

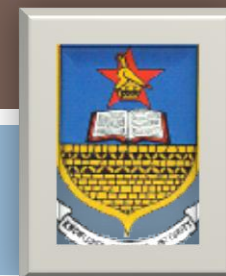
# GLOBAL FUEL ECONOMY INITIATIVE

## HEALTH RELATED ISSUES IN THE TRANSPORT SECTOR

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# Urban Air Pollution

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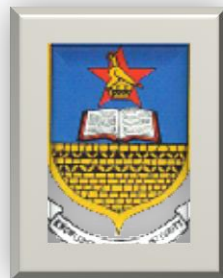
# Air pollution

- Air Pollution is the introduction of substances or surplus energy as waste products into the atmosphere.
- Directly or Indirectly adversely alter the quality of the environment or cause undesirable effects on man, animals, vegetation or materials.
  - gaseous or particulate emissions



# Air pollution

- ❑ Petroleum-powered automobiles are probably the largest single source of pollutants such as hydrocarbons, nitrogen oxides, sulphur dioxide and carbon monoxide
- ❑ **Economic impacts**
- ❑ **Health related impacts**
- ❑ **Ecological**



# Air pollution

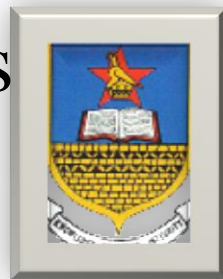
## □ Economic impacts

- ▣ the cost of maintenance as a result of the corrosion of building materials such as lime stone blocks and roofing sheets from acid rain generated from Sulphur dioxide emissions.



# Air pollution

- ❑ **Health related impacts**
- ❑ inhaling of sulfur dioxide leads to
  - ❑ lung diseases,
  - ❑ breathing difficulties,
  - ❑ formation of sulfurous acid along the airways causing a strong irritation and prevents the respiratory system's role in defending the body against foreign particles and bacteria



# Air pollution

## ❑ Health related impacts

- ❑ elevated burden of disease
- ❑ often affects the poor including children and the aged.
- ❑ illnesses including asthma, chronic bronchitis, emphysema, pneumonia and heart disease



# Air pollution

## Ecological

- Nitrogen oxides (NO<sub>x</sub>) & SO<sub>2</sub> contribute to the formation of acid rain.
- Carbon dioxide (CO<sub>2</sub>) is a “greenhouse gas” that traps the earth’s heat and contributes to global warming
- Zimbabwe: 9 M tonnes of CO<sub>2</sub> in 2008
- Zambia: 2.2 M tonnes of CO<sub>2</sub> same year





# Air pollution

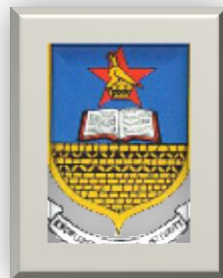
## ❑ Ecological

- ❑ Sulphur dioxide WHO limits  $20 \text{ mg/m}^3$  24-hour mean
- ❑ Zimbabwe: exceeded to over  $200 \text{ mg/m}^3$ 
  - formation of sulfurous acid



# The Objectives of the Health Study

- The main objective was to evaluate the health hazards associated with vehicle emission related to air pollution.



# The specific objectives of the study included:

- ❑ To identify the vehicle emission pollutants associated with respiratory morbidity and mortality.
- ❑ To determine the prevalence of vehicle emission pollutants related illnesses.
- ❑ To determine the mortality related rate of vehicle emission pollutants related illnesses.
- ❑ To estimate the total related costs of vehicle emission pollutants related to illnesses and deaths.



