

Policy options to reduce health outcomes associated with household air pollution in Sri Lanka



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**Biomass Fuel Use for Cool
Analysis of Data Fro**

Nandasena et al. *BMC Public Health* 2010, **10**:300
<http://www.biomedcentral.com/1471-2458/10/300>

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RESEARCH ARTICLE

Air pollution -
epidemiol-

Yatagama Loku-

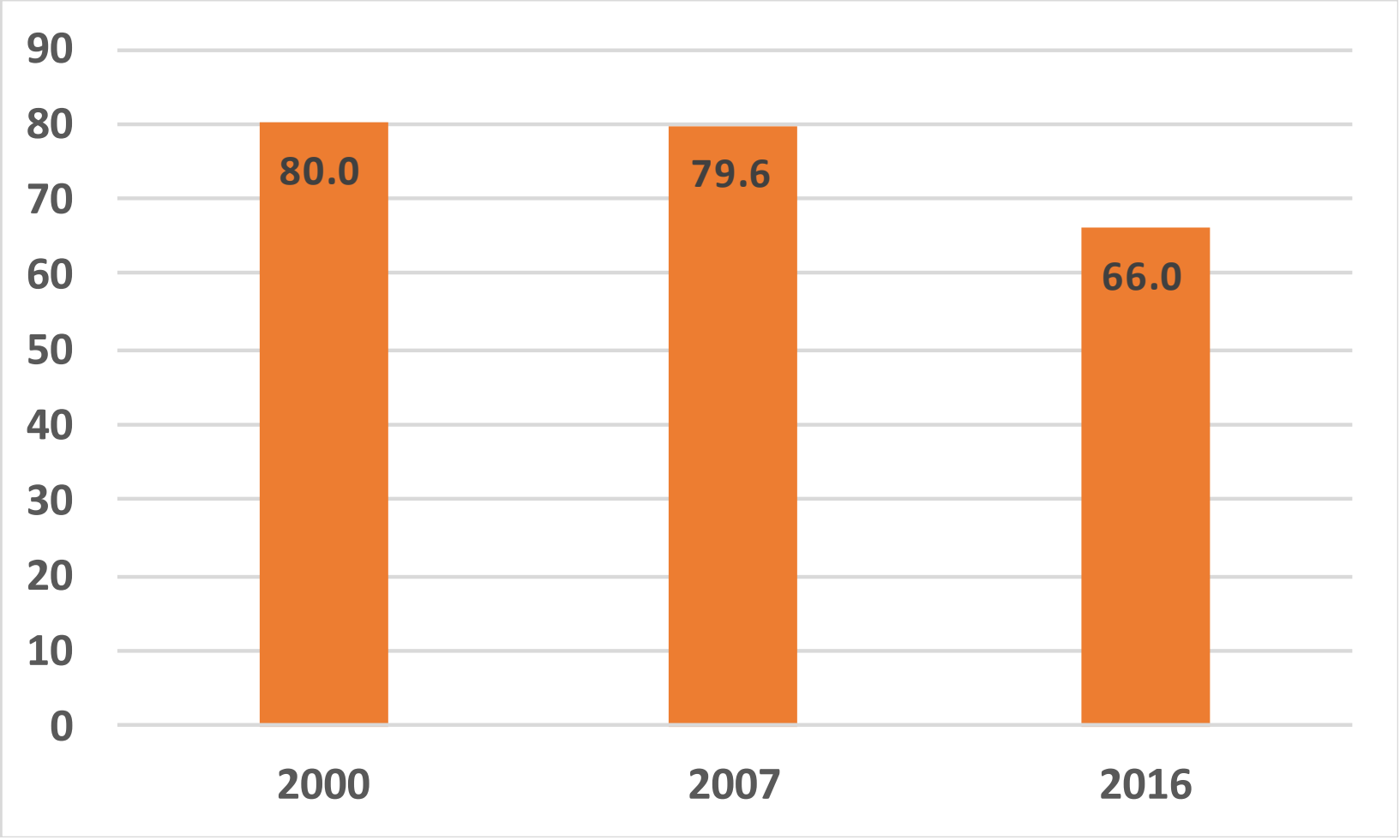
Indoor Air 2016
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**Major source of household air
pollution is biomass use for
cooking in Sri Lanka**

