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National Occupational Research Agenda (NORA)

International perspectives on priorities for occupational respiratory health

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Summary

The Respiratory Health Cross-sector Council (RHCC) of the National Occupational Research Agenda (NORA) program conducted discussions during June – October 2023 with six experienced occupational health experts from England, Denmark, and South Africa about their priorities for occupational respiratory health. They were contacted because they had contributed to the 2020 European Respiratory Society Monograph “Occupational and Environmental Lung Disease.” They identified numerous priorities related to different topics. For occupational exposures, common priorities related to dusts including silica, flour, and wood dusts, and the impact of climate change on fungal and pesticide exposures. Among occupational diseases, work-related asthma including work-exacerbated asthma was identified most often, followed in frequency by chronic obstructive pulmonary disease (COPD) and bronchiolitis. The experts had several suggestions about methods for research, surveillance, and exposure assessment. The most common clinical concern was the failure of non-occupational clinicians to ask patients about their jobs and workplace exposures. The priorities recorded in this document are a resource that members of the NORA RHCC and other organizations can use when developing an agenda for research and intervention in occupational respiratory health.

Background

The National Institute for Occupational Safety and Health (NIOSH) in the Centers for Disease Control and Prevention (CDC) initiated the [National Occupational Research Agenda \(NORA\) program in 1996](#). The goal of NORA is to stimulate innovative research and improved workplace practices. A national occupational research agenda is developed and implemented through ten industry sector councils and seven health and safety cross-sector councils. Council members come from universities, large and small businesses, professional societies, patient-support organizations, government agencies, and worker organizations. The diverse members of each council meet to decide on an agenda for their area of interest, and subsequently address implementation of the agenda. NIOSH is the steward of the NORA program and supports it in two main ways. First, NIOSH staff co-chair each council and coordinate council activities.

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Second, NIOSH considers the NORA agenda as important input when setting its own strategic plans.

Members of the NORA RHCC share an interest in preventing work-related respiratory diseases (See [Respiratory Health Cross-Sector Council](#) Website) .

- In 2019 RHCC members published the [National Occupational Research Agenda for Respiratory Health](#) online in January.
- In 2022, halfway through the third decade of NORA (2016-2026), the non-NIOSH RHCC members reaffirmed the 10 major objectives in the 2019 Agenda and published [Review of the 2019 National Occupational Research Agenda for Respiratory Health by Non-NIOSH members of the Respiratory Health Cross-Sector Council](#) .
- In 2024, the RHCC will start considering topics and issues to inform a new NORA for Respiratory Health that will be developed for the fourth decade of NORA that begins in 2026.

Current Project

Consistent with the NORA goal of soliciting input from a diverse audience, the RHCC sought to learn about the priorities of occupational respiratory health researchers from other countries. The RHCC began with the 2020 European Respiratory Society (ERS) monograph “Occupational and Environmental Lung Disease” (doi: 10.1183/2312508X.erm8920).¹ John R. Hurst, Editor in Chief of ERS Publications, wrote in the Preface (page vi) that the monograph “. . . addresses the clinical science and practice that underpins environmental and occupational respiratory medicine.” The 20 chapters in the monograph cover a variety of topics and were authored by different respiratory health professionals, most of whom worked in Europe. Beyond summarizing what was known about different environmental and occupational exposures and their related respiratory health effects, most chapters specified gaps in knowledge and needs for research and interventions to advance the prevention of respiratory diseases. The chapters were prepared before the start of the worldwide spread of COVID-19 and published in the first full year of the pandemic.

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In 2023, Paul Henneberger, NIOSH Co-Chair of the RHCC, approached contributors to the 2020 ERS Monograph with the request to discuss priorities for research and interventions. These individuals were asked to consider whether the same or additional priorities were important now that it was three years later and after the pandemic. To stimulate the discussions, phrases from each chapter that addressed either gaps in knowledge or goals were shared with the authors. The meetings were conducted in-person when possible and virtually otherwise, and typically lasted about an hour. No two discussions were the same. For example, some were more focused on the chapter content while others were more far-ranging. Paul Henneberger took notes during the meetings, which he later summarized and sent to the discussants who reviewed them and made minor changes. The revised meeting notes were assembled for this document.

