages can obscure both patterns.

A practical framework for country adaptation

The Lung Health Equity Framework is intended to help policymakers and local health systems identify where these disparities arise, where they overlap, and where intervention is most needed, so that progress can be assessed not only for the population as a whole, but for the groups that have historically benefited least.

Its implementation relies on data disaggregated by socioeconomic status, sex, geography, ethnicity and other characteristics relevant to the national context. A minimum equity dataset will allow countries to identify where high risk-factor exposure, late diagnosis, poor access to treatment and worse outcomes are concentrated in the same communities.

This insight must inform how services are designed, ensuring they reach the people least likely to access them. Smoking cessation, vaccination, low-dose CT lung cancer screening, and pulmonary rehabilitation are established interventions, but their implementation must be built around the specific barriers underserved populations face to maximise their impact.

The NHS England Lung Cancer Screening Programme offers one positive example: targeted invitations, community engagement and mobile scanning have helped to increase early-stage diagnoses in the most deprived communities.

Reinforcing the need for national lung health strategies

However, clinical services alone cannot resolve inequalities rooted in housing, employment, education, transport, tobacco use and environmental exposure. This is the central premise of World Health Assembly Resolution 78.5, which calls for an integrated lung health approach that links prevention, diagnosis, treatment and management with action on the wider determinants of health.

Turning that commitment into impact at country level will require national lung health strategies with measurable equity objectives, named accountability and periodic public reporting, mechanisms that keep progress visible and sustain it beyond individual programmes or political cycles.

From evidence to action

The window for action is narrowing. The number of people with COPD is projected to grow by 23% globally between 2020 and 2050,[79] and lung cancer cases are forecast to rise by 86% between 2022 and 2050.[80] The economic cost of inaction is estimated at $4.3 trillion for COPD alone between 2020 and 2050.[81] The equity case is even more pronounced: burden is not distributed by chance and much of it can be prevented or reduced.

By linking determinants, detection, treatment and outcomes in a single measurable structure, this framework offers a practical pathway to move from evidence to equitable action.

Appendix

Glossary

Care Gap
A measurable difference between the care received by a population and an agreed standard, such as clinical guidelines, national targets or outcomes achieved by the overall population. Within this framework, attention focuses on care gaps that fall disproportionately on underserved populations, distinguishing this equity analysis from a general quality-of-care audit.

Chronic Obstructive Pulmonary Disease (COPD)
A group of progressive lung conditions characterised by persistent respiratory symptoms and airflow limitation, including emphysema and chronic bronchitis.

Disaggregated Data
Data segmented by population characteristics such as socioeconomic status, sex, ethnicity, geography or age to identify variations in risk, access to care and outcomes between different populations.

Equity
The absence of unfair and avoidable differences in health outcomes, risk exposures or access to healthcare between population groups.

Health Inequality
Measurable differences in health across population subgroups.

Health Inequity
A systematic, avoidable and unjust difference in health outcomes, healthcare access or exposure to health risks experienced by specific population groups.

Indicator
A measurable metric used to assess performance and equity across the lung health pathway, from determinants and prevention through to diagnosis, treatment and outcomes. Indicators represent specific aspects of lung health equity at each pathway stage (e.g. screening uptake) and help identify care gaps, where underserved populations experience different access, quality of care or outcomes compared with the overall population.

Low-Dose Computed Tomography (LDCT)
A specialised imaging technique that uses a lower radiation dose than conventional CT scans and is used for lung cancer screening in eligible high-risk populations.

Lung Health Equity Framework
The output of Phase 1 of the project: a structured, indicator-based framework for identifying, measuring and addressing inequalities in COPD and lung cancer across the lung health pathway.

Lung Health Equity Project
A multi-phase project initiated and funded by AstraZeneca, and developed with academic partners, clinical experts and patient organisations, that aims to identify high-risk populations, demonstrate the value of addressing care pathway variance, and recommend evidence-based solutions applicable across country archetypes.

Pulmonary Rehabilitation
A comprehensive intervention combining exercise training, education and behavioural support, designed to improve quality of life and outcomes for people living with chronic respiratory disease.

Socioeconomic Disadvantage
The social and economic conditions associated with increased exposure to health risks and reduced access to opportunities and healthcare services, often measured using indicators such as income, education, employment or deprivation.