# Pollution in Harare

*Pollution indices for Harare, Zimbabwe*

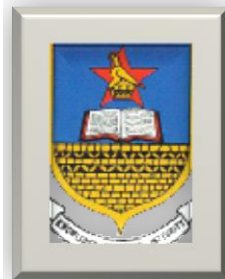
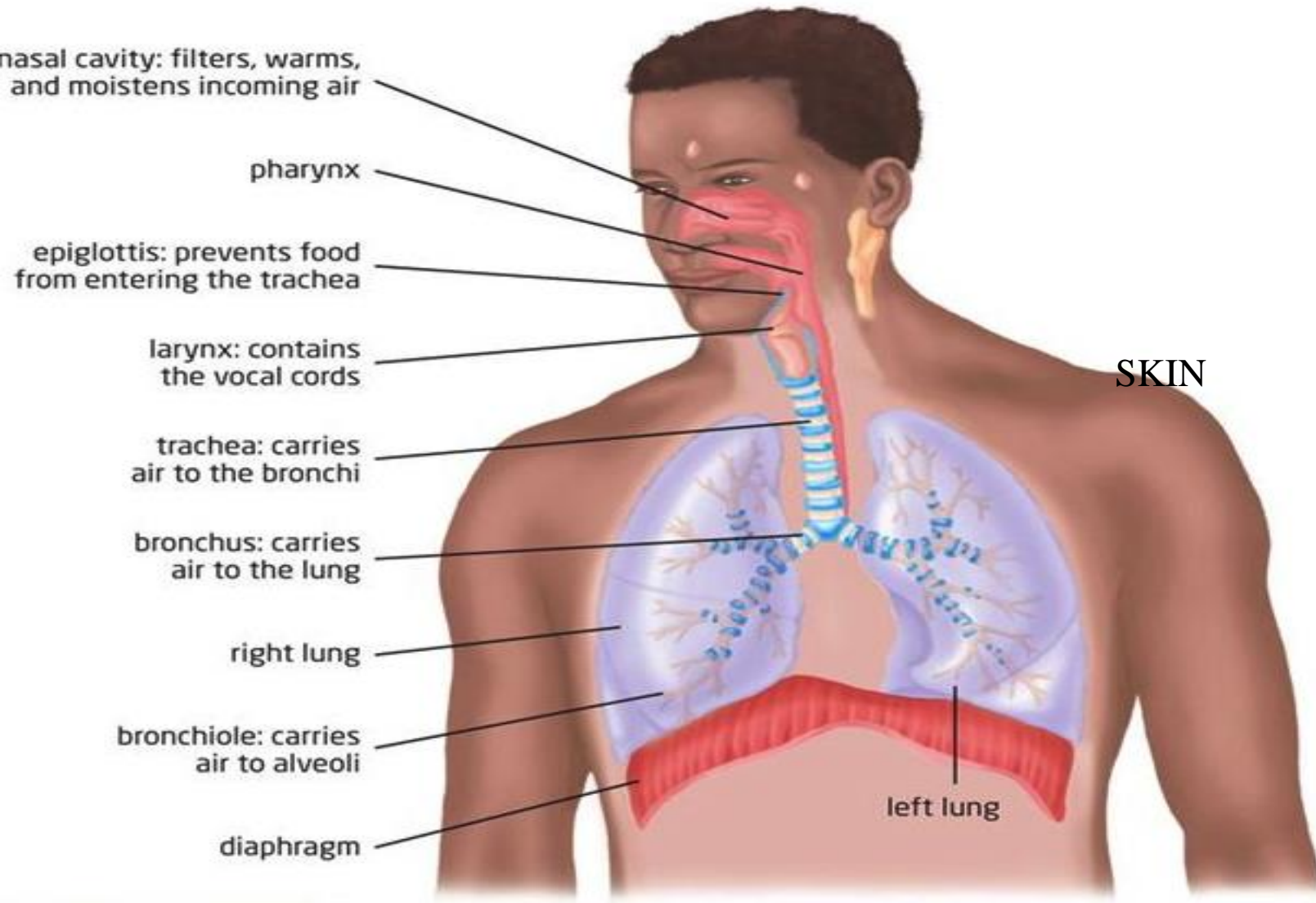
Pollution description	Index	Level
General pollution	74.14	Low
Air pollution	56.52	Moderate
Air quality	43.48	Moderate
Noise and Light Pollution	63.00	High

