Chronic Obstructive Pulmonary Disease Attributable to Air Pollution: A Global Environmental Health Crisis

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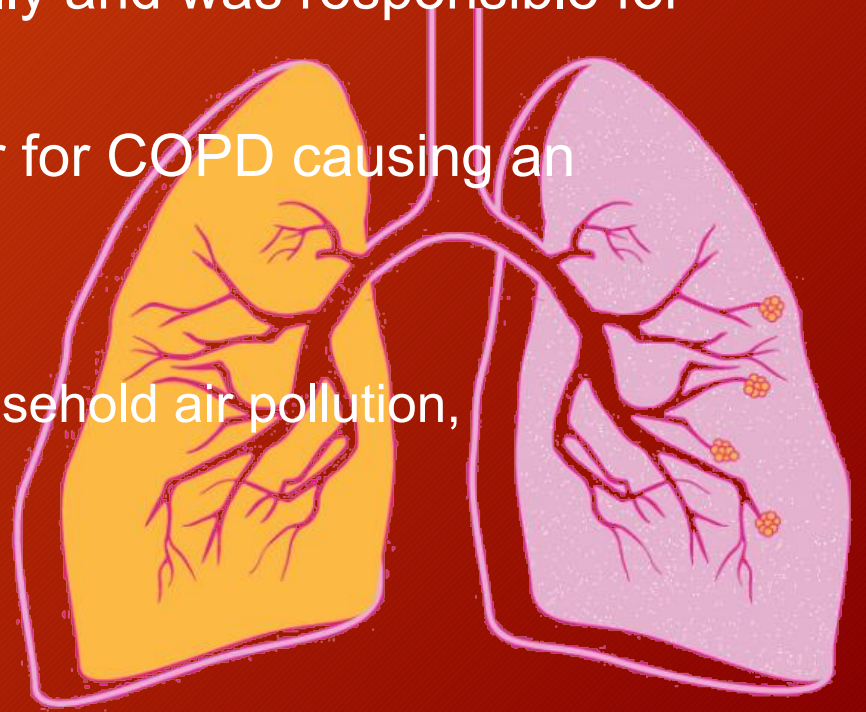
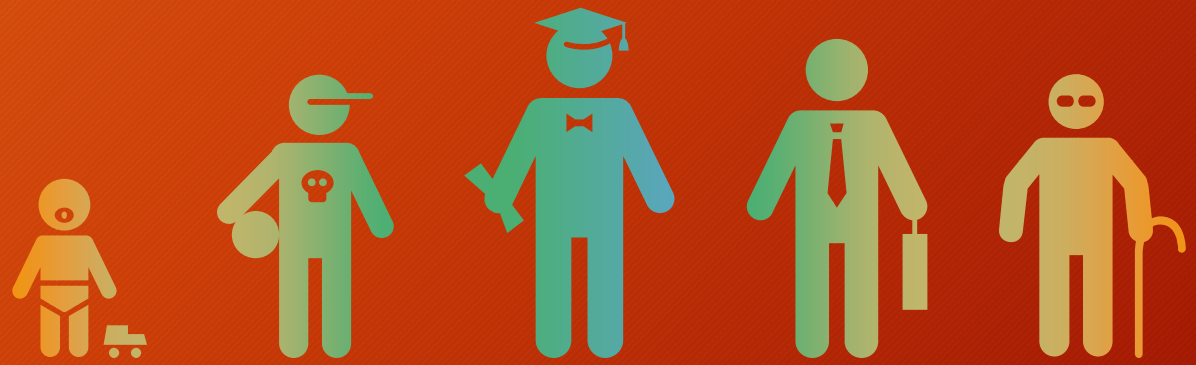
Introduction

- Chronic obstructive pulmonary disease, or COPD, is a common, preventable, and treatable disease characterized by persistent airflow blockage and parenchymal destruction caused by significant exposure to noxious particles or gases.
- COPD affected approximately 391·9 million people globally and was responsible for about 3.23 million death in 2019.
- According to WHO, air pollution is a significant risk factor for COPD causing an estimated 43% of COPD deaths
- The current report critically assesses
  - the global burden of COPD attributable to ambient and household air pollution,
  - the people and geographical area affected,
  - program and policies involved,
  - proposed prevention strategy to prevent the crisis.



