

Pilot Study Assessing Household Air Pollution Reduction Using LPG Cook Stoves



Maggie Abbott(1); Jonathan Thornburg, PhD(2); Michelle McCombs(2); Camille Raynes-Greenow, PhD(3)

(1)NC State, Raleigh, NC; (2)RTI International, Research Triangle Park, NC;
(3)University of Sydney School of Public Health, Sydney, Australia

Introduction

Approximately 3 billion people depend on burning biomass fuel (e.g., wood, dung, crop waste) for cooking and heating (Gordon et al., 2014). High use of biomass burning cook stoves is a leading source of household air pollution. Although household air pollution is a global issue, South Asia is being severely impacted; household air pollution is currently South Asia's number-one health risk. Past research has linked household air pollution to increased risk of many acute respiratory illnesses and chronic diseases, including perinatal and neonatal mortality (Gordon et al., 2014).

The HAPPeN trial, Household Air Pollution and Perinatal & early Neonatal Mortality, was started to estimate the perinatal burden from household air pollution in Bangladesh. The study is going to use the findings and conclusions from our research to improve upon the effectiveness of the trial that will investigate the impact of household air pollution on pregnancy.

This pilot study assessed whether or not liquified petroleum gas (LPG) cook stove intervention could be implemented in the Mymensingh District of Bangladesh to replace their traditional cooking stoves. RTI's part of the pilot study was measuring PM_{2.5} exposure before and after the intervention.

Objectives

1. Is household PM_{2.5} exposure reduced when cooking with an LPG cook stove?
2. Will participants wear the MicroPEM to provide accurate measurements?
3. Can we build Bangladeshis' capacity to use the MicroPEM to collect valid exposure data?