Underserved population
A population group that experiences disproportionate barriers to accessing, receiving or benefiting from appropriate healthcare and other resources needed to achieve good health, often as a result of social, economic, geographic or structural disadvantage. These barriers may contribute to poorer health outcomes, but poorer outcomes alone do not necessarily indicate that a population is underserved.

Universal Health Coverage (UHC)
A health system goal whereby all people can access the health services they need, when and where they need them, without experiencing financial hardship.

World Health Assembly Resolution 78.5 (WHA 78.5)
The 2025 World Health Assembly resolution, Promoting and Prioritising an Integrated Lung Health Approach, which calls for coordinated action across prevention, diagnosis, treatment and management of lung diseases, with a focus on health equity and underserved populations.

Methodology

The Lung Health Equity Framework was developed through a structured and iterative process that combined evidence synthesis and expert validation to ensure that the framework is consensus-based, evidence-informed and practical for use across diverse health systems.

Evidence synthesis

The evidence base underpinning the framework comprised scoping desk research and a targeted literature review (TLR). The TLR synthesised published evidence on determinants of health, disease burden, detection and diagnosis, treatment and management, patient outcomes, care gaps and underserved populations across the lung health pathway. It was complemented by a review of international policies, clinical guidance and strategic reports to ensure alignment with the evolving global lung health landscape.

Evidence from the TLR informed the development of the conceptual framework and characterised the key indicators, care gaps and opportunities for intervention that populate each pathway stage. The TLR also supported the identification of measurable indicators and underserved populations, informing the selection and prioritisation of framework components. Within the included studies, underserved populations were recorded where they were identified by the study authors.

Given the global scope of the review, the definition and characteristics of underserved populations varied according to the geographical, social and healthcare context of each study. All underserved populations identified in the literature have been included with their corresponding indicator. Policy implications and intervention opportunities were then identified through a supplementary rapid evidence review conducted by George Wharton and Hunter Batjer, LSE Health, London School of Economics and Political Science, drawing on the indicators and care gaps identified in the TLR.

Search strategy and inclusion

Two literature searches were conducted in Embase, alongside targeted grey-literature sources including clinical practice guidelines, WHO global health profiles, national health ministry publications in addition to think tank and policy institute reports. The first search focused on COPD and the second on lung cancer, with each covering determinants and risk factors, disease burden, detection and diagnosis, treatment and management, and patient outcomes. Citation hand-searching was conducted on included studies during data extraction. Studies published between 2016 and 2026 were eligible for inclusion. The COPD search returned 3,017 studies, of which 195 were included; the lung cancer search returned 2,107 studies, of which 204 were included; and five studies were retrieved through hand-searching of reference lists. In total, 5,124 studies were screened and 399 were included. COPD studies were conducted across 54 countries and lung cancer studies across 32 countries.

Expert validation

Findings were refined through iterative engagement with a multidisciplinary Steering Committee comprising clinicians, patient advocates, health policy experts and health economists from multiple countries. Steering Committee members reviewed the emerging framework, and proposed structure, as well as providing guidance on the prioritisation of indicators, interventions and underserved populations. This ensured that the framework is clinically relevant, policy-informed and applicable across a range of health system settings.

Indicator prioritisation

A modified Delphi process was undertaken to support the prioritisation of indicators. A long list of indicators identified through the TLR were presented to the Steering Committee during committee meetings. Members were invited to provide written feedback for each indicator to refine the long list. The revised long list was then recirculated to the Steering Committee, with members providing anonymous ranking to prioritise indicators for each pathway stage.

Each indicator was ranked by the Steering Committee on a five-point Likert scale, with higher scores indicating higher perceived importance, against three criteria: (i) applicability to different countries and regions globally; (ii) weight of evidence in the literature; and (iii) applicability to different lung conditions. The average score for each indicator was calculated. Indicators were classified as prioritised where the score was both greater than or equal to the section mean (reflecting relative merit within its pathway stage) and greater than or equal to 4.0. The TLR also identified emerging indicators: those described in the literature but not yet broadly applicable globally or endorsed by the Steering Committee.

Adaptability

The framework is intended to be globally relevant while allowing adaptation to national and local contexts. Although informed by evidence from countries across different income settings, data availability and health system priorities vary considerably, and national and subnational stakeholders are encouraged to tailor indicators and interventions according to local needs and feasibility.
The framework is not prescriptive or exhaustive; it provides a practical foundation that can be adapted as evidence, data availability and policy priorities continue to evolve.

