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Center for Population and Reproductive Health

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Personal exposure and stove use monitor data from a randomized controlled intervention trial in Ibadan, Nigeria

Oladosu A. Ojengbede, MBBS
Professor and Director
Centre for Population & Reproductive Health
College of Medicine
University College Hospital
Ibadan, Nigeria

Study Background

- Randomized controlled intervention trial in Ibadan, Nigeria
  - Mostly **urban** setting
- Majority of women in city use **kerosene** for cooking
- Women in the peri-urban areas use mixture of kerosene and wood

Study Background

- This study uses a clean-burning bioethanol stove in a randomized, controlled intervention to investigate the effect of maternal exposure to HAP on fetal growth and survival

Methods

- Recruit 300 pregnant women from five primary health care centers in Ibadan, Oyo State, Nigeria
- Inclusion criteria:
  - Less than 18 weeks gestational age; exclusive use of wood or kerosene for cooking
- Exclusion criteria:
  - Smoker; cooks for a living; multiple gestation; HIV; prior C-section; 3 or more previous miscarriages; uncontrolled hypertension

Methods

- Eligible participants randomized
- Questionnaires administered at recruitment
- Nutritional biomarker data collected at baseline and 35 weeks GA on mothers
- Serial ultrasound administered 6 times throughout pregnancy
- Spirometry administered at baseline, 26 weeks GA, and 6 weeks post-delivery

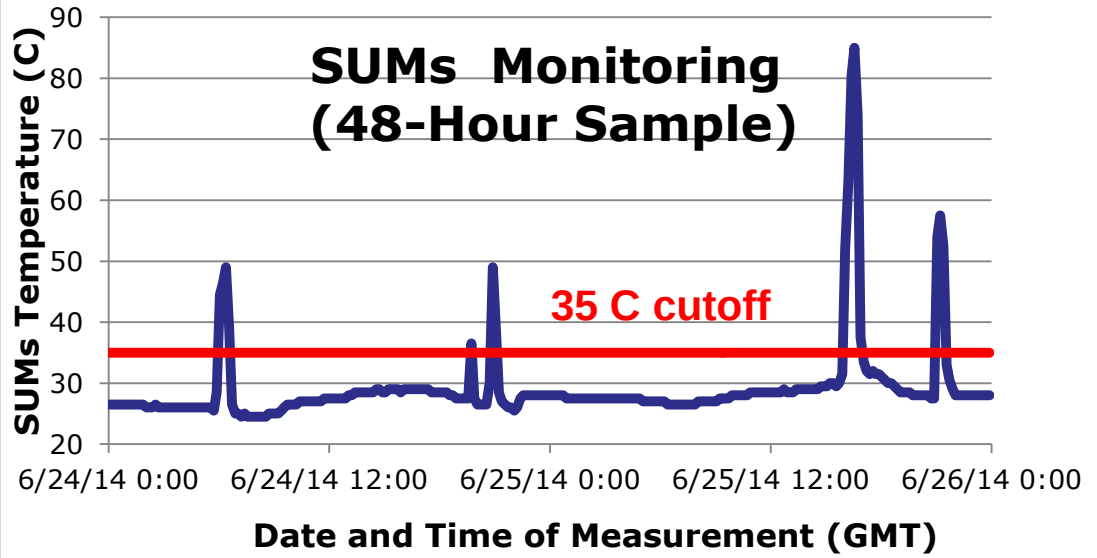
Exposure and Cookstove Monitoring

- 2nd and 3rd trimester
- 72-hr continuous $PM_{2.5}$ & CO
- 72-hr integrated PAH (subset)
- 20-hr GPS

- SUMs placed on all homes in study homes
- SUMs record temperature every 10 minutes