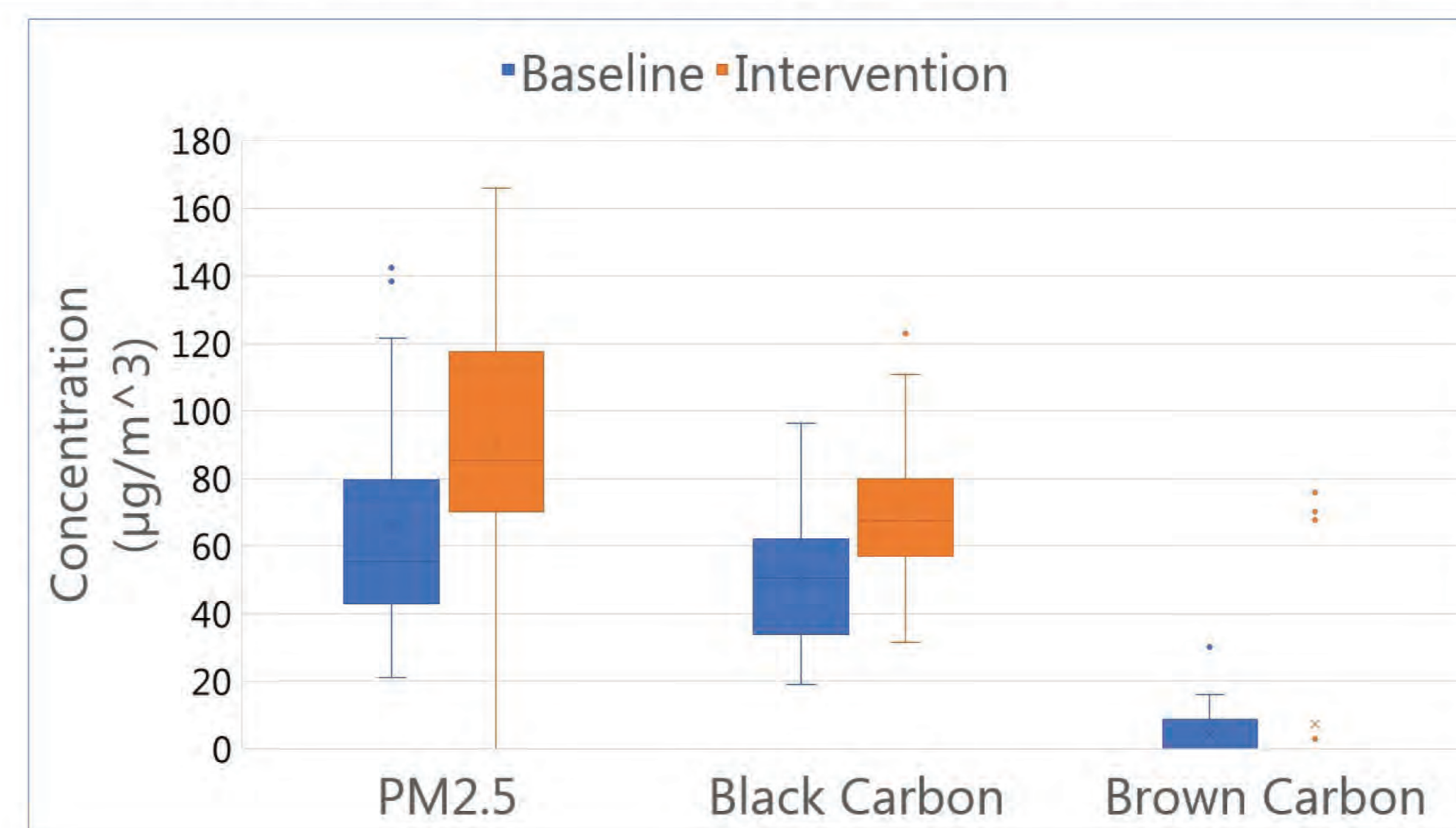
Pilot Study Preparation

1. Recruiting 30 pregnant Bangladeshi women
2. Training of field technicians for using MicroPEM
 - i. Hands-on training with MicroPEM
 - Basic operation and troubleshooting
 - Filter loading and unloading
 - Battery change-out procedures
 - Use of the computer software
 - Basic troubleshooting
3. Exposure assessment at baseline and intervention
 - i. Baseline: Traditional stove, June 2016
 - ii. Intervention: LPG stove, November 2016
 - iii. Wore MicroPEM to measure PM_{2.5} exposure for a period of 24 hours in each phase