Against the index of 132.14

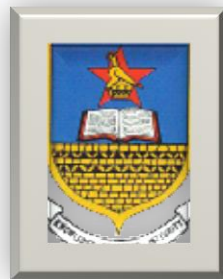
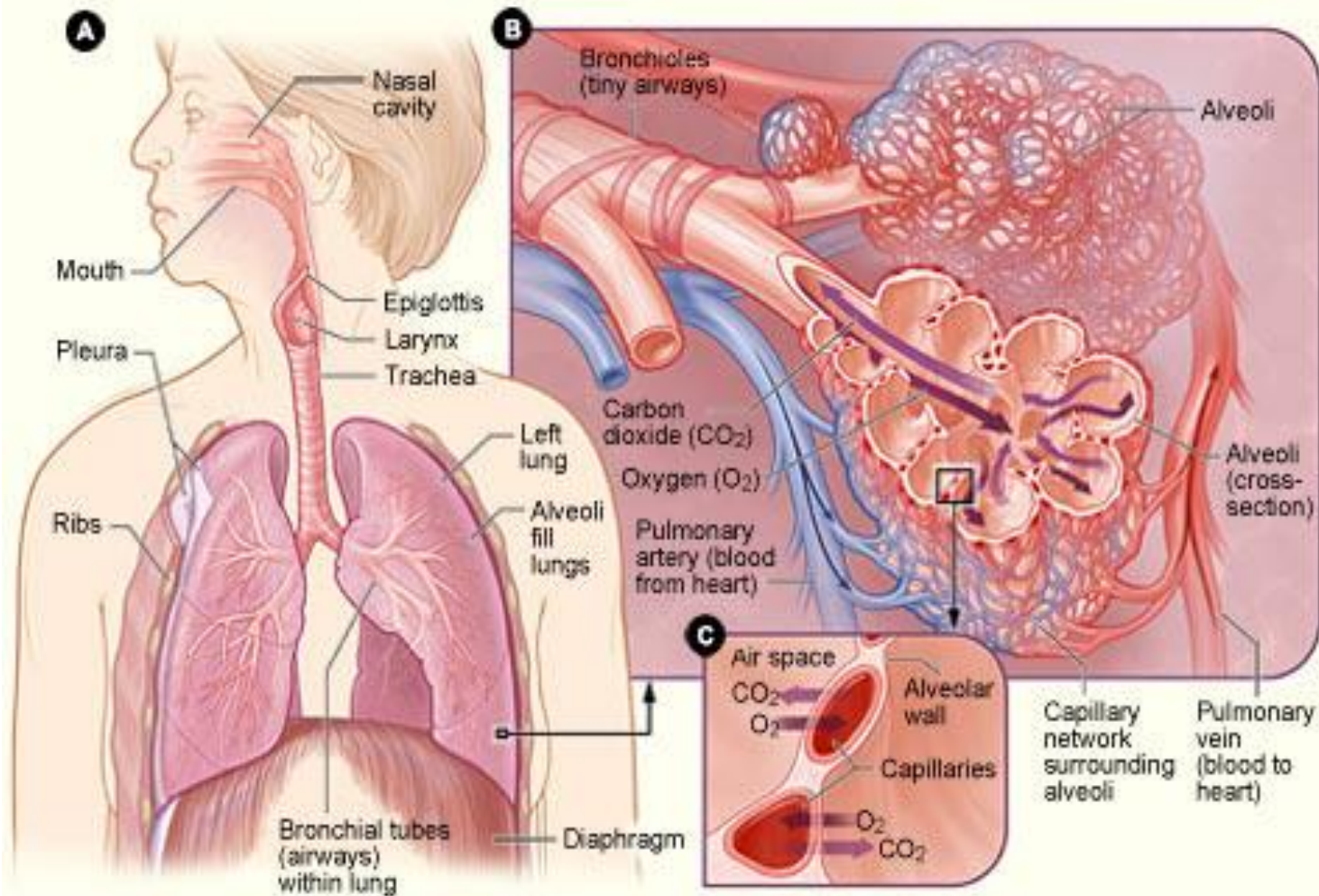


# Gaseous exchange

## Clean Air, Pollution & Affected organ/body part



# Affected parts of the Respiratory system



# Vehicle emission – Economical status

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# Normal cells lining the windpipe and bronchus have tiny hairs.

Sticky mucus traps dust and microbes.  
The hairs moves it out of the lungs.

Air pollution can damage these cells so lung infections become common.