Target Population Involved

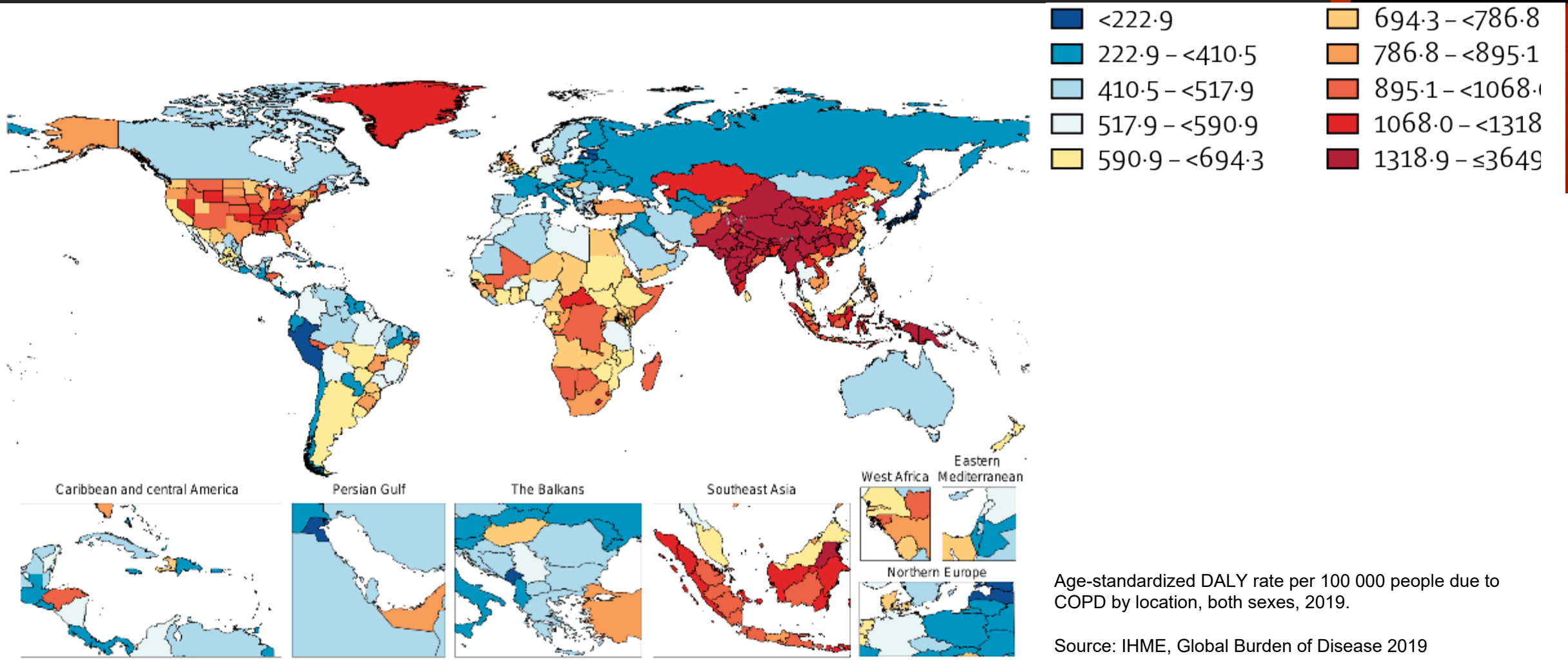
- Women and young children are affected by COPD attributable to household air pollution (HAP) particularly in rural areas.
- Older adults are known to be more susceptible to the detrimental health effects of ambient and household air pollution.
- The burden of COPD disproportionately affects socioeconomically disadvantaged populations worldwide.