The six individuals who participated in the discussions and their primary affiliation, country, and chapter titles from the 2020 ERS Monograph are listed here.

- Dr. Johanna Feary, Imperial College London and Royal Brompton Hospital, United Kingdom (UK): Introduction
- Dr. Mohamed Jeebhay, University of Cape Town, South Africa: Chapter 1 The Global Perspective of Occupational Lung Disease
- Dr. Martie Van Tongeren, University of Manchester, UK: Chapter 2 Exposure Assessment
- Dr. David Fishwick, Health and Safety Executive, Manchester, UK: Chapter 13 Cotton, Other Bioaerosols, Inhalation Fevers and Occupational Organising Pneumonia
- Dr. Gareth Walters, University of Birmingham, UK: Chapter 4 Work-exacerbated Asthma
- Dr. Vivi Schlünssen, Aarhus University, Denmark: Chapter 6 The Impact on the Aetiology of COPD, Bronchitis and Bronchiolitis

The remainder of this document features their thoughts and recommendations for priorities in occupational respiratory health. The occupational respiratory health priorities for exposures,

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diseases and exposure/disease combinations, clinical concerns, and methods for research, surveillance, and exposure assessment, are presented in two formats:

- Section 1 lists bulleted priorities separately for each discussion.
- Section 2 summarizes each priority in one of four tables that represent different topics in occupational respiratory health.

Section 1: Priorities from Each Discussion

Discussion with Dr. Johanna Feary, guest editor of the 2020 ERS Monograph Occupational and Environmental Lung Disease, and lead author of the Introduction.

The discussion was conducted virtually on October 18, 2023.

Affiliation:

Dr. Johanna Feary

Faculty of Medicine, National Heart & Lung Institute

Senior Clinical Research Fellow

Imperial College London

London, United Kingdom

Dr. Johanna Feary started the discussion by expressing concern about two work-related diseases, and how the patients frequently have been inadequately worked-up and diagnosed before being referred to her clinic.

- First, Dr. Feary expressed concern about silicosis because she is seeing more cases than in the past, especially among workers who work with silica-rich artificial stone counter tops. Also, health surveillance programs refer patients with suspected silicosis who have worked in mines, construction, and other jobs with silica exposure. A significant proportion of silicosis cases she has recently seen have been immigrants with relevant occupational exposures in jobs they held outside the UK.
- Second, Dr. Feary is concerned about work-related asthma cases that are not identified, and those cases who were inadequately worked-up and mistakenly identified as having work-related asthma. Physicians without the appropriate training and experience should refer a patient with a suspected occupational disease to get appropriate diagnosis and care.

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Many physicians emphasize diagnosing and treating a disease rather than approaching patients holistically and considering whether exposures at work and elsewhere have caused and perhaps exacerbated the disease.

- The occupational medicine community needs to better imbed itself in other medical services to counter the notion that occupational diseases are rare and irrelevant.
- In response to this pessimism, it is important to stress that early identification of many occupational diseases can have better results for the patient if it is possible to limit exposure and allow the worker to retain their job. Intervention doesn't always mean the patient has to give up their job.

Dr. Feary voiced concern about other occupational exposures and respiratory diseases.

- Obliterative bronchiolitis associated with diacetyl and other food flavorings.
- The recycling of electronic equipment and exposures to metals.
- Cases of hypersensitivity pneumonitis related to composting of organic material.
- Climate change and increased fungal exposure at work and home.
- The respiratory impact of vaping might be a legacy issue.

As a final thought, Dr. Feary observed that occupational lung diseases are a global problem. She suggested that perhaps the United States and other richer countries can provide leadership by offering to assist in identifying and preventing occupational exposures and diseases in low- and middle-income countries.

Discussion with Dr. Mohamed Jeebhay, author of Chapter 1 The Global Perspective of Occupational Lung Disease

The discussion was conducted virtually on June 13, 2023.