Objective 1 Findings: Household Air Pollution Reduction

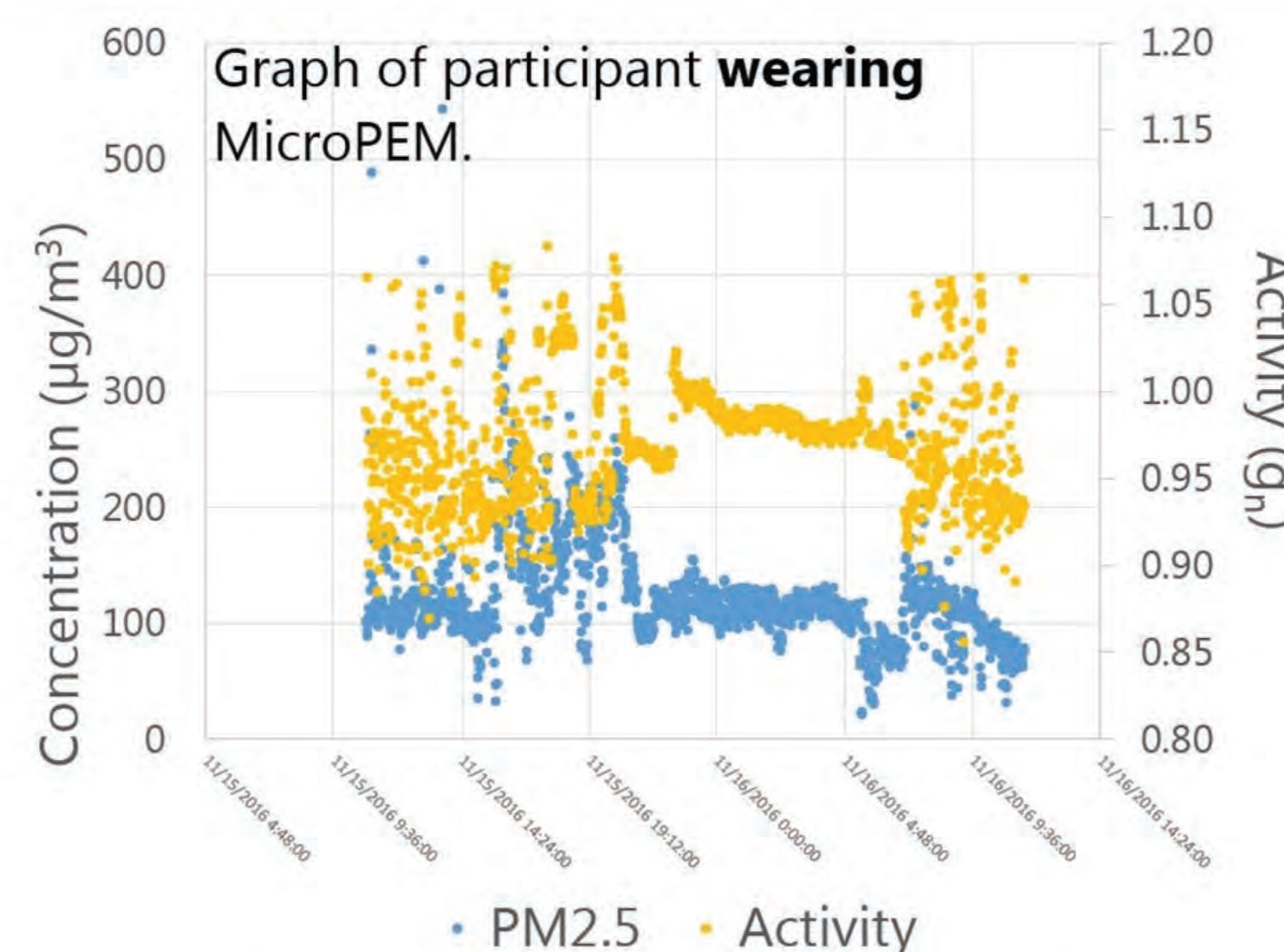
A statistically insignificant increase in exposure during the intervention phase, affected by the following:

- i. Selective use of LPG fuel
- ii. Participants' ongoing daily use of traditional stoves

