

# **Concentrations of Particulate Matter fractions and kitchen characteristics among solid fuel and LPG using households in Sri Lanka**



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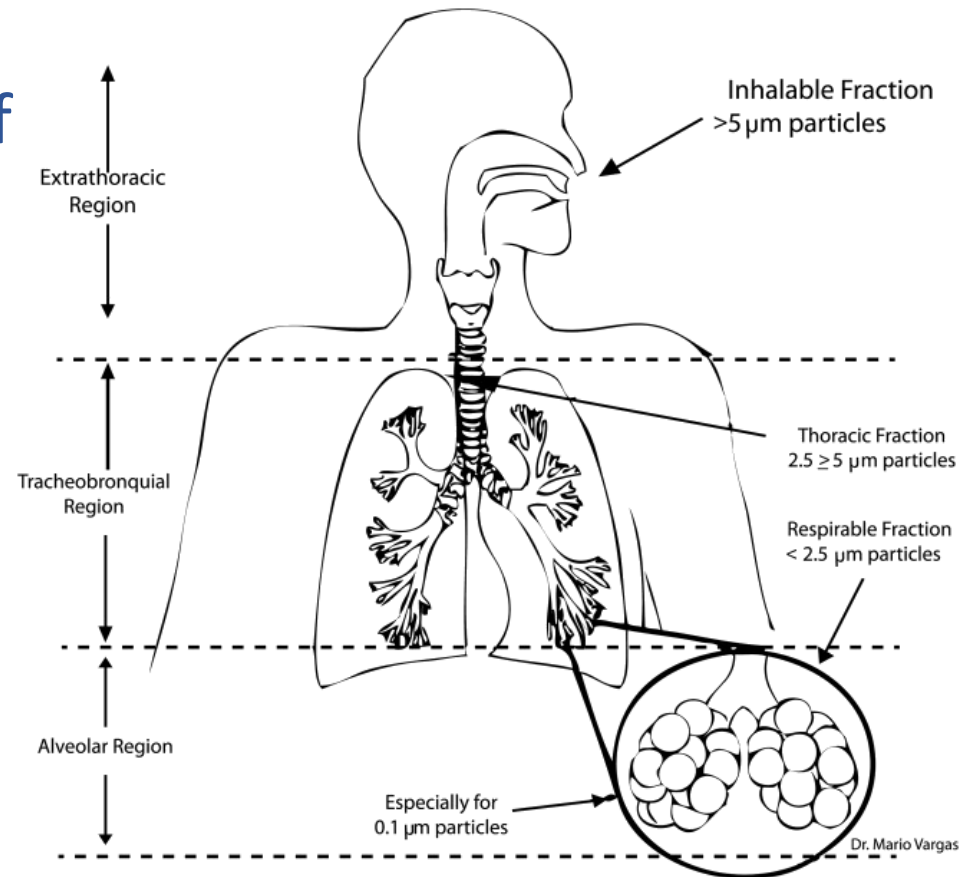
National Institute of Health Sciences

Sri Lanka

# Introduction

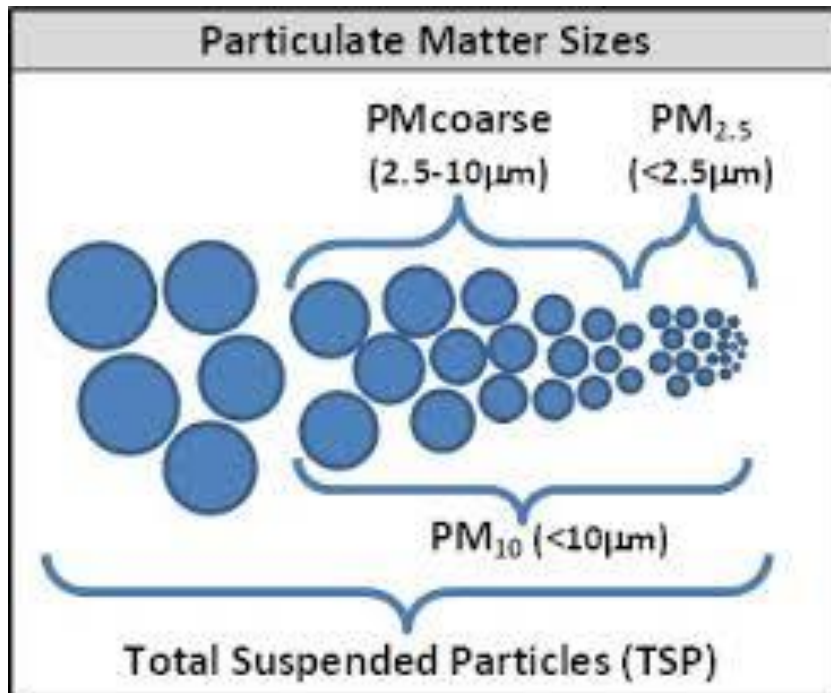
Use of biomass fuel for cooking is a major source of household air pollution (HAP).