Affiliation:

Prof Mohamed F Jeebhay, MBChB DOH MPhil (Epi) MPH (Occ Med) PhD FCPHM (Occ Med) SA

Head of Occupational Medicine Division

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School of Public Health, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa

Dr. Jeebhay provided comments in response to two statements from Chapter 1 in the 2020 ERS Monograph.

The first statement addresses surveillance systems for occupational lung diseases (pages 13-14): “In light of the inequitable distribution of knowledge, information and research relating to occupational lung diseases, some have suggested a globalized surveillance system for capturing international data. Coupled with appropriate training, this could contribute to improvements in the health and well-being of all workers globally.”¹

- Dr. Jeebhay noted that little has changed to date. At the 2023 Conference of the International Commission on Occupational Health, there were some initiatives to do surveillance globally, but nothing substantial has followed yet.
- There is a need for a surveillance system that can combine data across countries. This would be one way to keep an eye on industry and “migration” of disease to low- and middle-income countries as production moves from one country to other countries with lower labor costs.
- The new International Classification of Diseases 11th Revision (ICD 11) includes codes for occupational lung diseases that could be operationalized across countries to start looking at data globally.
 - The World Health Organization was the main mover for ICD 11 with codes for OLDs and enlisted the International Labor Office to help set it up.
 - The ICD 11 codes for occupational lung diseases have been tested by experts in desk-top exercises, but the question now is can they actually work in surveillance and research. So maybe it is time to test them in pilot studies.
 - A common coding system for jobs across countries is needed as well.
- The occupational disease surveillance systems in the United Kingdom – SWORD and SHIELD – have identified new trends, notably for asthma. And some surveillance

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programs have started to report on other occupational lung diseases as well, including less-common ones, to identify new or emergent risks.

- There is a problem with voluntary surveillance systems because reporter fatigue is a real problem and inevitable.
- Also, there can be conflicts between compensation data versus voluntary medical data, which provides motivation to conduct studies.

The second statement addresses what clinicians need to help them identify suspected OLD cases. It appears in the Conclusion of Chapter 1 (page 15):

“Finally, physicians should have a high index of suspicion of the potential risks of exposures to their patients, especially those with unusual or unique presentations. This also calls for more efficient tools, such as “job– or task–exposure matrices” to identify hazardous exposures, electronic chemical data bases and medical algorithms, to assist in identifying causes of occupational lung diseases and to inform their appropriate management in routine clinical practice.”¹

- Such systems to help clinicians in South Africa are crude and seem to be used in very localized settings. They are not integrated to assist clinicians in real time assessment, investigation, and management of their patients.
- Artificial Intelligence is a big issue. There needs to be some thought to the use of AI to assist in this type of space, because this is all about linking massive data sets sitting in different places and that is contextually driven. Currently, this requires intensive effort in individual workplaces, and very specialized investigations.
- New generations will experience the same challenges and could perhaps use AI to assist in identifying occupational lung diseases.
 - Even with common occupational respiratory diseases, such as interstitial pulmonary fibrosis, pulmonary doctors in South Africa frequently do not investigate possible associations with workplace exposures due to lack of awareness of occupational or environmental exposures.

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- Electronic health records may help bring attention to this need, since they can require doctors to collect work and occupational exposure information on all patients.
- The COVID-19 Pandemic brought attention to the importance of occupation for disease, as in the case of health workers.

In addition, Dr. Jeebhay offered comments about exposure standards and areas in need of more research.

- Lower exposure standards for silica are needed to prevent all types of silica-related diseases.
 - Silica exposure is worldwide, and reducing it needs to be addressed to prevent disease. This includes artificial stone countertops, which is a relatively recent phenomenon.
 - Affordable sampling and laboratory technologies are needed in low-resource settings, to evaluate exposures levels and motivate interventions.
- Common sensitizers: More work is needed to assess exposures to common sensitizers (e.g., wood dust, seafood), investigate exposure-response associations, and set exposure standards.
- Co-exposure to chemical and biogenic agents in indoor and outdoor spaces.
 - These types of multiple exposures are common in many jobs.
 - How do such multiple exposures impact the risk of developing asthma, sensitization, and respiratory allergies?
- Climate change and how it impacts exposures and disease.
 - Pesticide exposures have likely increased in response to an increase in the number of pests associated with global warming.
 - Climate change is likely to increase allergic problems, including more asthma cases due to increased pollen and chemical pollutant exposures in domestic and occupational settings.