A comparative study of household air pollution from commonly used cooking stoves in Sri Lanka
Sathiakumar³

Myles F. Elledge^{1*}, Michael J. Phillips¹, Vanessa E. Thornburg¹, Kibri H. Everett¹
and Sumal Nandasena²

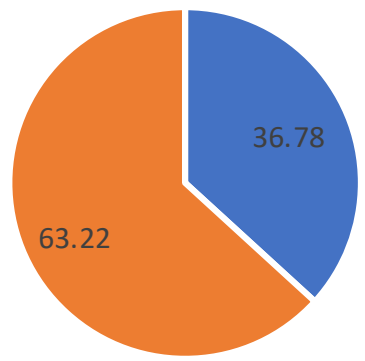
Percentage of biomass use as the primary cooking fuel in Sri Lanka



Source: DHS 2016

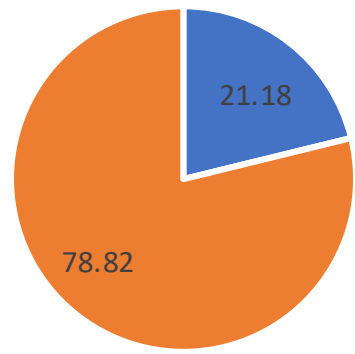
Burden due to Household Air Pollution (HAP) in Sri Lanka

Lower Respiratory Tract Infection



■ Attributable risk for HAP ■ Other risk factors

Ischemic Heart Diseases



■ Attributable risk for HAP ■ Other risk factors

Ref: Institute of Health Metrics and Evaluation, 2018

Key Risk factors for disability and death in Sri Lanka : 2016

- 1 High fasting plasma glucose
- 2 Dietary risks
- 3 High blood pressure
- 4 High body-mass index
- 5 Tobacco
- 6 Air pollution
- 7 Alcohol & drug use
- 8 High total cholesterol
- 9 Occupational risks
- 10 Impaired kidney function
- 11 Malnutrition

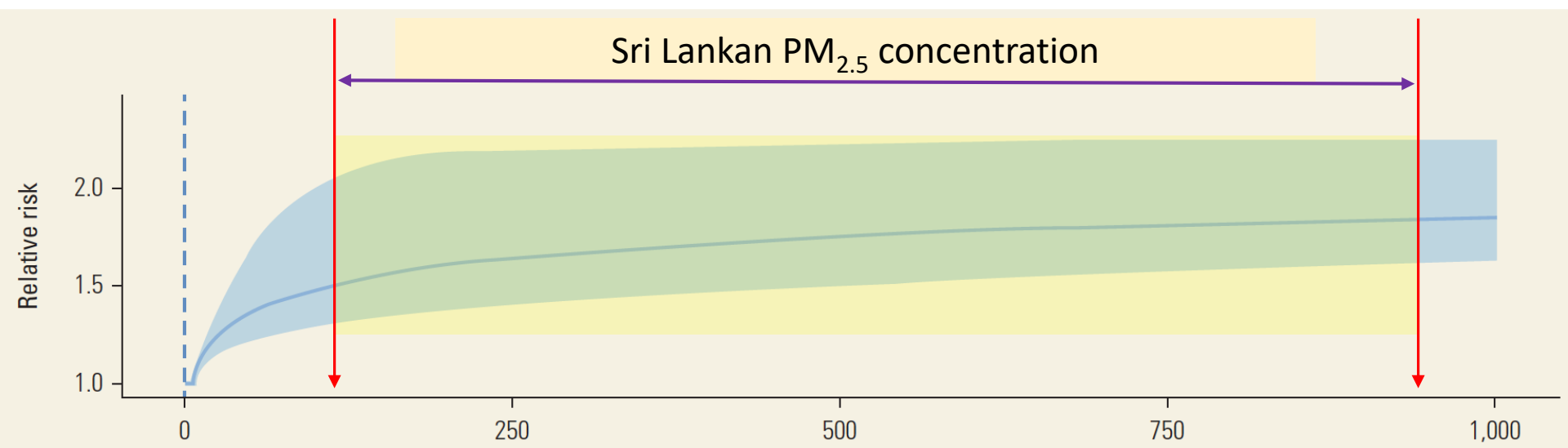
Ref: Institute of Health Metrics and Evaluation, 2018