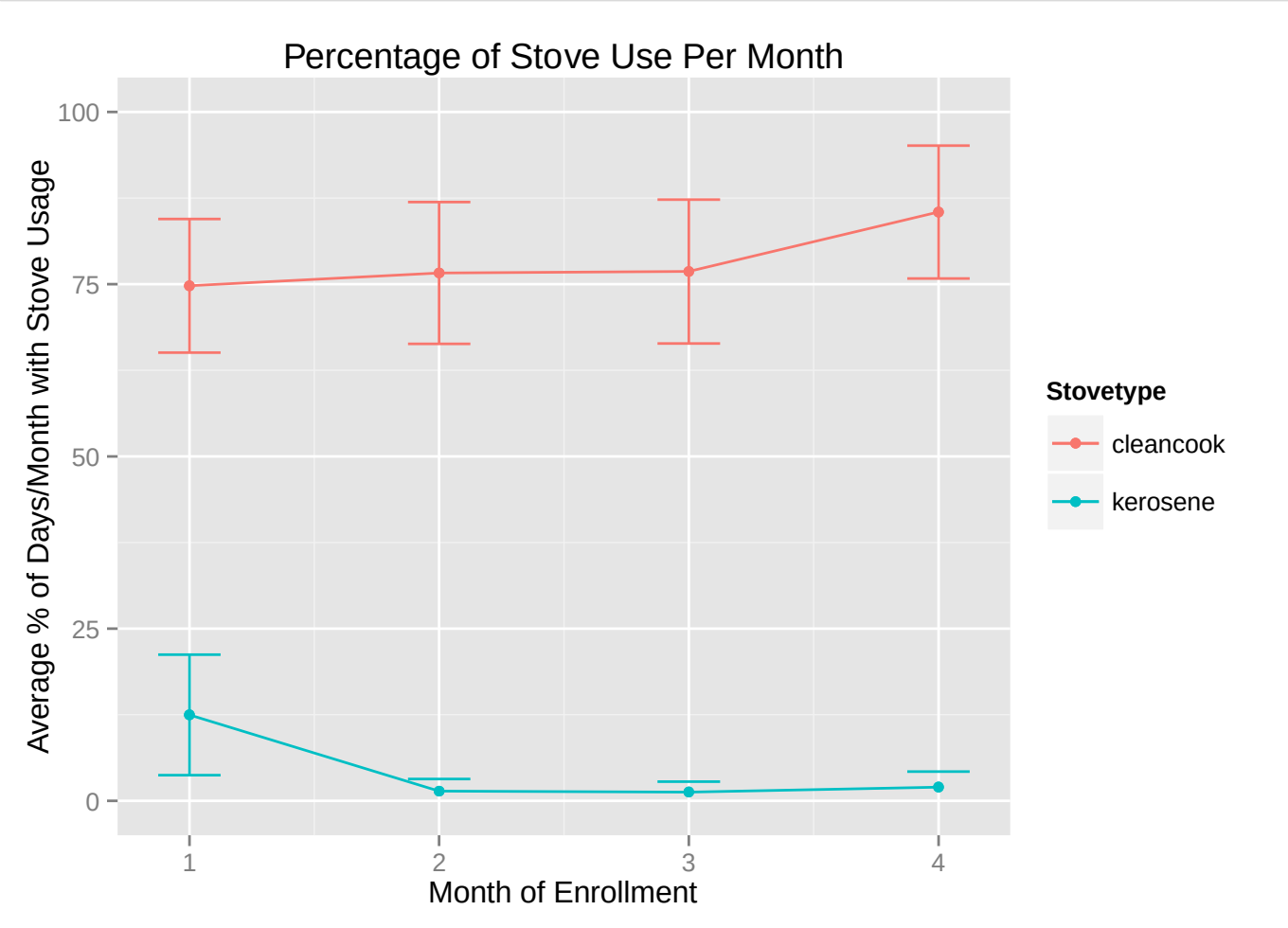
*SUMs = Stove Use Monitors

Estimating Cooking Time



- Stove On≥ 35C
- Stove Off <35C
- Periods with consecutive Stove On periods are segmented to create cooking event.