Discussion with Dr. Martie van Tongeren, co-author of Chapter 2 “Exposure Assessment,” and Dr. David Fishwick, author of Chapter 13 “Cotton, Other Bioaerosols, Inhalation Fevers and Occupational Organising Pneumonia”

The discussion was conducted virtually on July 10, 2023.

Affiliations:

Dr. Martie van Tongeren (MVT)

Professor of Occupational & Environmental Health, Division of Population Health, Health Services Research & Primary Care, University of Manchester

Dr. David Fishwick (DF)

Consultant Respiratory Physician and Chief Medical Adviser for Health and Safety Executive, Great Britain and Northern Ireland

Honorary Professor in Respiratory Medicine, University of Sheffield and University of Manchester

Co-Director of the UK Centre for Workplace Health.

DF: The national Health and Safety Executive in the United Kingdom is still very interested in:

- asbestos, mesothelioma, and pleural disease;
- many cancers;
- welding fumes and lung cancer;
- asthma is a big deal still, rhinitis less so; and
- COPD and the agents that cause it are still important.

There is less interest in:

- anthrax and welders;
- flavorings;
- silica exposure and resp disease, including construction; and
- COVID-19 work.

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DF: The trend is away from workplace-specific investigations and towards data linkage and large population studies.

MVT:

- Exposure assessment is moving to exposome sensors and activities, although this trend has not completely penetrated the occupational health arena.
- Similar to what we saw with COVID-19, there is less separation between work and other settings like home regarding sources of harmful exposures that could be relevant to many respiratory diseases.
 - Exposures of interest in indoor environments, especially in homes, include volatile organic compounds, fungi, and cooking fumes.
 - Must discern if a causative exposure is purely occupational, purely non-occupational, or a mix of the two.
 - Compared to the past, workers now are less likely to be exposed to huge amounts of silica, welding fumes, etc.

MVT:

- The number of workers exposed to uniform agents is declining. For example, carbon black workers numbered in the thousands during earlier decades, but studies of those types of large cohorts are less common and more difficult to initiate. Exposure assessment must focus on the experience of individuals rather than of large cohorts with common exposures.
- It is more typical now to conduct exposure assessment with sensors that are worn 24 hours a day by study participants. This makes it possible to investigate occupational and non-occupational sources of exposure.

MVT: Priorities are the same as before: asthma, flour dust is still important; longer term exposure to silica and other dusts.

MVT:

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- A potential problem with the current economic downturn is that occupational exposures might be worse because fewer controls are being implemented.
- Construction: contractors and subcontractors are hard to follow and determine to what they have been exposed
- We have started recently to identify sentinel cases due to new exposures or old agents in new settings.
 - For example, exposures in prisons to second-hand smoke and the street drug “spice” might be causing asthma responses in prison staff. This is an opportunity to possibly follow up to conduct active surveillance to identify exposures.
 - Practicing physicians submit reports of suspected occupational diseases, but the diagnosis or suspected occupational agents may not always make sense. Prison officers exposed to “spice” is within the realm of the possible.

DF:

- Measuring the exposome over 24 hours is essential, including housing and leisure activities as well as occupational experience.
- A better understanding of disease phenotype could guide what should be measured. An example of better understanding a disease is characterizing emphysema with computerized tomography.

MVT:

- We want to explore complicated agents like cleaning agents and pesticides.
- Trying to link electronic health records to occupation information is difficult in the UK because they are not in one place.
- Job exposure matrices are useful but crude, and it is difficult at a population level to get the type of cause-effect relationships that could inform interventions.

DF:

- In the UK, clinicians rarely do actual workplace investigations, and instead rely on other sources of exposure measurements, such as from the employer.

MVT: In Sweden, some academic clinicians can go out with hygienists to do workplace visits.