Health outcomes used for evaluation purpose

| Health Outcome |
|---|
| Lower Respiratory Infections – under five years |
| Ischemic Heart Disease: Admissions |
| Ischemic Heart Disease: Deaths |
| Low Birth Weight |

Estimates of Risk of Wood Fuel Use

Integrated- Exposure Response Curves for Ischemic Heart Disease Outcomes Based on PM_{2.5} Exposure



Source: Adapted from Burnett and others 2014.

Note: PM_{2.5} = particulate matter with an aerodynamic diameter of less than 2.5 micrometers; µg/m³ = micrograms per cubic meter. Shaded areas are model-based uncertainty bounds. Large uncertainties in areas approximating household air pollution exposures (300–1,000 micrograms per cubic meter) indicate a lack of evidence in those exposure ranges.

Burnett et al, 2014, (Environmental Health Perspective)

Assumed risk of HAP in Sri Lanka

based on the systematic reviews, dose exposure response curves and reported air quality

| Health Outcome | Risk Ratio |
|---|------------|
| Lower Respiratory Infections – under five years | 1.5 |
| Ischemic Heart Disease: Admissions | 1.5 |
| Ischemic Heart Disease: Deaths | 1.5 |
| Low Birth Weight | 1.4 |

Based on meta analysis

Health Outcomes: Based on the Annual Health Bulletin 2016

| | Health outcome | Data |
|---|---|--------|
| 1 | Lower respiratory Tract Infections under five years | 60583 |
| 2 | Low Birth Weight | 51269 |
| 3 | Admissions for Ischemic Heart Diseases for Government Hospitals | 114609 |
| 4 | Deaths in Ischemic Heart Diseases in government hospitals | 6041 |

Source: Annual Health Bulletin 2016

NOTE: Under estimate the health outcomes since the data is from only government hospitals

Proposed options to reduce exposure due to biomass use for cooking

Options 1: Change the household practices and improve the awareness (Behavior change package)

