Air Pollution with Particulate Matter and Health in Arab Countries

SDG 11.6.2

SDG 3.9.1

SDG 11- Human Settlements Indicators in Arab Countries
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Health Impacts of Airborne Particulate Matter (PM)

• The evidence on public health impact of PM is consistent in showing adverse health effects at exposures that are currently experienced in all countries of the World.

• The range of health effects is broad, but are predominantly to the respiratory and cardiovascular systems.

• All population is affected. The risk for various outcomes has been shown to increase with exposure and there is little evidence to suggest a threshold below which no adverse health effects would be anticipated.
Air pollution with particulate matter is a major risk to public health in Arab Countries

• **SDG 11.6.2** in Arab Cities is arising at alarming rates:
  
  – The annual average concentration of particulate matter of 10 microns (PM10 and PM 2.5) in Arab Countries is the **highest in the world** (2-9 times the WHO recommended levels)
  
  – The annual average concentration of particulate matter of 2.5 microns (PM 2.5) in Arab Countries is **54 μg/m³** (5 times the WHO recommended levels)

• **SDG 3.9.2.** PM Air pollution is killing more than **247,500 people** annually in Arab Countries (2018 estimates).

• Although source apportionment studies are very limited, the available ones show that **50% of airborne PM is natural dust**
Pyramid of health effects due to exposure to PM

25% Stroke
45% COPD
30% Lung Cancer
28% Heart Disease

Death
Hospital admissions
Emergency room visits
Doctor visits
Asthma attacks, medication use, symptoms
Lung function changes, immune cell responses, heart rate variability responses
Health effects: The two myths

- **Myth 1: Dust particles are large and cannot reach the lungs**
  - About 50% of PM are larger than 10 μm (*non-inhalable*)
  - About 45% of PM are coarse between 2 and 10 μm (*inhalable*)
  - About 5% of PM are fine less than 2 μm (*penetrate deeply*)

Goudie and Middleton, 2006
Myth 2: Dust composition is similar to that of natural soil, therefore is not toxic:

—Airborne PM is a mixture:
  • Minerals (e.g., SiO$_2$, Al$_2$O$_3$, CaO)
  • Metals (e.g., Fe)
  • Bio-aerosols
  • (e.g., pollen, fungi, bacteria)
  • Anthropogenic pollutants

—Partial Toxicity of this mixture is not well understood. WHO is currently reviewing the available evidence.
SDG 11.6.2: WHO Global Ambient Air Quality Database (PM10 and PM2.5)

• Reported measured data (PM10 and PM2.5)
  – As of May 2108, 4000 cities reported air quality data (PM0 and PM2.5) including only 51 in 11 Arab Countries
  – Most of the PM2.5 data are converted from PM10

• Modelled Data (PM2.5)
  – Measured data
  – Remote sensing (Satellites)
  – Chemical Model
Modeled PM2.5 (WHO 2018)
Issues with PM data

• Political Well for reporting is not always strong!
• Frequently data is not “Population Weighted”!
• Geographical Representation!
• Homogeneity, Continuity and Reliability!
• Most of the available data is converted from PM10
• Source Apportionment and Chemical Composition Studies are limited?
Thank you