Intervention Arm Stove Usage



**Data through July 10, 2014

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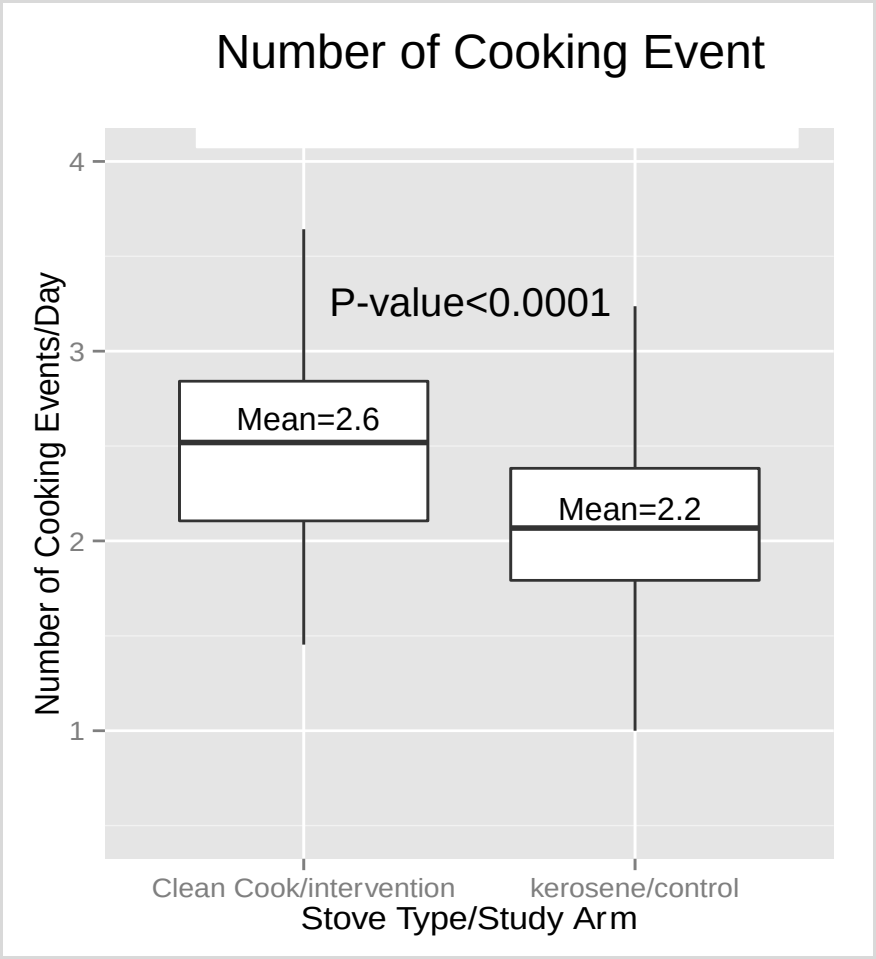
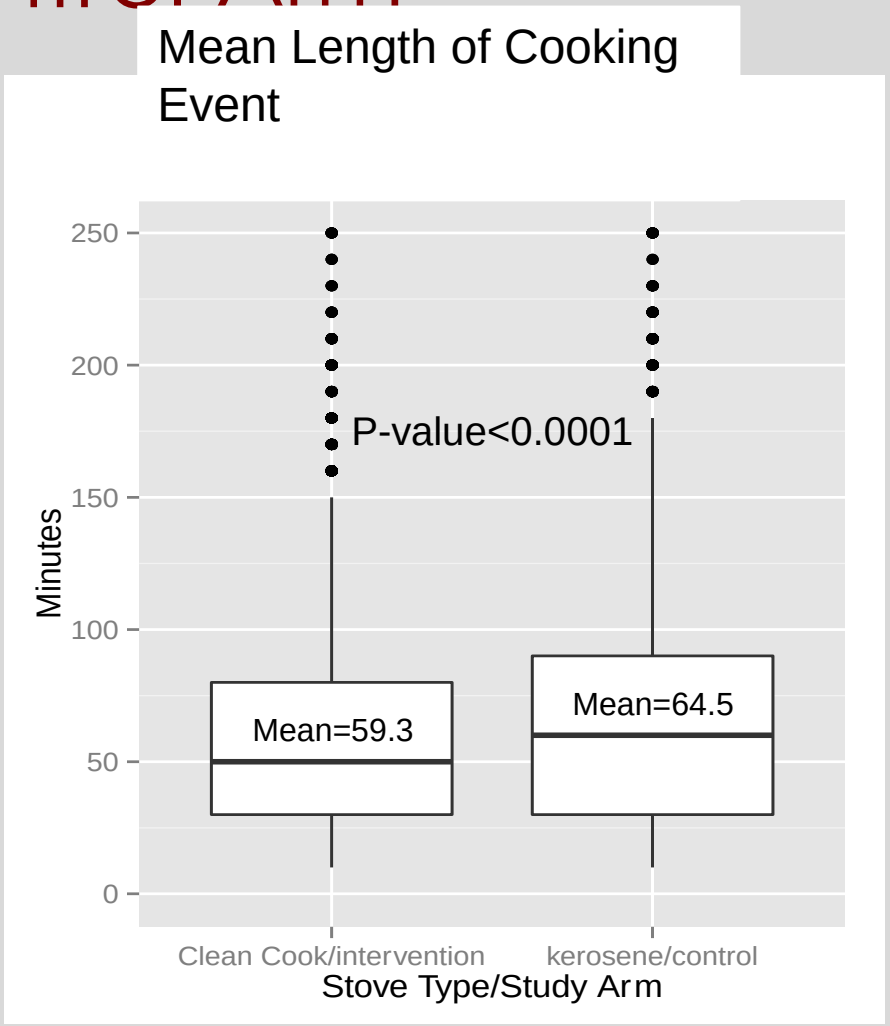
Intervention vs. Control Arm





