Module 2: Air pollution impact on workers
What will you learn in this module?

- What is air pollution and why does it matter?
- What is occupational exposure, and its impacts?
- How do we estimate health impacts of occupation exposure?
- What further research is needed?
What is air pollution and why does it matter?
What is air pollution?

Key sources of PM2.5:
- Fossil fuel consumption in industry
- Waste burning
- Agricultural crop residue burning
- Residential cooking
- Road transportation
HUMAN HAIR
50-70 μm (microns) in diameter

PM$_{2.5}$
Combustion particles, organic compounds, metals, etc.

PM$_{10}$
Dust, pollen, mold, etc.

<2.5 μm (microns) in diameter

<10 μm (microns) in diameter

FINE BEACH SAND
90 μm (microns) in diameter
Why does it matter?

- Exposure to air pollution has been linked to various health impacts.
- According to the WHO, air pollution contributes to around 6.9 million premature deaths in 2016.

**Respiratory infections**
- Air pollution can cause inflammation of the respiratory system

**Lung cancer**
- Air pollution can cause inflammation which can lead to the activation of cancerous mutations.

**Stroke**
- Air pollution can impact the cardiovascular system increasing the risk of heart attack or stroke

**Diabetes**
- Air pollution inhibits the body's ability to respond to insulin
What is occupational exposure and its impacts?
How are people exposed to air pollution?

Ambient exposure
- The exposure people face due to air pollution in the outside air.
- Sources of ambient air pollution can be both natural (e.g. desert dust or sea salt) or anthropogenic (emissions from biomass burning, vehicle emissions etc.).

Household exposure
- The key source is traditional biomass cook stoves.
- A large proportion of the health burden from household air pollution is shouldered by women and children as they typically spend most of their time indoors.

Occupational exposure
- The exposure of people to harmful air pollutants and other toxic substances due to their work
- Covers both formal and informal occupations
Examples of occupational exposure to air pollution

Office workers
- Reduced exposure to ambient air pollution
- Possible 'office syndrome' due to lack of ventilation and high CO2

Traffic police
- Spend their time exposed to harmful emissions from traffic pollution

Textile workers
- High levels of formaldehyde, carbon monoxide, carbon dioxide, and PM are dangerous contaminants prevalent in their working place

Streetfood workers
- Limited proper equipment for protection
- Exposed to PM and black carbon

Construction workers
- Frequent exposure to dust, fumes and gases emitted by vehicles and machinery

PM – Particulate Matter
The impacts of occupational exposure
Premature deaths due to air pollution in Southeast Asia
How do we estimate health impacts of occupational health?
Step 1:

• Determine the number of people working in each sector.

Proportion of the population engaged in different occupations x the economically active population
Step 2:

- Understand the level of pollution to which a worker is exposed to because of their occupation.
- Some occupations have higher levels of exposure than others e.g. construction workers might have higher exposure because of their work than office workers. The Global Burden of Disease study has classified economic activities as having either high, low or no exposure.
Step 3:

- The exposure rate and the population exposed is then used to estimate the number of premature deaths.

\[ \Delta Mort = y_0 \left( \frac{RR - 1}{RR} \right) \text{Pop} \]

- Number of premature deaths due to risk
- Population exposed
- Baseline mortality
- Relative Risk
What further research is needed?
Gaps in current estimates/research of the health burden of occupational exposure

Available data is concentrated in certain regions. Many countries in Southeast Asia region are *data scarce* because of a lack of capacity to monitor air quality.

Certain economic activities/occupations are often more studied than others particularly in *informal workers* who are also often not protected by policies.

- Informal labour not included
- Limited types of professions studied

Only considers increased risk of cardiovascular disease not any other diseases associated with air pollution e.g. *stroke, lung cancer, diabetes, respiratory infection* which are associated with ambient particulate matter and household air pollution exposure.
What is needed to reduce occupational exposure?

**Improve understanding and empower workers**
- Quantitative studies to estimate total air pollutant emissions from different types of work and the exposure in each occupation group will allow for better estimates of health burdens, leading to better informed policy and empowerment of workers to take action.
- Qualitative studies to understand the perceptions of air pollution for different groups and what policies are in place to understand key issues facing workers.

**Estimate exposure for informal workers**
- Better understand the contribution of the informal sector.
- Estimate the exposure and associated health impacts for informal workers.

**Policies to reduce occupational exposure**
- Promotion of personal protective equipment (PPE) wearing to reduce exposure.
- Better ventilation to reduce exposure.
- Improve/enhance technology to reduce emissions.
Key messages

A person’s job can significantly impact their exposure to air pollution with consequences for their health.

This occupational exposure is often additional to other sources of exposure to air pollution such as ambient and household. Certain groups of people will have higher exposure to occupational air pollution due to their jobs but also may be more likely to have higher air pollution exposure from other sources due to their socioeconomic status.
Key messages

There are various ways that we can assess and mitigate occupational air pollution exposure. This can provide evidence which will help to inform policy.

Policy is often limited in the informal sector in particular, and often workers in these sectors have limited rights – these sectors are also often a major source of ambient air pollution and are a significant policy gap when it comes to air pollution mitigation.
Relevant resources

SEI work on air pollution and gender:


Relevant resources

Podcasts:

- SEI Asia podcast: [Air pollution and its impacts on the health of workers in Cambodia](#)