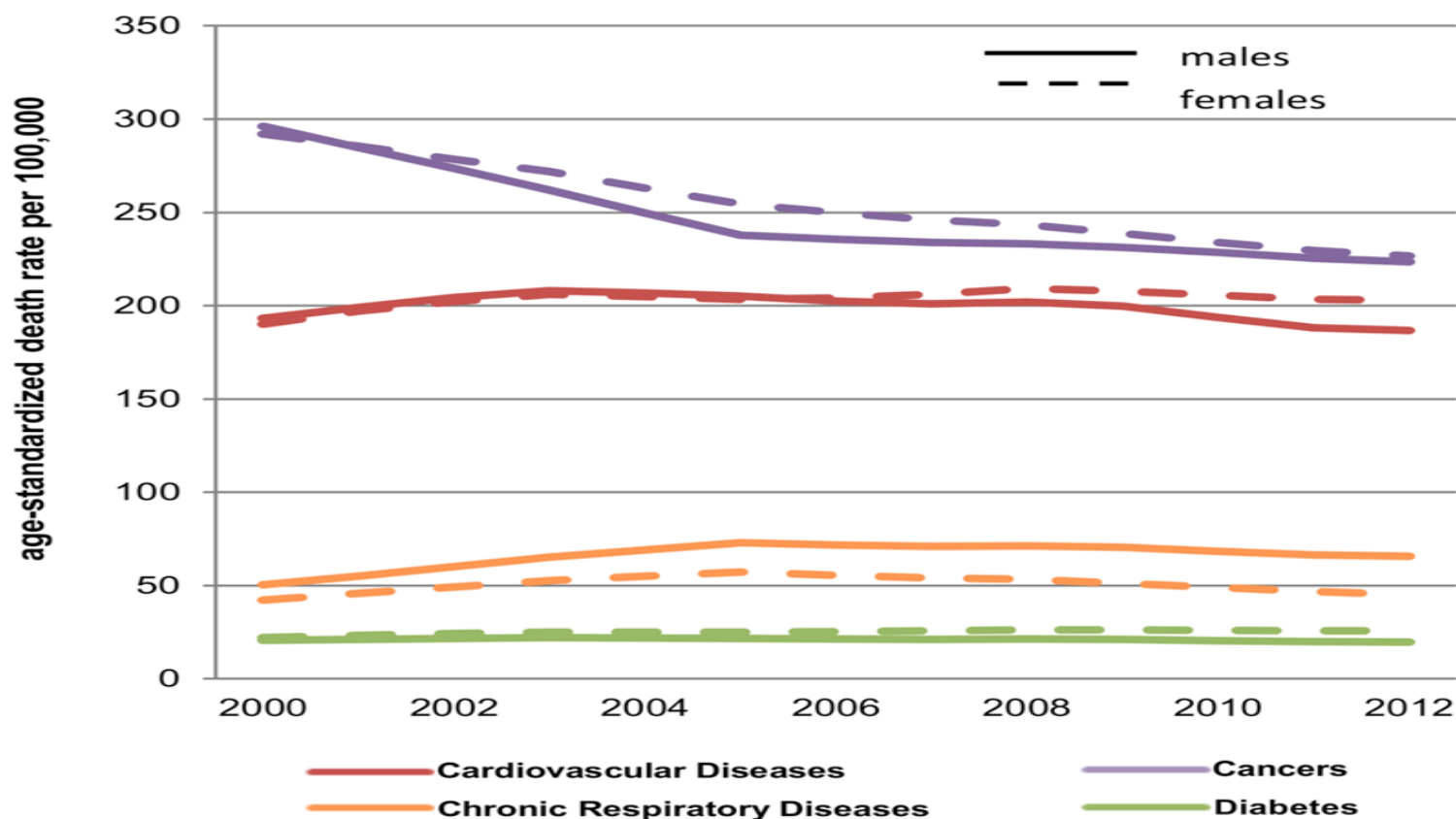


# Trends on death rates & Premature mortality due to Non Communicable diseases (Yrs2000 – 2012) in Zimbabwe

Total population: 13 724 000

Income Group: Low

Age-standardized death rates\*

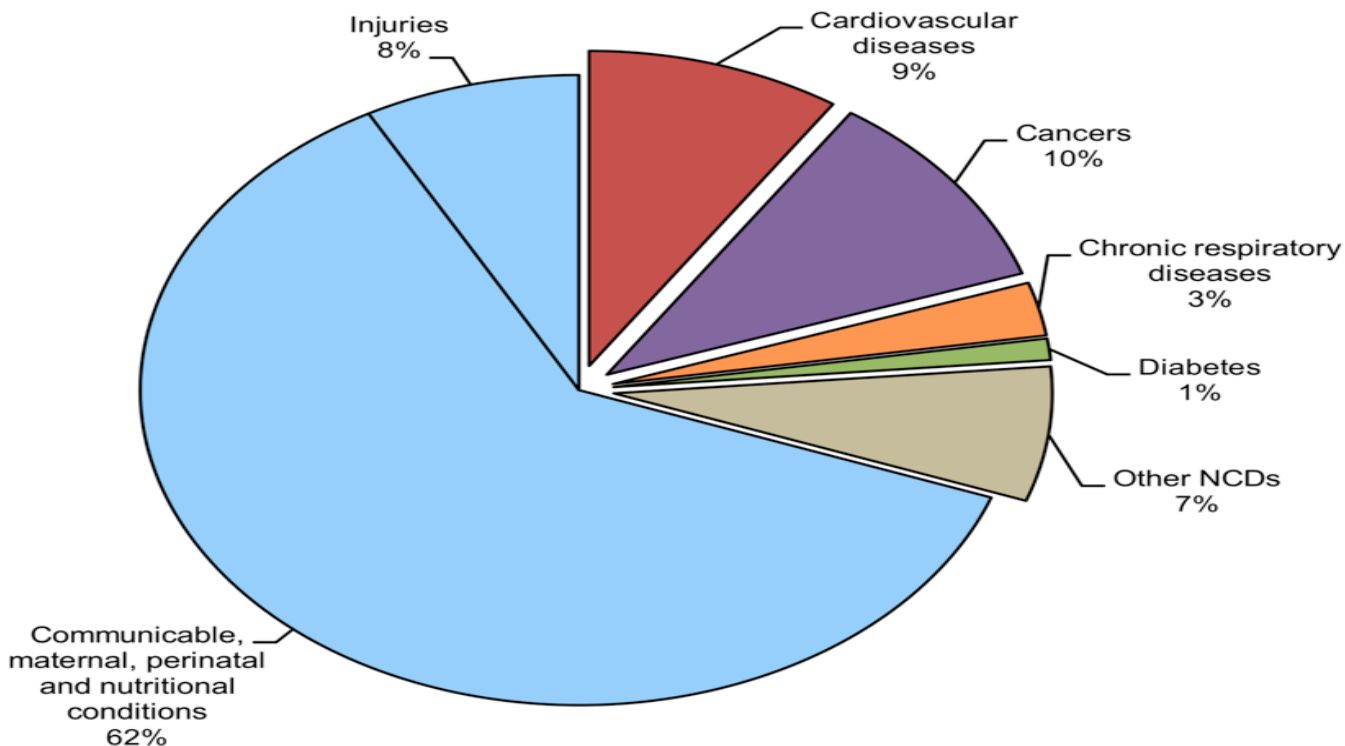


# Distribution of Mortality Due to Non Communicable Diseases (Years: 2000 – 2012) in Zimbabwe

Percentage of population living in urban areas: 38.6%