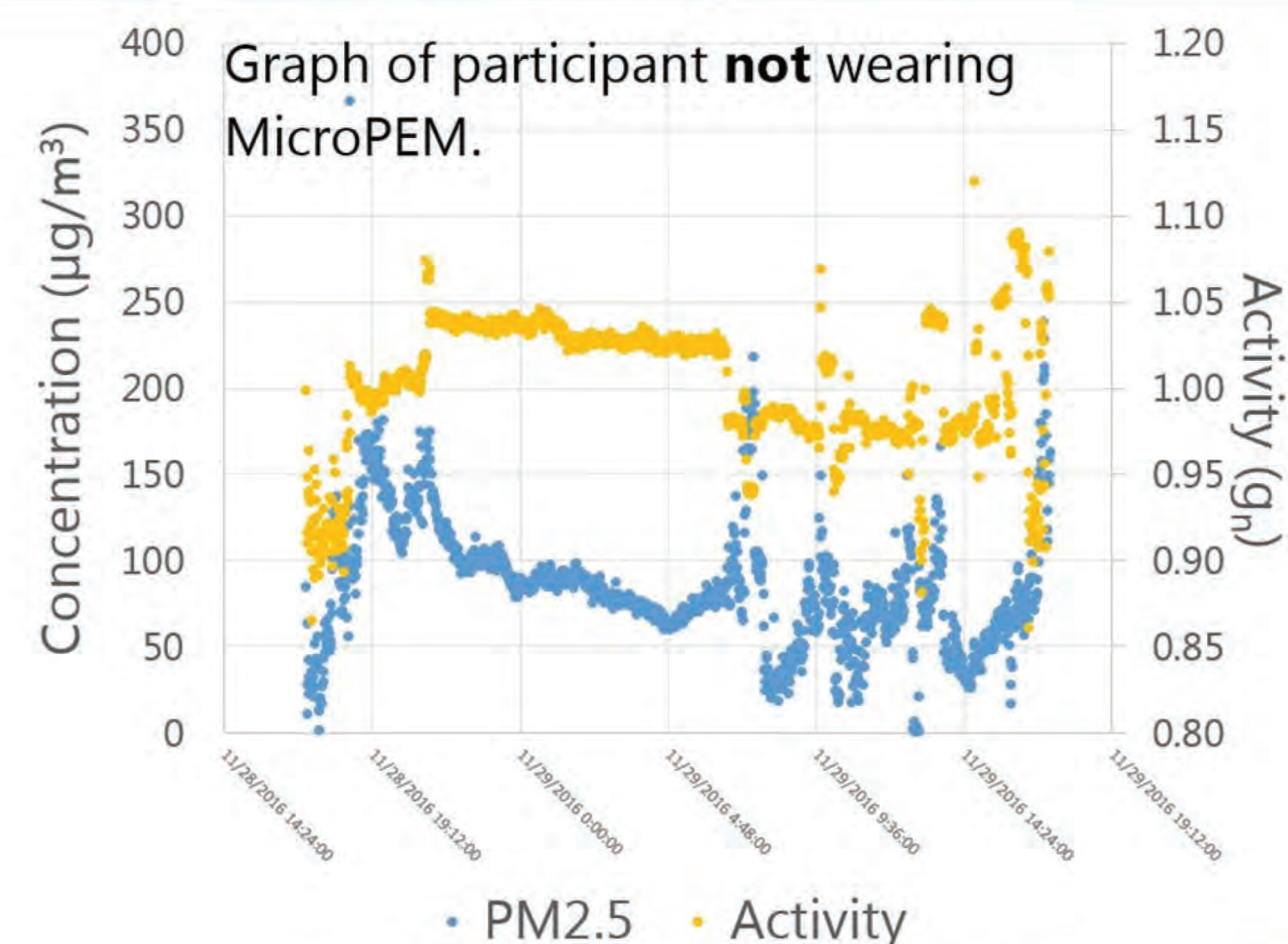


Objective 2 Findings: Participant Compliance

In each phase, the MicroPEM constantly measured the participants' activity. The activity data revealed to us whether the MicroPEM was actually being worn.