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MVT:

- Exposure assessment in population-based settings has fewer details about the workplace exposures of participants.
- Even though the overall information is okay, it is not possible to understand how specific exposures are related to risks.
- For example, you might know cleaning agents are a problem, but not be sure which ones or which tasks are risk factors.
- Need to conduct both intensive workplace studies and large-scale population-based studies.

DF:

- Studies conducted at the population level can yield estimates of the population attributable risk.
- Mental health and its association with work is an emerging issue to the UK.
- A big challenge is to use objective measures of stress at work, including physical stress.

MVT:

- We still do not measure enough even for known occupational exposures that are harmful.
- Manchester is refurbishing their city hall using lots of stone.
 - The options for exposure control are limited because they cannot use water to suppress dust, and they have done no silica measurements.
 - The project will last 4-5 years and involve many activities with drilling sandstone.
 - This is very troubling because even with everyone following the recommended preventive measures, it is still necessary to take measurements to monitor risk.

MVT: Mold has shot up the health agenda in the UK.

Discussion with Dr. Gareth Walters, author of Chapter 4 “Work-exacerbated Asthma”

The discussion was conducted in person on September 12, 2023.

Affiliation:

Gareth Walters, MD

NHS Consultant in Occupational Respiratory Medicine

Hon. Senior Clinical Research Fellow, University of Birmingham

Dr. Walters had recommendations related to several statements in Chapter 4.

- From the Socioeconomic Impact section (page 64): “Further research into the long-term health and socioeconomic outcomes of work-exacerbated asthma is recommended.”¹
 - Dr. Walters confirmed the value of this recommendation.
 - There remains little evidence to document changes in asthma status related to changes at work.
 - Management plans for adults need to be updated regularly by the treating physician, periodically asking the asthma patient about products and tasks that might exacerbate asthma at work.
 - There may be opportunities to establish routine capture of data on a patient’s occupation or change of occupation, within existing health service frameworks. Currently in the UK National Health Service there is no method in place for systematic collection of these data, despite recommendations for this in national guidelines for asthma and work-related asthma.
- Conclusion in Chapter 4 (page 67): “Studies on the effectiveness of interventions that aim to prevent exacerbation of asthma in specific industries, or that reduce or prevent ongoing exposure in affected individuals, are needed.”¹
 - What are the right interventions for patients/workers with asthma?
 - This question still needs to be answered.
 - The goal is to find strategies that are acceptable to patients, feasible, and have good results.

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- The absence of evidence from this type of research hampers the ability of physicians to provide better care to their asthma patients.
- Prevention and workplace management section (page 65): “Education of the workforce by various means (e.g., web-based, external occupational health providers) about the effects of workplace exposures on asthma may improve adherence to treatments and control measures such as respiratory protection equipment, if indicated.”¹
 - Physicians typically do not ask their asthma patients about their jobs, despite multiple efforts over several decades to educate physicians about the importance of considering occupational exposures in a management plan for asthma patients.
 - Instead, it might be more productive to educate patients/workers directly about the importance of occupational exposures for the onset and exacerbation of asthma. This could perhaps be accomplished through a non-governmental organization, like the American Lung Association, in the US.
- An idea unrelated to Chapter 4: Update the 2011 American Thoracic Society (ATS) Statement on Work-exacerbated Asthma.
 - Updating the 2011 ATS Statement is unlikely to be considered a priority by either the ATS or the European Respiratory Society. Consequently, so this task could possibly be taken on by the NORA RHCC.
 - Start with the 2011 ATS Statement and decide which content to keep and which to delete, and which other content not in the older document should be added to the updated document.

Discussion with Dr. Vivi Schlünssen, lead author of Chapter 6 “The Impact on the Aetiology of COPD, Bronchitis, and Bronchiolitis”

The discussion was conducted in person on September 11, 2023.