Out of the many pollutants emitted during solid fuel combustion, particulate matter (PM) is considered to be one of the most hazardous pollutants.



# Objective

To assess concentration of PM fractions emitted during biomass fuel and Liquefied Petroleum Gas (LPG) combustion in kitchens.



# Methodology

426 households in  
a cohort study

## PM monitoring

322 households were  
randomly selected for 3  
hour monitoring



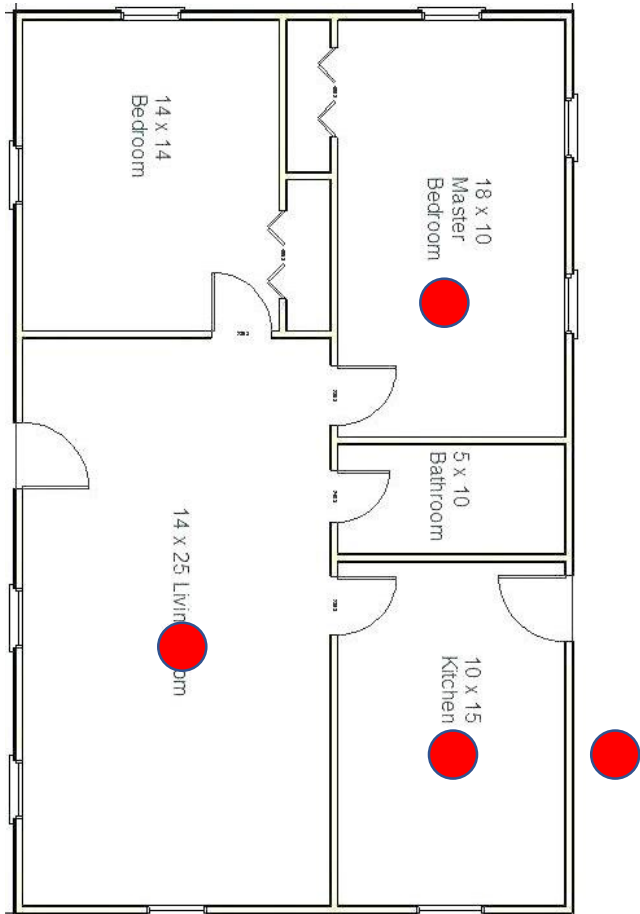
## Check List

## Questionnaire

Basic characteristics of the  
kitchen (e.g., presence of a  
chimney, functionality of  
the chimney, dimensions  
of the kitchen, etc.)