Indicator long list

Table showing full list of all indicators and corresponding measures reviewed, average score from the Steering Committee rating process and resulting prioritisation.

Indicator	Measure	Average Score (1–5)	Priority Status	Initial Source	Underserved Populations Identified
Determinants (COPD and lung cancer)					
Smoking: Historical exposure	Number of pack years smoked	4.8	High priority	TLR	Males
Current smoking rates	Rate of smoking	4.8	High priority	TLR and SteerCo	Males
Socioeconomic status	Area deprivation index, sociodemographic index, family income	4.7	High priority	TLR and SteerCo	SES is an underserved group
Ambient air pollution	NO_2, NO, O_3, SO_2, PM2.5/ PM10 concentrations, proximity to major roads	4.7	High priority	TLR and SteerCo	Age (older age groups), sex, TB diagnosis
Second-hand smoke exposure	Percentage of non-smoking population regularly exposed to second-hand smoke	4.2	High priority	TLR	Females
At-risk occupation: Historical exposure	Number of years exposed	4.2	High priority	TLR	Males
Indoor air quality	Household fuel energy type, Biomass fuel, indoor level of PM2.5, ventilation for indoor cooking	4.1	High priority	TLR and SteerCo	Females, lower SES

Existing pulmonary tuberculosis	Percentage or number of people with pulmonary tuberculosis	3.8	Moderate priority	TLR	-
Radon exposure	Residential radon exposure	3.8	Moderate priority	TLR	Females
At risk occupation: Current rates	Percentage of population in at-risk occupations	3.8	Moderate priority	TLR and SteerCo	Males
Existing COPD diagnosis (LC)	Percentage of LC patients with an existing COPD diagnosis	3.8	Moderate priority	TLR and SteerCo	Males
History of tuberculosis	Percentage or number of people with a history of tuberculosis	3.8	Moderate priority	SteerCo	-
Insurance type (LC)	Percentage of population covered by insurance type	3.6	Moderate priority	TLR	Lower SES
Damp, overcrowding, ventilation	Percentage of population living in poor housing conditions	3.5	Moderate priority	SteerCo	-
Housing type	Housing vulnerability score from social vulnerability index	3.5	Moderate priority	TLR	Males
Polygenic risk score (LC)	Percentage of population classified as genetically high risk for LC	3.2	Moderate priority	SteerCo	-
HIV (COPD)	Prevalence per 100,000	3.2	Moderate priority	SteerCo	-
Diet (LC)	High meat diet, low fruit, Western diet	3.0	Moderate priority	TLR	-
Temperature extremes: below 18 °C, above 29 °C	Percentage of areas experiencing extreme temperatures per year	2.9	Low priority	TLR	LMICs (COPD)
Relative humidity extremes: below 30%, above 60%	Percentage of areas experiencing extreme humidity changes per year	2.9	Low priority	TLR	LMICs (COPD)
Migrant, refugee, displaced status	Number displaced per 100,000 population	2.9	Low priority	SteerCo	-
High fasting plasma glucose (LC)	Percentage of the population	2.8	Low priority	TLR	-
Alcohol intake (LC)	Percentage of population with excess alcohol consumption	2.8	Low priority	TLR	-

Emerging indicators

- Temperature (COPD and lung cancer)
- Relative humidity (COPD)
- History of tuberculosis, age at TB diagnosis (COPD and lung cancer)
- Diet (Western, high in meat, low in fruit) (Lung cancer)
- Alcohol consumption (lung cancer)
- BMI (lung cancer)

