BREATHING HEAVY

New Evidence on Air Pollution and Health in Bangladesh: Headline Messages

THE INVISIBLE KILLER

Bangladesh was ranked as the most polluted country in the world and Dhaka as the second most polluted city each year between 2018 to 2021. Air pollution was deemed the second largest risk factor leading to deaths and disability in Bangladesh in 2019, with four out of the top five causes of total deaths in the country being directly associated with exposure to air pollution.[1] An estimated 78,145 to 88,229 deaths and between 1.0 to 1.1 billion days lived with illness in Bangladesh in 2019 were attributable to ambient air pollution. This translates to economic losses, estimated between 3.9 and 4.4 percent of the country's gross domestic product (GDP) during the year. The report, *Breathing Heavy*, assesses the short-term impacts on physical and mental health due to exposure to outdoor/ambient air pollution using data from 12,250 individuals in Dhaka and Sylhet.

MAJOR POLLUTION SOURCES

Three sources of ambient air pollution in urban locations were identified for the survey based on exposure levels: i) persistent traffic; ii) major construction and traffic; and iii) brick kilns.[2] A fourth comparator location, representing the cleanest part of the country, was in rural Sylhet.

Exposure: Major construction and traffic

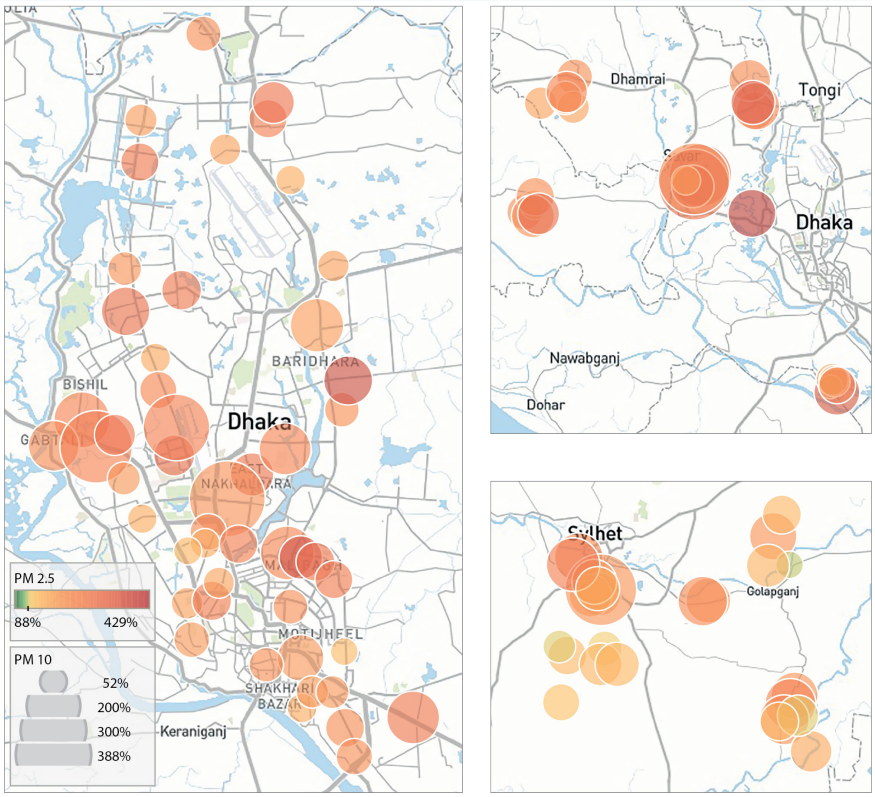
The highest $PM_{2.5}$ concentration levels — approximately 150 percent above the WHO Air Quality Guidelines (AQG)[3] 2021 of the World Health Organization or equivalent to smoking 1.7 cigarettes per day.

Brick kilns

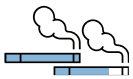
The second highest levels of $PM_{2.5}$ concentration — 136 percent above the WHO AQG 2021 or equivalent to smoking 1.6 cigarettes per day.

For Dhaka division, while the major sectors contributing to ambient air pollution are the small industries (which includes brick kilns), up to one-fifth of the total $PM_{2.5}$ concentration can be attributed to transboundary sources.