Sample includes 53 Clean Cook stoves
64 kerosene stoves

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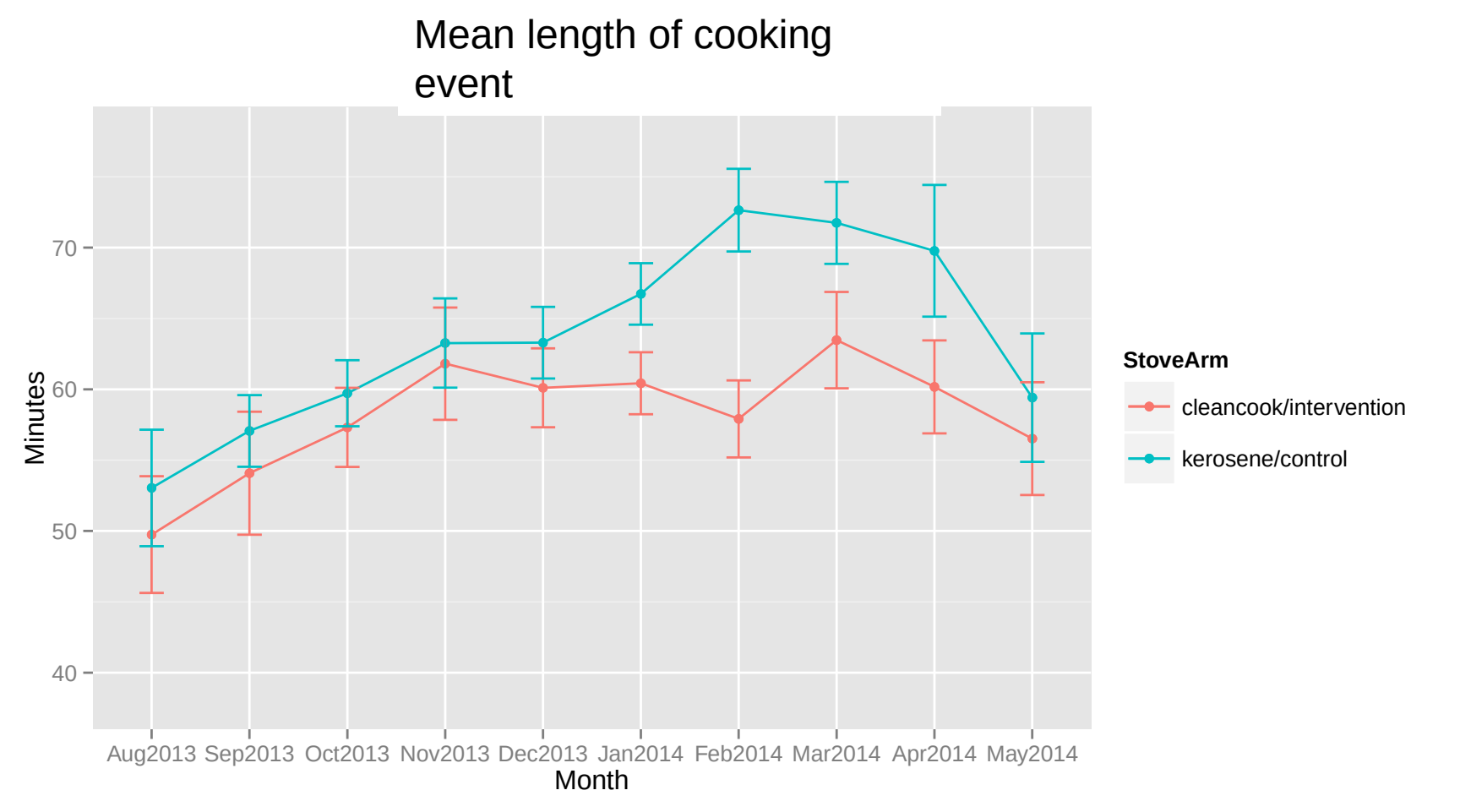
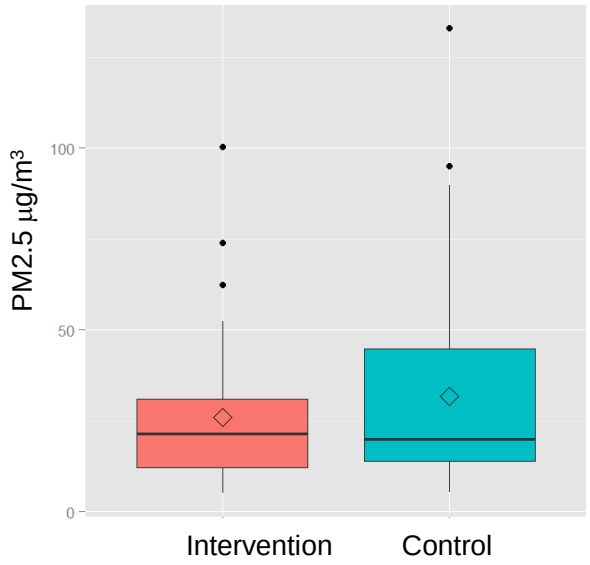
Monthly Variations in Cooking Time