Primary prevention					
Smoking cessation uptake	Percentage of patients using smoking cessation services	4.4	High priority	TLR	Males, age (younger age groups)
Smoking cessation	Number of patients offered smoking cessation service	4.2	High priority	TLR	-
Vaccination rates	Herpes Zoster, RSV, Pneumococcus, COVID-19, influenza	4.2	High priority	TLR and SteerCo	-
Smoking cessation therapy	Percentage of eligible patients receiving guideline-recommended therapy	3.7	Moderate priority	SteerCo	-
COPD incidence and prevalence					
COPD prevalence	Age-standardised prevalence	4.7	High priority	TLR and SteerCo	Ethnic groups: majority vs minority, males
True COPD prevalence	Ratio of diagnosed to true prevalence (the 'diagnostic gap')	4.6	High priority	SteerCo	-
COPD incidence	Age-standardised incidence rate per 100,000 population	4.5	High priority	TLR	Age (older age groups), males
COPD severity distribution (GOLD stage)	Number of patients with disease across GOLD stages	4.2	Moderate priority	TLR and SteerCo	Rural populations
Lung cancer incidence and prevalence					
LC incidence by sex	Sex-standardised rate per 100,000 population	4.7	High priority	TLR	Rural populations
LC incidence by age	Age-standardised rate per 100,000 population	4.5	Moderate priority	TLR	Rural populations
LC incidence by smoking status	Rate per 100,000 population by smoking status (never, previous, current)	4.5	Moderate priority	TLR and SteerCo	Females

LC Histology-stratified incidence	LC incidence stratified by histology (NSCLC vs SCLC)	4.5	Moderate priority	SteerCo	-
COPD detection and diagnosis					
COPD diagnostic equipment access	Case-finding rate in symptomatic at-risk adults with post-bronchodilator spirometry	4.6	High priority	SteerCo	Rural populations
COPD use of GOLD-recommended diagnostic testing for COPD	Percentage of patients with suspected COPD who undergo spirometry in line with GOLD recommendations	4.6	High priority	TLR	Age (younger age groups), males
COPD GOLD stage at diagnosis	Percentage of patients diagnosed stage I, II, III, IV per 100,000	4.5	High priority	TLR and SteerCo	Rural populations, females
COPD time to diagnosis from first symptoms	Time in days to diagnosis from first symptoms	4.3	High priority	TLR	-
COPD equipped primary care facilities	Percentage of primary care sites with quality-assured spirometry	4.2	Moderate priority	SteerCo	-
COPD number of primary care providers	Number of primary care providers per 100,000	3.6	Moderate priority	TLR	Rural populations
Emerging indicators					

- Diagnostic method comparison: spirometry using GOLD definition, self report, EMR, medical history, screening tools (CAT, CDQ), CT scan
- Number of newly diagnosed patients left untreated
- Accuracy of handheld spirometry vs standard spirometry
- Appropriate recording of patient diagnosis by providers
- Diagnosis provided prior to medication prescription

Lung cancer detection and diagnosis					
LC screening rate in high-risk populations	Percentage of eligible individuals up to date with screening	4.8	High priority	TLR	Uninsured individuals, females, lower SES
LC stage at diagnosis (I, II, III, IV or TNM)	Percentage of patients diagnosed at each stage	4.6	High priority	TLR and SteerCo	Ethnic minorities, lower SES, males, uninsured individuals
LC time to diagnosis from first symptom	Median time to diagnosis from first presentation of symptoms to healthcare provider	4.5	High priority	TLR and SteerCo	Lower education status, longer travel time

LC biomarker testing uptake	Percentage of eligible lung cancer patients receiving complete guideline-concordant biomarker testing (including molecular/ genomic testing and relevant protein biomarkers)	4.2	High priority	SteerCo	-
LC screening eligibility	Percentage of population eligible for risk-based screening	4.2	High priority	SteerCo	-
LC emergency route diagnosis	Diagnoses in emergency department as a percentage of all diagnoses	4.2	High priority	TLR	-
LC LDCT availability	Number of LDCT per 100,000 population	4.0	Moderate priority	TLR	Females
LC access to chest imaging in primary care	Number of patients receiving chest imaging in primary care	3.9	Moderate priority	SteerCo	-
LC biomarker testing availability	Percentage of treatment centres providing guideline-concordant predictive biomarker testing (including molecular/genomic testing and relevant protein biomarkers)	3.9	Moderate priority	SteerCo	-
LC route of diagnosis	Percentage of LC diagnoses from when symptoms present vs in screening pathways	3.9	Moderate priority	SteerCo	-
LC molecular testing time	Median time from sample collection (or pathology diagnosis) to actionable molecular result report (DNA/RNA-based testing for actionable genomic alterations)	3.7	Moderate priority	SteerCo	-
LC referrals	Number of fast-track referrals	3.7	Moderate priority	SteerCo	-

Emerging indicators

- Diagnosis in primary care settings
- Patient preference for enrolment in screening
- Diagnostic methods: CT scan vs chest x-ray
- Population size impact on participant screening uptake
- Location of diagnosis vs location of treatment
- Smoking cessation at time of screening