Figure 1. Exposure to air pollutants $PM_{2.5}$ and PM_{10}



150% above WHO Air Quality Guidelines
Equivalent to 1.7 cigarettes/day



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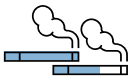

MAJOR AIR POLLUTANTS

WHO identifies at least six air pollutants of major public health concern:

i. Fine particulate matter ($PM_{2.5}$)
ii. Coarse particulate matter (PM_{10})
iii. Ozone at ground level (O_3)
iv. Nitrogen dioxide (NO_2)
v. Sulfur dioxide (SO_2), and
vi. Carbon monoxide (CO).

Of these, $PM_{2.5}$ is considered the most harmful for human health, as it is small enough to pass through the nose and get into the bloodstream, affecting all major organs.

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Figure 2: Prevalence of illness in the sample

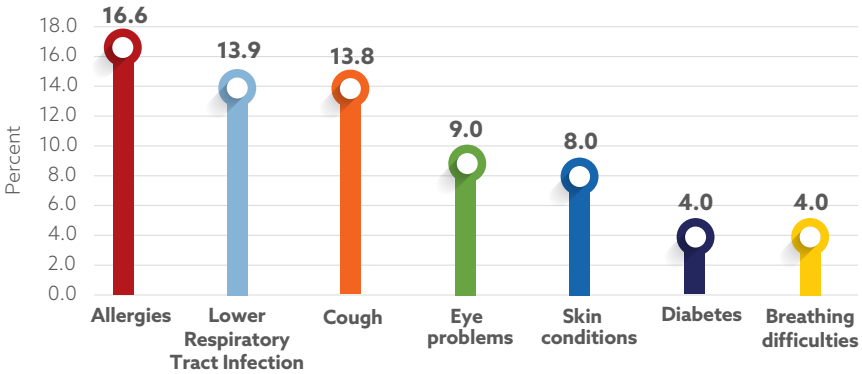
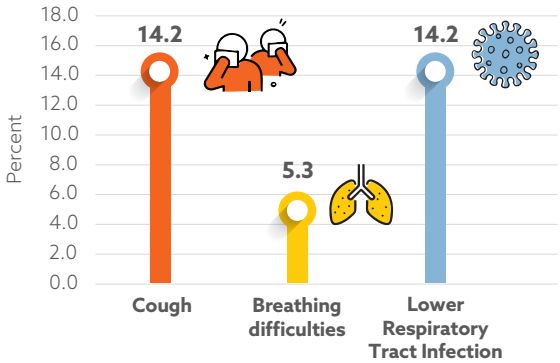


Figure 3: Selected illnesses in locations with highest levels of pollution



Those under the age of 5 and over the age of 65 are most vulnerable to these illnesses.

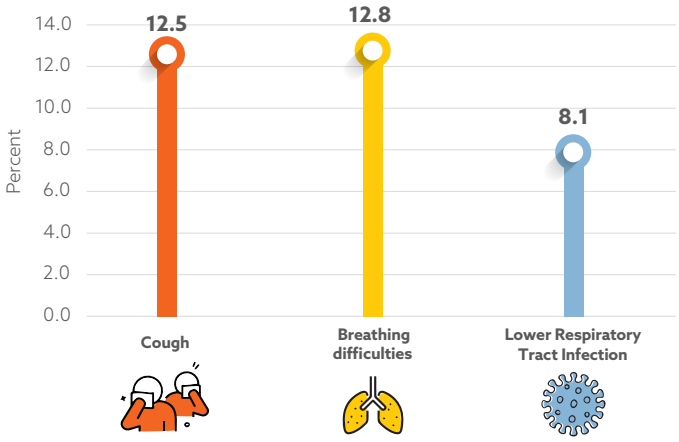
HEALTH CONDITIONS ASSOCIATED WITH EXPOSURE TO AMBIENT AIR POLLUTION (AS MEASURED BY $PM_{2.5}$ CONCENTRATION LEVELS)

Most vulnerable to the effects of air pollution are the elderly, children and individuals with comorbidities such as allergies, diabetes and heart conditions. Productive cough and breathing difficulties are typically highest among these groups, irrespective of their location.

Lower respiratory tract infections are the highest among children and elderly living in locations with major construction and traffic than all other locations.

People with underlying health conditions like allergies, diabetes, and hypertension, living in areas with major construction and traffic, are more likely to experience lower respiratory tract infections than those living than all other location.