Geographical Area Affected

- The largest number of COPD deaths attributable to household air pollution (HAP) was found in South Asia.
- Average Year of life lost (YLLs) per COPD death attributable to HAP is higher in North Africa and Middle East, Western Sub-Saharan Africa, Central Asia, and Southern Sub-Saharan Africa (Wu et al)
- The global average YLLs per COPD death attributable to ambient air pollution (AAP) is higher in Central Asia, Western Sub-Saharan Africa, Eastern Sub-Saharan Africa, and Central Sub-Saharan Africa.
- Approximately 130 thousand deaths from 1900-2015 due to cardiorespiratory diseases, including COPD, in the United States were attributable to $PM_{2.5}$ pollution

Geographical Area Affected



Age-standardized DALY rate per 100 000 people due to COPD by location, both sexes, 2019.

Source: IHME, Global Burden of Disease 2019

Sustainable Development Goals

Sustainable Development Goals and targets related to ambient and household air pollution exposure and disease burden include

- SDG target 3.4, which call for reduction of one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being by 2030
- SDG target 3.9.1, which calls for a substantial reduction in deaths and illnesses from air pollution.
- SDG target 7.1.2, which aims to ensure access to clean energy in homes
- SDG target 11.6.2, which aims to reduce the environmental impact of cities by improving air quality

Reduction of the Burden

- Household Air Pollution
  - The Benefits of Action to Reduce Household Air Pollution (BAR-HAP) is a tool used as a resource in WHO's Clean Household Energy Solutions Toolkit (CHEST).
  - The tool includes 16 different cleaner cooking transition options from traditional stoves.
  - Das et al. provide data that gives a detailed view of how BAR-HAP can be used adoption and use of improved cooking technology including forecasts of financial resource needs in low- and middle-income countries (LMIC).

Reduction of the Burden

- Ambient air pollution
  - The Partnership for Clean Fuels and Vehicles (PCFV) toolkit is a global public-private partnership working with developing and transitional countries vehicular air pollution through the promotion of cleaner fuels and vehicles.
  - Lev-On et al described how PCFV help to reduce the use of high Sulphur fuel and leaded gasoline and help to improve environmental sustainability in transportation sector in developing countries.

Description of Programs / Policies

- The Global Initiative for Chronic Obstructive Lung Disease (GOLD) is a global initiative launched in 1997 for COPD prevention and management. GOLD Objectives includes
  - Effective COPD management and prevention strategies for use in all countries
  - Raise awareness of COPD among the health care, public health professionals and public.
  - Decrease morbidity and mortality from COPD through implementation and evaluation of effective programs for diagnosis and management.
  - Promote research about prevalence of COPD including relationship with environment.
  - Implementation of effective programs for prevention.

Description of Programs / Policies

- The Chronic Disease Self-Management Program is an interactive self-education framework developed by the Stanford University to help people with COPD or other chronic conditions. The main objective are
  - Addressing the physical and psychological effects of COPD including fatigue
  - Exercising, getting proper nutrition, and using medications appropriately
  - Communicating effectively with family, friends, and health professionals

Proposed Program/Policy Recommendations

- The adverse effects of air pollution are largely determined by the concentration of air pollutants, the amount of exposure time and distance from the air pollutant.
- If People with COPD can reduce the detrimental effects of ambient air pollution by shorting the time spent on activity outdoor and reduce activity when Air quality index (AQI) is beyond a safety level that can help to reduce the symptom of COPD.
- A global program based on providing regular information about local AQI through social media, local news channel or newspaper could help reduce global burden of COPD attributable to ambient and air pollution.
- Information about $PM_{2.5}$ concentration, ground level O_3, CO, and SO_2 would be beneficial.

Conclusion

- Environmental exposure to noxious substances or gases are essential for development and exacerbation of COPD.
- Ambient and household exposure to dangerous environmental pollutant are potential risk factors for COPD.
- The study of environmental factors is important to epidemiologists, toxicologists, and clinicians to develop evidence-based strategies for prevention of COPD.
- Multidisciplinary approaches are helpful for finding key factors in developing program and policies to prevent the crisis.

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