COPD treatment					
COPD uptake of guideline-recommended therapy	Percentage of eligible patients receiving guideline-recommended therapy	4.9	High priority	TLR and SteerCo	Females, education level, lower SES, ethnic groups
COPD disease control	Percentage of patients uncontrolled (experiencing ≥2 moderate or ≥1 severe exacerbation/year or high symptom burden per GOLD) after receiving guideline-recommended therapy	4.7	High priority	SteerCo	-
COPD healthcare resource use: hospitalisations	Percentage of patients hospitalised for COPD	4.2	High priority	TLR and SteerCo	Males, ethnic groups, rural populations
COPD pulmonary rehabilitation	Percentage of eligible patients undergoing pulmonary rehabilitation	4.2	High priority	SteerCo	-
COPD time to specialist referral	Median number of days from GP/primary care referral to first specialist (pulmonologist/respiratory physician) consultation	4.2	High priority	SteerCo	-
COPD time to treatment	Time to guideline-recommended therapy in eligible patients	4.2	High priority	TLR	Age (younger age groups), females
COPD ED presentations	Percentage of patients presenting at ED with COPD complications	4.1	High priority	TLR and SteerCo	Lower SES
COPD healthcare resource use: patient readmissions	Percentage of patients readmitted for COPD within 30, or 90 days	4.1	High priority	TLR and SteerCo	-
COPD medical oxygen access	Percentage of patients with access to medical oxygen	4.1	High priority	SteerCo	-
COPD unplanned hospitalisations	Percentage of patients hospitalised for COPD (unplanned)	4.0	Moderate priority	TLR and SteerCo	Males
COPD treatment review	Percentage of eligible patients with a documented review in past 12 months	3.9	Moderate priority	SteerCo	-

COPD pulmonary rehabilitation wait times	Percentage of patients reporting timely access	3.8	Moderate priority	TLR	Rural populations
COPD advanced care planning	Percentage of patients receiving advanced care planning	3.6	Moderate priority	SteerCo	-
Affordability of transport to receive treatment	Percentage of patients able to afford transport to referral site	3.6	Moderate priority	TLR	Lower SES

Emerging indicators

- Access to pulmonary rehabilitation with appropriate wait times
- Pre-hospital admission respiratory specialist visits
- Treatments received prior to diagnosis
- Number of outpatient visits
- Distance to healthcare provider
- Access to medications

Lung cancer treatment					
LC time from diagnosis to starting treatment	Percentage of eligible patients being treated within guideline-recommended timeframe	4.8	High priority	TLR and SteerCo	Lower SES, uninsured individuals
LC access to radiotherapy	Percentage of eligible patients accessing radiotherapy	4.6	High priority	TLR	Race / ethnic groups
LC treatment of eligible patients	Percentage of eligible patients receiving any treatment	4.5	High priority	TLR	Ethnic groups, public or no insurance, lower SES
LC uptake of guideline-recommended therapy	Percentage of eligible patients receiving guideline-recommended therapy	4.3	High priority	TLR and SteerCo	Lower SES, age (older age groups), race / ethnic groups
LC timely surgery	Percentage of eligible patients undergoing surgery within nationally recommended timeframe	4.3	High priority	TLR and SteerCo	Males, age (older age groups), rural populations, Lower SES
LC resection for stage I / II NSCLC	Percentage of patients with stage I/II NSCLC undergoing surgical resection	4.2	High priority	SteerCo	Lower SES
LC receipt of biomarker-matched therapy	Percentage of eligible patients receiving biomarker-matched therapy	4.2	High priority	SteerCo	-

LC availability of MDT	Percentage of patients with access to MDT	4.2	High priority	SteerCo	-
LC palliative care	Percentage of eligible patients offered palliative care	3.8	Moderate priority	SteerCo	-
LC hospital admissions	Number of hospital admissions after diagnosis	3.8	Moderate priority	TLR	Lower SES, rural populations
LC ED attendance preceding diagnosis	Number of ED attendances in year preceding diagnosis	3.8	Moderate priority	TLR	Lower SES, rural populations
LC ED attendance following diagnosis	Number of ED attendances in year following diagnosis	3.6	Moderate priority	TLR	Lower SES, rural populations
LC trial opportunities	Percentage of patients enrolled in clinical trials	3.5	Moderate priority	SteerCo	-
LC pulmonary rehabilitation uptake	Percentage uptake of pulmonary rehabilitation among eligible patients	3.5	Moderate priority	SteerCo	-