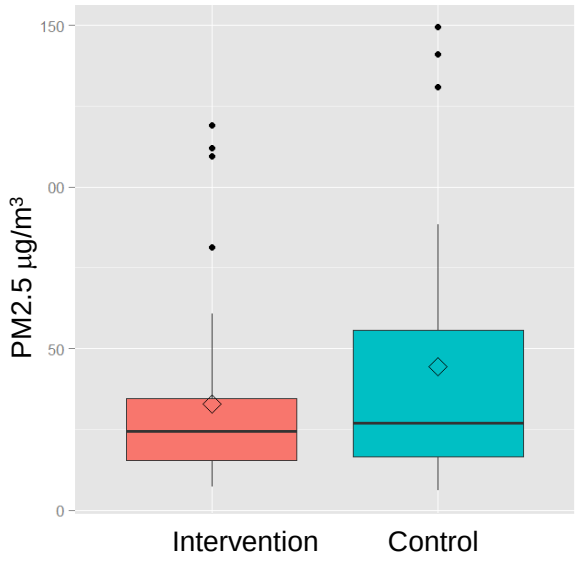
Background $PM_{2.5}$ Concentrations

2nd Trimester



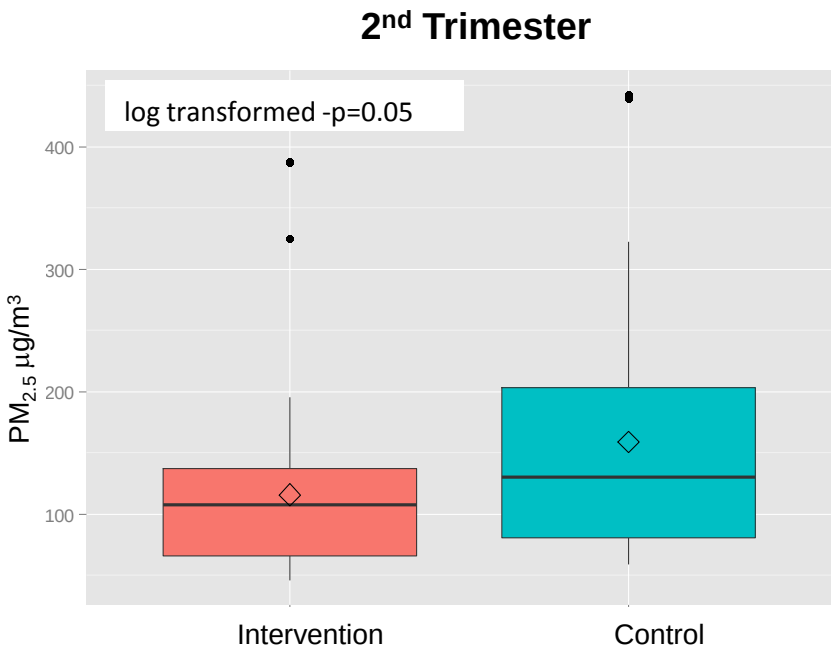
Intervention mean: 25.9 ±6.8 µg/m³
Control mean: 31.8 ±9.4 µg/m³