Affiliation:

Dr. Vivi Schlünssen

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Professor, Department of Public Health
Research Unit for Environment, Occupation and Health
Danish Ramazzini Centre and Aarhus University
Aarhus, Denmark

Most of the discussion and the related recommendations addressed improving exposure assessment for both epidemiologic studies and in clinical settings. For example, relevant text from Chapter 6 (page 95): “The vast majority of studies still use a broad and unspecific qualitative measure for occupational exposure. In order to perform targeted prevention and approach specific exposures, we need independent, quantitative exposure measures (e.g., measurements, job exposure matrices in a strong study design (e.g., longitudinal, case–control).”¹

- COPD and Bronchitis
 - There is an ongoing need to have more specific characterizations of exposure so physicians and responsible public health officials can speak with employers about what might contribute to their employees’ COPD and bronchitis.
 - There is a need for research regarding exacerbation of COPD: Are the exposures at work that worsen COPD the same as those that cause COPD?
 - A job exposure matrix can help estimate a worker’s lifetime occupational exposure for epidemiologic research and possibly also in clinical settings.
 - Planning underway for a pilot study to apply a Job exposure matrix in occupational clinical settings to facilitate assigning occupational exposures to patients being evaluated for COPD and bronchitis.
- Bronchiolitis
 - There is a need to alert clinicians to the fact that this outcome can be occupational. Cases can be attributed to known occupational causes and to emerging occupational causes that were not previously recognized.
 - Communication efforts should target physicians in occupational medicine, primary care, and pulmonary medicine, as well as medical students.

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- Perhaps the communication would have more impact if the messenger were a patient with the same training as the audience. For example, a physician, dentist, or nurse with the occupational disease of interest could speak to other clinicians and students in their profession.

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Section 2: Priorities by Topics

Abbreviations

COPD chronic obstructive pulmonary disease

CT computerized tomography

EHR electronic health record

ICD 11 International Classification of Diseases
11th Revision

JEM job exposure matrix

LMICs low- and middle-income countries

MD medical doctor

UK United Kingdom

WEA work-exacerbated asthma

Table 1 Priorities for Occupational Respiratory Health: Exposures

Dr. Feary		Dr. Jeebhay		Dr. van Tongeren & Dr. Fishwick	
Themes	Notes	Themes	Notes	Themes	Notes
Climate change	And fungal exposure	Silica	Lower exposure standards are needed	Certain exposure issues persist	Longer exposure to silica and other dusts
Recycling electronics	And the associated exposures to metal	Climate change	More pesticides will be used, more allergic diseases	Have used sentinel cases to identify new exposures or old agents in new settings: exposures for prison officers	Exposures in prisons to second-hand smoke and street drug “spice” might cause asthma response in staff
Vaping	Respiratory impact	Common sensitizers, like wood dust	More measurements, more exposure-response studies, and set exposure standards	Mold	Has become more prominent in the UK health agenda
				Interest in complicated agents	Examples include cleaning agents and pesticides

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Table 2 Priorities for Occupational Respiratory Health: Disease and Exposure/Disease Combinations

Dr. Feary		Dr. Jeebhay		Dr. Walters		Drs. van Tongeren & Fishwick		Dr. Schlüssens	
Themes	Notes	Themes	Notes	Themes	Notes	Themes	Notes	Themes	Notes
Obliterative bronchiolitis	Associated with diacetyl and other food flavorings	Co-exposure to chemical and biogenic agents	Common in both indoor and outdoor jobs. How do they impact risk of asthma, sensitization, and respiratory allergies?	More research: long-term health & socio-economic outcomes of work-exacerbated asthma (WEA)	Including research on changes in health related to changes at work	Interests of the Health and Safety Executive (HSE) in the United Kingdom	Asbestos, mesothelioma, and pleural disease; Many cancers; Welding fumes & lung cancer; Asthma, including cases due to flour; and COPD & the agents that cause it	Improve exposure assessment for epidemiologic studies and in clinical settings: COPD and Bronchitis	Need more specific exposure assessment. Need better JEM to assign exposures for these two occupational respiratory diseases
Hyper-sensitivity Pneumonitis (HP)	Due to composting organic material			Intervention effectiveness studies needed for WEA	Learn what prevents exacerbation of asthma in specific industries, or what interventions reduce ongoing exposures in affected individuals	Better understanding of disease phenotypes might inform what exposures should be measured	Example is characterizing emphysema with CT	Better understand agents that cause and exacerbate COPD	With better exposure metrics can address the question: Are exposures at work that cause COPD the same as the ones that exacerbate COPD?