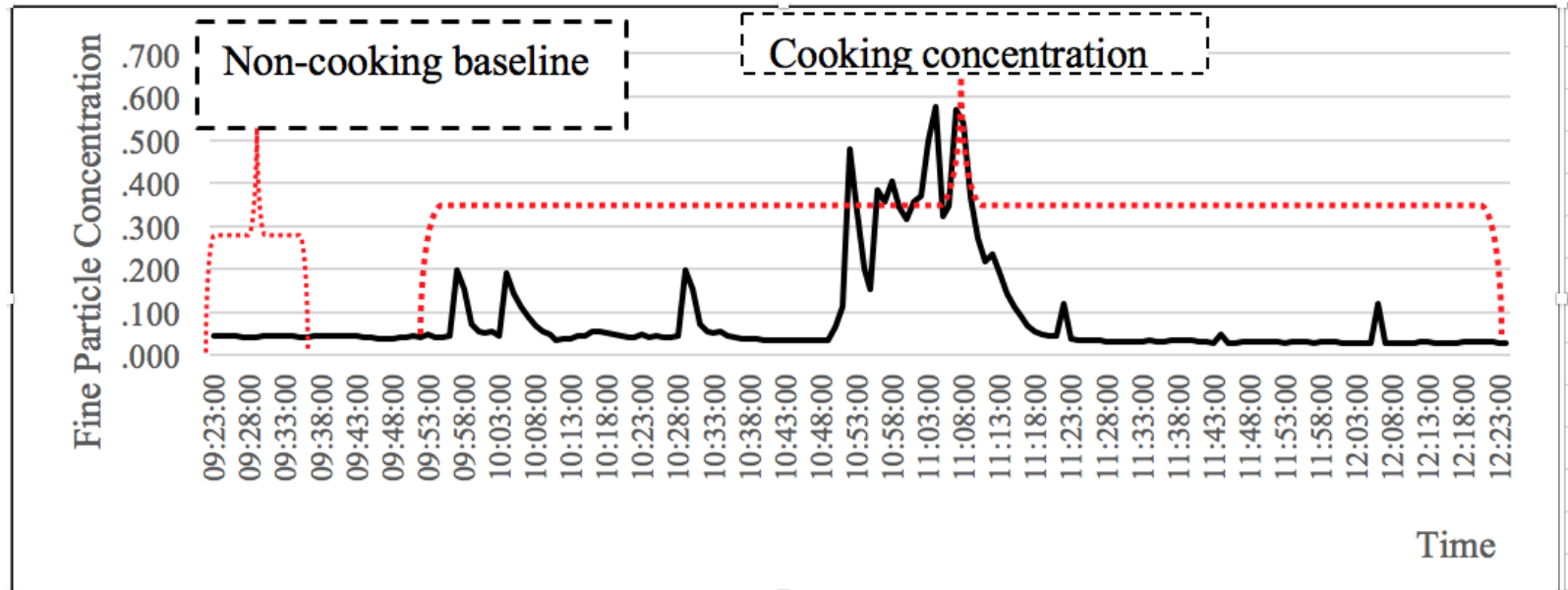


# DustTrak™ DRX aerosol monitor 8533



# Methodology: Analysis

## PM Data for 3 hour monitoring



PM monitoring started about 30 minutes prior to the cooking session

# PM levels in different Wood and LPG use households

Cooking fuel type and location of monitoring	n	PM concentrations at baseline			PM concentrations during cooking		
		PM <sub>1</sub> median $\mu\text{g}/\text{m}^3$	PM <sub>2.5</sub> median $\mu\text{g}/\text{m}^3$	PM <sub>10</sub> median $\mu\text{g}/\text{m}^3$	PM <sub>1</sub> median $\mu\text{g}/\text{m}^3$	PM <sub>2.5</sub> median $\mu\text{g}/\text{m}^3$	PM <sub>10</sub> median $\mu\text{g}/\text{m}^3$
<b>Kitchen</b>							
100% wood use	48	55.3	60.5	75.2	337.4	344.1	348.1
> 75% to <100% wood use	13	80.13	80.97	82.03	310.2	314.5	328.1
50% to 75% wood use	21	51.8	59.7	77.2	225.7	233.6	248.3
100% LPG use	64	50.2	52.5	58.3	51.8	53.6	69.5
<b>Living Room</b>							
100% wood use	41	57.2	61.2	64.4	90.8	91.7	93.6
> 75% to <100% wood use	10	47.7	53.3	65.0	83.2	83.5	84.6
50% to 75% wood use	19	44.7)	48.2	52.2	69.4	71.3	71.8
100% LPG use	56	53.7	56.8	61.4	48.3	49.9	51.4
<b>Sleeping room</b>							
100% wood use	47	55.0	59.0	73.5	85.5	88.7	105.1
> 75% to <100% wood use	13	44.3	50.1	67.5	74.1	77.5	81.3
50% to 75% wood use	21	52.1	54.9	76.6	92.2	94.5	119.0
100% LPG use	63	49.1	53.1	66.0	44.6	47.6	57.0
<b>Immediate Outdoors</b>							
100% wood use	29	55.8	57.1	61.3	114.9	115.1	115.7
> 75% to <100% wood use	8	42.5	45.4	57.5	83.4	84.6	87.2
50% to 75% wood use	11	48.6	44.1	59.1	57.7	57.7	66.2
100% LPG use	45	57.4	58.1	62.8	48.7	50.2	54.7

Kitchen and immediate outdoor PM<sub>2.5</sub> concentration with and without chimney in **only wood** using households (Households cook at the **main building only**)

<b>Chimney</b>	Kitchen Median (IQR) $\mu\text{g}/\text{m}^3$	Immediate Outdoors Median (IQR) $\mu\text{g}/\text{m}^3$
<b>With</b> chimney (n = 21)	<b>182.1</b> (126.5–455.2)	<b>105.7</b> (83.4– 195.8)
<b>Without</b> chimney (n = 8)	<b>635.4</b> (473.7 – 5221.4)	<b>245.9</b> (72.5 – 641.7)



# Conclusions

- PM concentrations were higher in kitchens and other microenvironments of households using solid fuel for cooking as compared to households using LPG for cooking.
- The immediate outdoor PM concentrations were higher than the sleeping and living room during the cooking period.
- In households without a chimney using only wood, the median PM<sub>2.5</sub> concentration in the kitchens was more than three-fold higher than concentrations in households having a chimney
- the median outdoor PM<sub>2.5</sub> concentration was two-fold higher in households without a chimney as compared to households with a chimney

**Thank you**