Figure 4: One percent increase in exposure to $PM_{2.5}$ above WHO AQG 2021 increases the probability of contracting the following by:



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AIR POLLUTION ALSO AFFECTS MENTAL HEALTH

Depression is most reported in locations with persistent traffic and areas of major construction and traffic [13.7 percent in both instances].

The lowest rates are reported among those living near brick kilns [11.2 percent].

Depression increases with age, with those 65 years or older being more susceptible than others.

Females are more depressed than men [13.7 percent and 11.8 percent respectively].

A one percent increase in exposure to $PM_{2.5}$ above the WHO AQG 2021 is associated with a 20 percent higher probability of being depressed.

Each hour spent outdoors increases the likelihood of experiencing depression by three percent.

INTENSITY OF POLLUTION VARIES ACROSS THE COUNTRY

Dhaka is the most polluted division, with an average $PM_{2.5}$ concentration of 87 μg/m³. Sylhet is the least polluted, with an average $PM_{2.5}$ concentration of 46 μg/m³. Barisal is the second most polluted division after Dhaka, with an average $PM_{2.5}$ concentration level of 73 μg/m³ (figure 5).

Air pollution levels in Dhaka are becoming increasingly concentrated while dissipating in Sylhet over the years.

The western divisions — Khulna and Rajshahi (average $PM_{2.5}$ concentrations of 65 μg/m³ and 66 μg/m³ respectively) — are more polluted than the eastern ones of Sylhet and Chattogram (average $PM_{2.5}$ concentrations of 61 μg/m³ and 46 μg/m³ respectively). Moreover, the western divisions are experiencing higher levels of exposure to air pollution than the eastern divisions (See figure 6).

Figure 5: $PM_{2.5}$ average annual concentration levels (μg/m³) for the period 2013 to 2021