Population proportion between ages 30 and 70 years: 24.1%

**Proportional mortality (% of total deaths, all ages, both sexes)\***



**Total deaths: 138,000**

**NCDs are estimated to account for 31% of total deaths.**



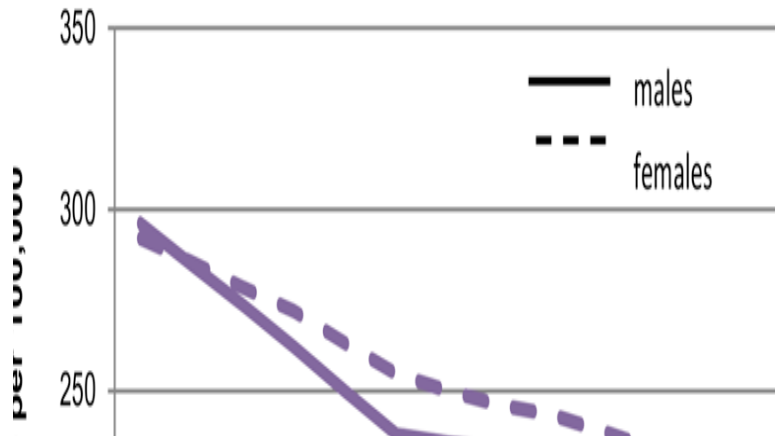
# Premature Mortality Due to Non Communicable Diseases (Years: 2000 – 2012) in Zimbabwe