Emerging indicators

- Number of patients diagnosed but not receiving treatment
- Time to treatment initiation after diagnosis
- Number of hospital admissions
- Number of weeks spent in hospital
- Type of hospital attended
- Number of visits to an emergency department in year following diagnosis

COPD outcomes					
COPD mortality rate	Age-standardised mortality rate	4.8	High priority	TLR	Males
COPD disease-specific patient-reported outcome measures	Patient score on patient-reported outcome measures: SGRQ, CRQ, SF-CRQ, CAT, EXACT	4.6	High priority	TLR and SteerCo	-
COPD exacerbations	COPD exacerbation rate per patient-year (moderate and severe)	4.6	High priority	SteerCo	-
COPD avoidable mortality	Percentage of COPD deaths which could have been avoided	4.4	High priority	SteerCo	-
COPD crude mortality rate	Number of deaths due to COPD per 100k population	4.3	High priority	TLR	Age (older age groups), males

COPD 5-year mortality	Percentage of COPD patients dying within 5 years of diagnosis	4.3	High priority	TLR	Age (older age groups), males
COPD severity distribution (GOLD stage)	Number of patients with disease across GOLD stages	4.1	Moderate priority	SteerCo	-
COPD stability	Percentage of patients with FEV1 decline	4.0	Moderate priority	TLR	SES, rural populations
COPD mortality: Life years lost	Years of life lost	4.0	Moderate priority	TLR	-
COPD disability-adjusted life years	Disability-adjusted life years per 100,000 population	3.8	Moderate priority	TLR	-
COPD lung cancer as a secondary diagnosis	Percentage of patients with lung cancer diagnosis secondary to COPD	3.8	Moderate priority	TLR	-
Emerging indicators					

- Deaths attributable to particulate matter (PM) pollution
- Mortality for people who smoke vs non-smokers
- FEV1 decline (COPD)
- Lung cancer diagnosis in COPD patients
- PROMs: SGRQ, CRQ, SF-CRQ, CAT, EXACT

Lung cancer outcomes					
LC stage-specific survival (I, II, III, IV)	Survival at 1, 3 and 5 years, specific to stage at diagnosis	4.7	High priority	TLR and SteerCo	Males, Lower SES
LC mortality: 5-year	Percentage of LC patients dying within 5 years of diagnosis	4.6	High priority	SteerCo	-
LC mortality: 1-year	Percentage of LC patients dying within 1 year of diagnosis	4.4	High priority	SteerCo	Females
LC avoidable mortality	Percentage of LC deaths which could have been avoided	4.2	High priority	SteerCo	-
LC survival rate	Median survival time	4.2	High priority	TLR	Males, lower SES
LC age-standardised mortality rate	Per 100,000 population	4.2	High priority	TLR	-

LC patient-reported outcome measures	Patient score on patient-reported outcome measures: EORTC QLQ-C30, LCSS	4.2	High priority	TLR and SteerCo	-
LC stage-specific mortality rates (I, II, III, IV)	Stage-stratified percentage of LC patients dying within 5 years of diagnosis	4.1	High priority	TLR and SteerCo	-
LC mortality: 3-year	Percentage of LC patients dying within 3 years of diagnosis	4.0	Moderate priority	SteerCo	People who smoke
LC stratified mortality rates	Age- and sex- specific number of LC deaths	3.8	Moderate priority	TLR	-
LC caregiver burden	Caregiver hours or days	3.8	Moderate priority	SteerCo	-
LC return to work rates	Percentage of LC patients who were able to return to work	3.6	Moderate priority	SteerCo	-
LC mental health comorbidity	Percentage of LC patients with diagnosed depression, anxiety	3.5	Moderate priority	SteerCo	-
LC disability-adjusted life years	Disability-adjusted life years per 100,000 population	3.5	Moderate priority	TLR	-

Emerging indicators

- Stage-stratified percentage of LC patients dying within 5 years of diagnosis
- Percentage of LC patients dying within 1 year of diagnosis
- EORTC QLQ-C30, EORTC QLQ-LC13, EORTC QLQ-LC29, LCSS
- Return to work rates
- Percentage of LC patients with diagnosed depression, anxiety

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