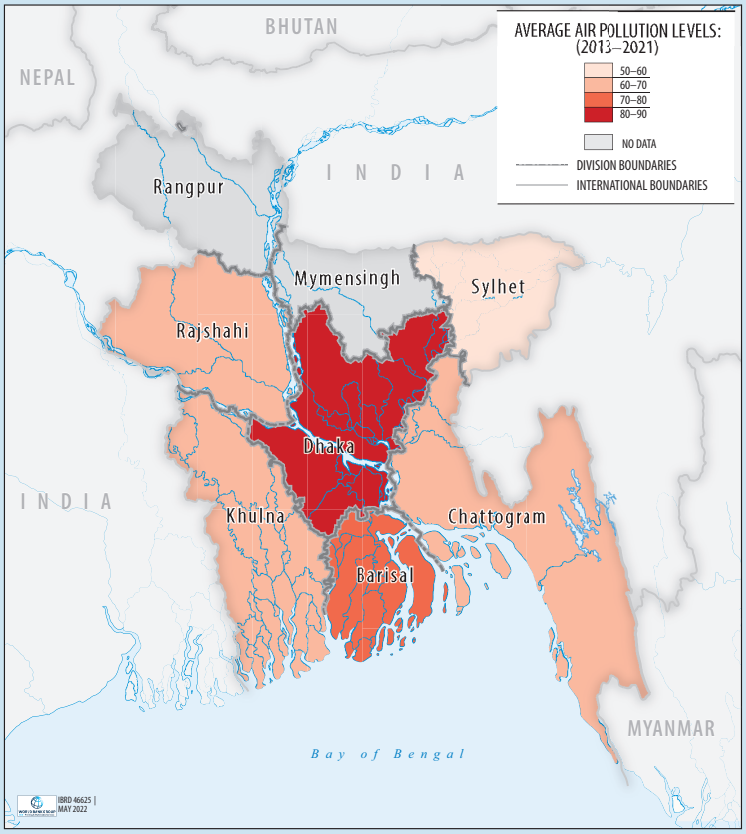
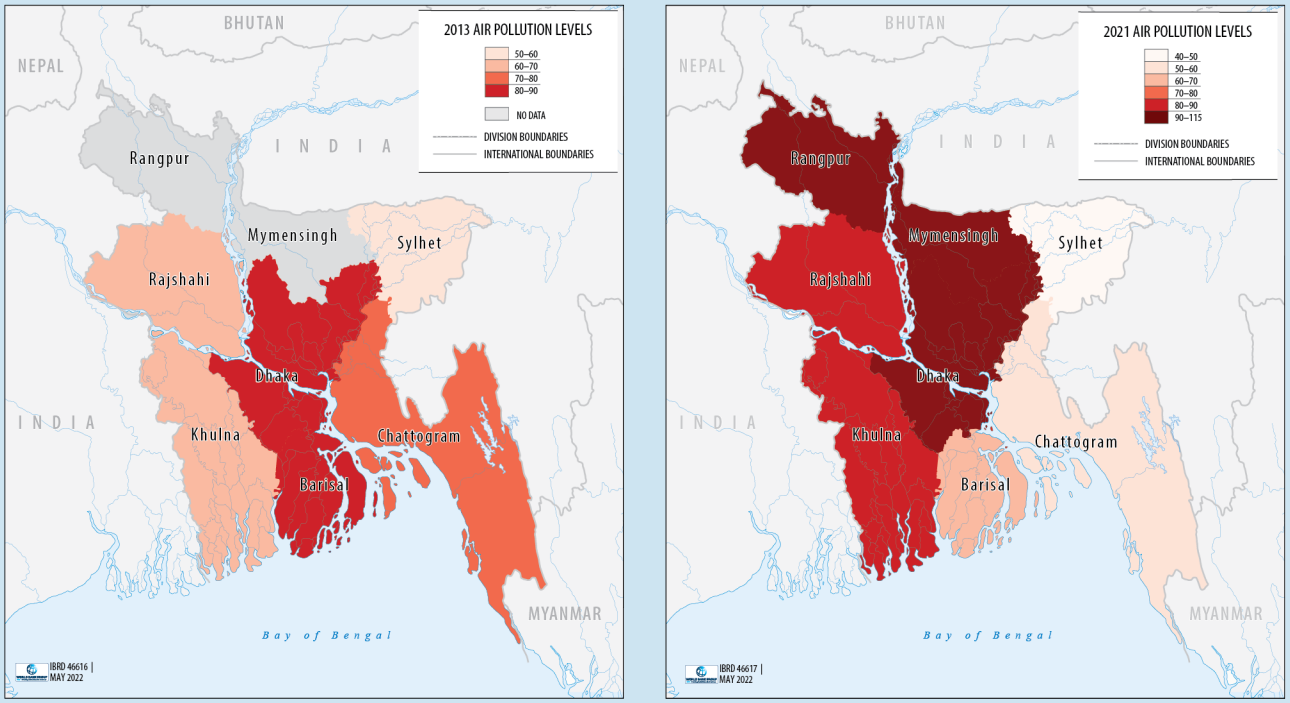


Figure 6: Average Annual $PM_{2.5}$ Concentration Levels (μg/m³)



AIR POLLUTION LEVELS ARE LIKELY TO INTENSIFY AND DEMANDS URGENT ATTENTION.

Driven by climate change and compounded by contributing factors like urbanization, air pollution levels are likely to intensify further over time. Air pollution causes the climate to change, while climate change worsens the quality of breathable air. This is mainly due to the emission of greenhouse gases such as carbon dioxide, ozone, and particulate matter from the burning of fossil fuels. Hence, there is an urgent need for the health sector to do the following with a view to being better prepared to deal with the impending crisis:

1. Improve health service delivery

Curative care, particularly those delivered through public health platforms, need to be further strengthened to treat the health problems brought on by air pollution.

2. Promote preventive measures

Community-level screening for specific conditions such as persistent coughs and breathing difficulties among people living in air pollution hot-spots will assist the government in detecting and addressing emerging health issues.

3. Monitor air pollution levels closely

Together with the weather data collected by the Bangladesh Meteorological Department, the agencies will be able to provide a fuller picture of the extent of air pollution in Bangladesh.

4. Conduct further research

While this report provides a litany of information, additional work in this space will help triangulate the findings and assist in better understanding the health impacts of air pollution.

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1 *Stroke, ischemic heart disease, chronic obstructive pulmonary disease, and lower respiratory tract infections*

2 *Locations with persistent traffic and major construction and traffic were selected from within the Dhaka city corporation areas while locations with brick kilns were in the outskirts of Dhaka city corporation areas.*

3 *For $PM_{2.5}$, there is no "safe" threshold, because small particulate pollution has health impacts even at very low concentration levels.*