Males aged <70 years

total population: 13 724 000

Income Group: Low

Age-standardized death rates\*

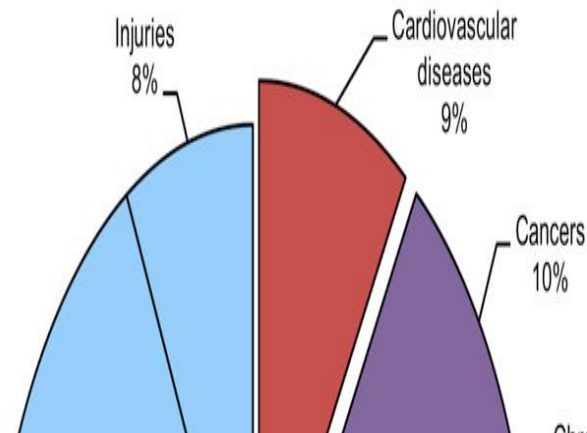


Females aged <70 years

percentage of population living in urban areas: 38.6%

Sex proportion between ages 30 and 70 years: 24.1%

Proportional mortality (% of total deaths, all ages, both sexes)\*



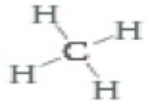
# The Ingredients of Air Pollution



**Greenhouse gases**



**Particulate matter (PM)**



**Hydrocarbons (HC)**



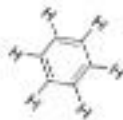
**Nitrogen oxides (NO<sub>x</sub>)**



**Carbon monoxide (CO)**



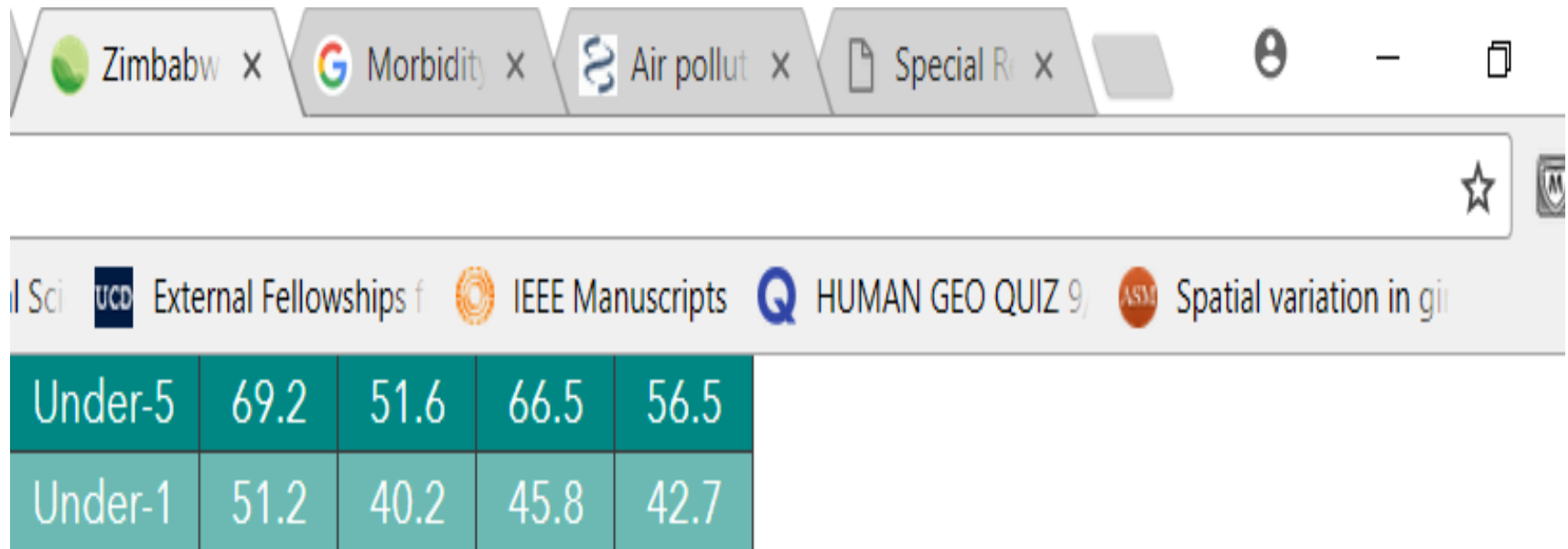
**Sulfur dioxide (SO<sub>2</sub>)**



**Hazardous air pollutants (toxics)**

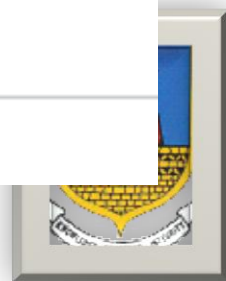


# Morbidity and mortality associated with automobile derived pollutants



Under-5	69.2	51.6	66.5	56.5
Under-1	51.2	40.2	45.8	42.7

ality, 1990-2016



## Estimates of External Costs of Sulfur Dioxide Emissions on individuals

### Valuation/t SO<sub>2</sub>

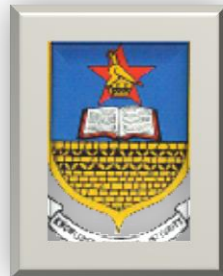
Estimate (1)	Valuation/t SO2 (2) (\$1992)
Zuckerman (1995)	\$4,900
CEC/US (1993)	\$3,770
BPA (1987)	\$1,950
EPRI (1990)	\$1,730
Nevada PSC (1993)	\$1,700
Elkins et al. (1985)	\$1,470
California (1989)	\$1,200
Cifuentes (1993)	\$790
Rowe (1995)	\$780
Repetto (1990)	\$700
[Median of Studies]	[\$1,600]

- Sulphur dioxide a major emitted component from use of fossil fuels in automobile.
- SOLUTION: Reduction/alternative fuels



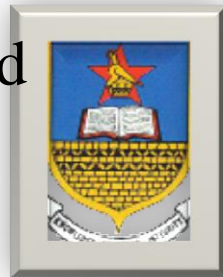
# Points for synthesis

- By 2016 Zimbabwe's population was living in places where the WHO air quality guidelines levels were not met.
- Air pollution - a major environmental risk to health.
- Reducing air pollution levels - Zimbabwe can reduce the burden of disease from stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma.
- LONG TERM BENEFITS on the health of the population, expenses on health issues (chronic respiratory problems drains the economy).