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Dr. Feary		Dr. Jeebhay		Dr. Walters		Drs. van Tongeren & Fishwick		Dr. Schlünssen	
Themes	Notes	Themes	Notes	Themes	Notes	Themes	Notes	Themes	Notes
Silicosis	Sees more silicosis cases now than in past			Update 2011 American Thoracic Society (ATS) Statement on Work-exacerbated Asthma	The NORA Respiratory Health Cross-sector Council could possibly accomplish this			Bronchiolitis	Improve exposure assessment for epidemiologic studies and in clinical settings

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Table 3 Priorities for Occupational Respiratory Health: Clinical concerns

Johanna Feary		Mohamed Jeebhay		Gareth Walters		Vivi Schlünssen	
Themes	Notes	Themes	Notes	Themes	Notes	Themes	Notes
Work-related Asthma	Cases not adequately worked up, resulting in both false positives and false negatives	Non-occupational physicians need tools to help them identify patients with occupational disease	AI may help clinicians connect symptoms with occupational exposures. EHRs may help if they require physicians to collect a patient's occupation and industry data.	Physicians should update management plans for adults with asthma	Physicians should periodically ask asthma patients about workplace products and tasks that might exacerbate their asthma	Bronchiolitis	Alert clinicians this can be related to occupation. Target physicians and students in occupational medicine, primary care, and pulmonary medicine. Might be useful to have patients specific to the audience communicate this message.
Outreach to non-occupational physicians	Convince other physicians to act on knowledge that occupation is an important determinant of health. Part of treating patients holistically.			Educate clinicians about work-related asthma	Many physicians do not ask asthma patients about their jobs and exposures at work, so not part of management plans	Using JEMs in clinical setting	Can a JEM facilitate assigning occupational exposures to patients evaluated for COPD and bronchitis?
				To support clinicians, workers could take initiative to describe their jobs and work-related exposures to their clinicians	Educate workers to act, perhaps through a non-governmental organization		

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Table 4: Priorities for Occupational Respiratory Health: Methods for research, surveillance, and exposure assessment.

Johanna Feary		Dr. Jeebhay		Drs. van Tongeren & Fishwick	
Themes	Notes	Themes	Notes	Themes	Notes
Occupational lung diseases are a global problem	Maybe higher resource countries could assist identifying and preventing occupational exposures and diseases in LMICs	Globalized surveillance systems for occ lung diseases	Much work remains, some hope with new ICD 11 with codes for occupational lung diseases. International surveillance could tract migration of exposed jobs to LMICs.	Trend is away from workplace-specific investigations and towards data linkage and large population studies	Lower cost
		Voluntary surveillance systems	Problem with reporter fatigue. Conflict between these data and data from worker compensation systems can motivate additional studies.	Exposure Assessment is moving to exposome sensors and activities	Focus on individuals instead of large worker cohorts with same exposure. Switch is not complete in occupational health arena
				For harmful exposures that could be relevant to respiratory diseases, is less separation between work and other settings like home	Similar to what occurred in COVID-19 pandemic. More likely to use sensors that workers wear entire day and not just at work.
				JEMs are useful in studies at population level, but exposure estimates are crude.	Difficult at population level to get the type of cause-effect relationships that could inform interventions. Need to conduct intensive workplace exposure studies to identify risk factors for disease and inform interventions.

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				Even if follow recommended preventive measures, still must take measurements to monitor risk	Example of drilling sandstone to refurbish a city hall in England city
				Link electronic health records to occupational information if possible	Difficult in the UK because data are not in one place.

Conclusions

The diverse membership of the NORA RHCC enriches the development of a research agenda for occupational respiratory health. The project described in this document engaged non-RHCC members working in countries other than the United States to express their priorities for advancing research and interventions in occupational respiratory health. These insights will be a resource that RHCC members can use when considering objectives for the fourth decade of NORA that begins in 2026.

References

¹ Feary J, Suojalehto H, Cullinan P, eds. Occupational and Environmental Lung Disease (ERS Monograph/Number 89). Sheffield, European Respiratory Society, 2020. DOI: 10.1183/2312508X.erm8920