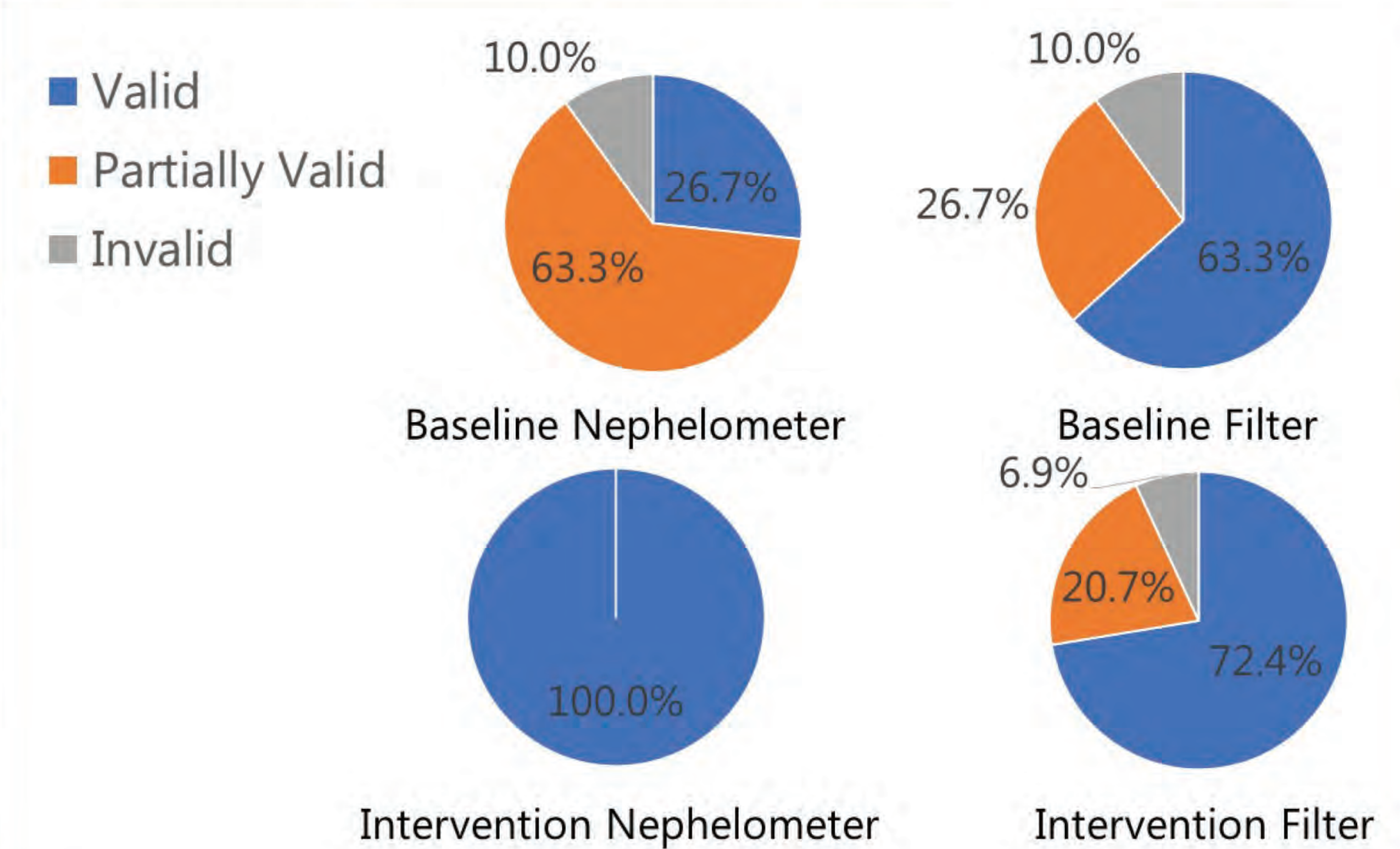


Approximately 77% complied with wearing MicroPEM in baseline and 83% complied during the intervention phase.



Objective 3 Findings: Capacity to Use the MicroPEM

Calculating the number of valid nephelometer and filter samples gave us an understanding of the effectiveness of the training and use of the MicroPEM. Data validity improved for the intervention stage.



Conclusions

- PM_{2.5} exposure was constant due to poor LPG adoption.
- Participants' wearing compliance was high.
- Field technician capacity to use the MicroPEM improved as the study progressed.

Reference

Gordon, S.B., et al. 2014. Respiratory risks from household air pollution in low and middle income countries. *The Lancet Respiratory Medicine*, 2(10), pp. 823-860.

Acknowledgments

The Australian National Health Medical Research Council APP1127074 funded this research.

Presenting Author: Maggie Abbott
School: NC State
E-mail: internships@rti.org
RTI International: 3040 E. Cornwallis Drive
Research Triangle Park, NC 27709

Presented at: 10th Annual RTI Internship Showcase
August 2, 2018 | 9:30 am–12:30 pm
Horizon Building
Multipurpose Rooms 1140A/B/C

RTI International is a registered trademark and a trade name of Research Triangle Institute. The RTI logo is a registered trademark of Research Triangle Institute.