- Policies and investments supporting cleaner transport would reduce urban outdoor air pollution.



# Zimbabwe Proposed Response Strategy

- Zimbabwe should promulgate a road map for an enhanced national response to the adverse health effects of air pollution.
- Zimbabwe should implement "Motor Vehicle Emission Guidelines" recommending emission limits of motor vehicles.
- Zimbabwe should create detailed health-related assessments of different types of air pollutants, which originate from motor vehicles.
- Zimbabwe should produce evidence regarding the linkage of air pollution to specific diseases, such as cardiovascular and respiratory diseases and cancers, as well as burden of disease estimates from existing air pollution exposures, at regional and country levels.





# Health Information Gaps

- A long term studies required on air pollution and health
  - ▣ morbidity, mortality, social and health costs.
- Carrying out periodic annual systematic monitoring (surveillance)
  - ▣ on markers of pollutants ( $PM_{10}$  )
  - ▣ occupational related illness (exposure to vehicular fumes).
- Long-term monitoring of the economic burden of vehicle emission
  - ▣ plan and implement cost-benefit programs for the control and prevention strategies.
  - ▣ Create partnerships with interested potential stakeholders for research.
- Develop or adopt models for resolving the burden of motor vehicle pollutants



# Health Information Gaps

- Strengthening of existing infrastructure to enhance investment in public transport:
  - ▣ urban road infrastructure to reduce road deterioration
    - reduce/minimize low gear driving.
  - ▣ numbers of motor vehicles and congestion.
  - ▣ improve stakeholders support to enforce laws and regulations
    - protect health and ensure safety of vulnerable groups
    - enforcement of clean air Legislation Acts and regulations.



**Thank You**