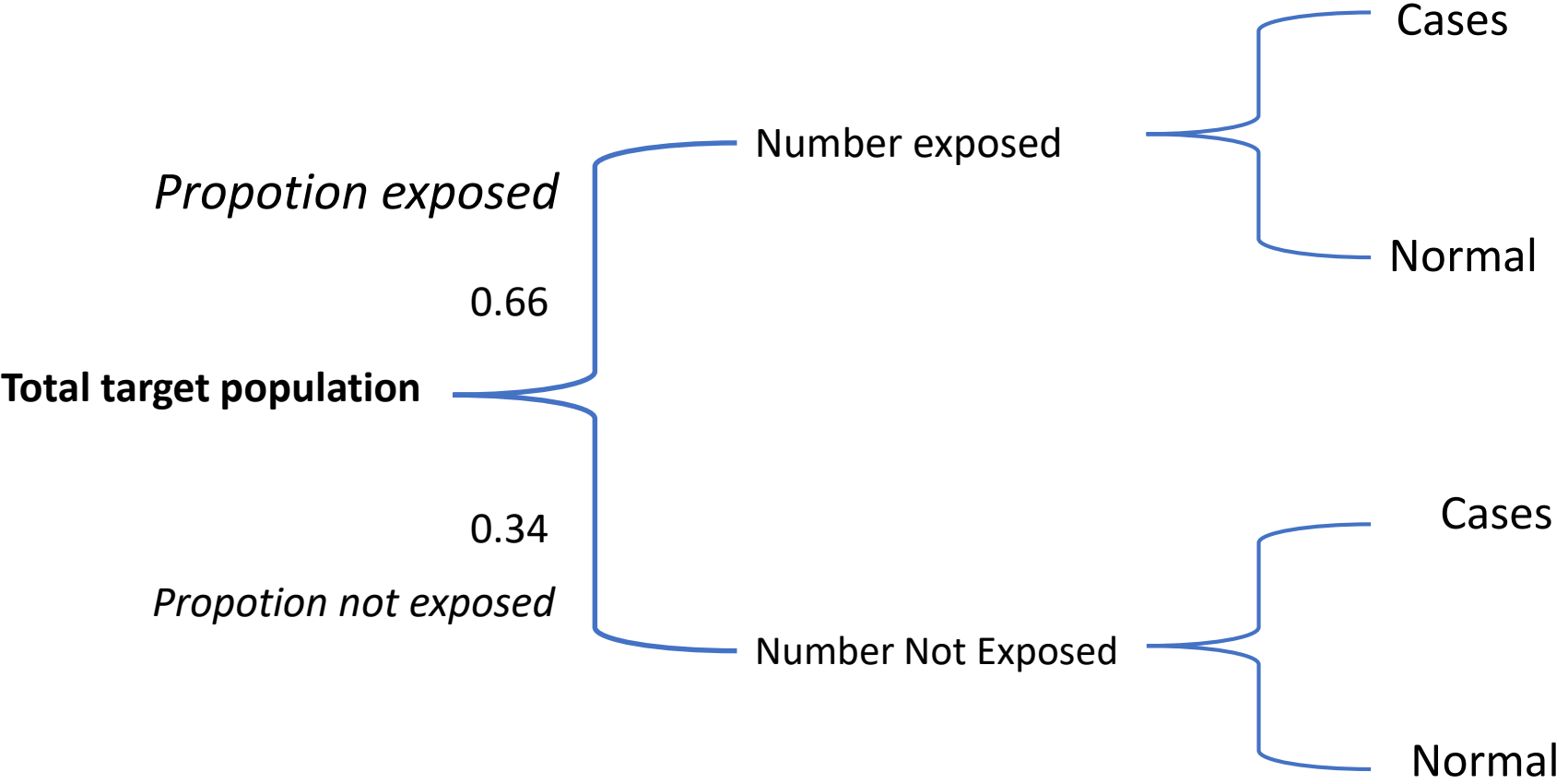
Based on the evidence 30% to 90% of the population could change the behavior

Option 2: Provision of Improved wood cook stoves 10% of the households received the lowest income.

(Hypothetical value was used. Different countries have initiated different percentages based on the feasibility)

Option 3: Free supply of LPG stove and one year gas for 10% of lowest income households.

Mathematical modelling: Decision tree for each health outcome



Public health impact of the propose options

| Criteria | Behavior Change Campaign | Provision of improved wood cook stove | Shift from wood Provision of LPG stove and supply |
|--------------------------------------|-----------------------------|---------------------------------------|---|
| Public Health Impact | | | |
| Deaths: IHD | 280 | 60 | 227 |
| Admissions: IHD (<i>per year</i>) | 6,737 | 1,669 | 4,216 |
| Admission LRTI(<i>Per year</i>) | 3,640 | 1,116 | 2,278 |
| Low Birth Weight (<i>per year</i>) | 3,080 | 2,448 | 2,120 |
| Percentage Prevented | 4.6% - 6% | 1% - 4.3% | 3.9% - 4.3% |
| Program Cost per year (SLR) | 13 Million | 467 million | 14,410 million |
| Feasibility (Political) | <u>High</u> | <u>Medium</u> | <u>Low</u> |
| Feasibility (Operational) | <u>High</u> | <u>Medium</u> | <u>Low</u> |
| Cost per case | Less than Rs. 1000 per case | Rs. 90,000 per case | Rs. 1.6 million per case |

Recommendation

Behaviour Change Campaign is the most cost-effective and feasible option

- Saves highest number of deaths ischemic heart diseases and hospital admissions on ischemic heart diseases and respiratory infections
- Reduces the highest number of low birth weights
- Can be implemented with highest feasibility through the existing preventive health system in Sri Lanka
- Larger component of the cost of this estimation is already allocated through the health system
- More cost effective as compared to providing improved cooking stove or LPG stove and supply

Thank you