3rd Trimester

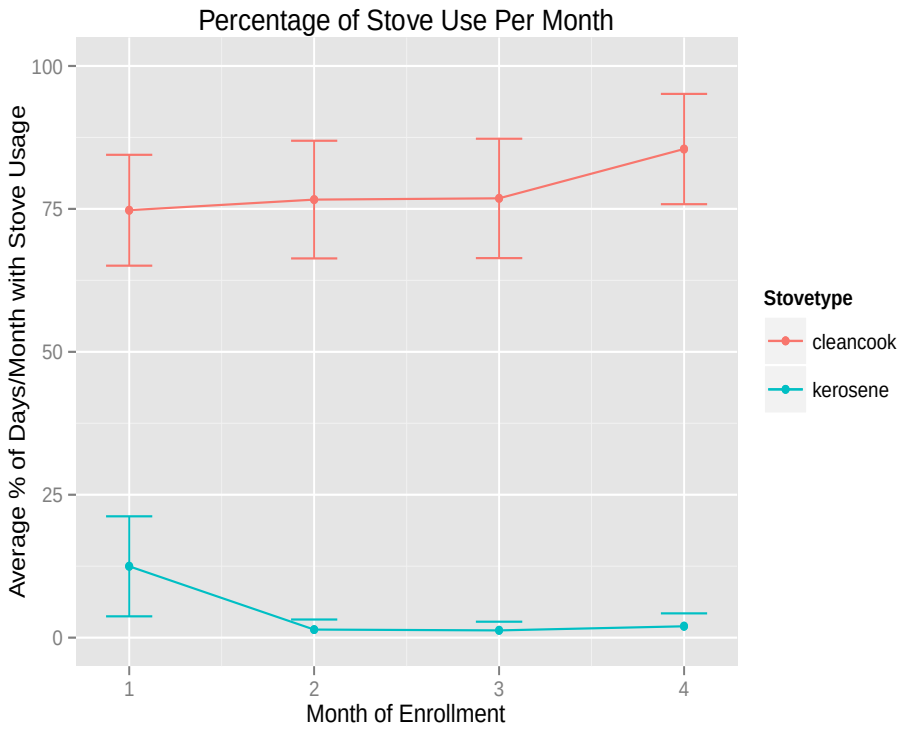


Intervention mean: 32.8 ±9.4 µg/m³
Control mean: 44.3±13.3 µg/m³

72 hour Mean $PM_{2.5}$ Concentration



Intervention mean: 126.4 ±34.7
Control mean: 163.0 ±36.2



Personal $PM_{2.5}$ Exposures in Urban Nigeria – complicating factors

Multi-family and multi-wife homes lead to multiple stoves

Personal $PM_{2.5}$ Exposures in Urban Nigeria – complicating factors

Generator use >80% of homes use once per week

Personal $PM_{2.5}$ Exposures in Urban Nigeria – complicating factors

20% of homes burn their trash

A higher percent of homes live nearby a trash burning site

Personal $PM_{2.5}$ Exposures in Urban Nigeria – complicating factors

Exposures to high concentrations near-roadways and during transit

Conclusions

- Very high usage of CleanCook Stoves
- Very little 'stove stacking'
- 23% reduction in $PM_{2.5}$ exposure for CleanCook group in 2nd trimester
- 32% reduction in $PM_{2.5}$ exposure in 3rd trimester
- Ambient air pollution plays an important role in exposure

Next Steps

- Health analysis
  - Correlating health outcomes with exposures
- GPS analysis
- PAH analysis
- Firewood homes

Acknowledgments

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Thank You!

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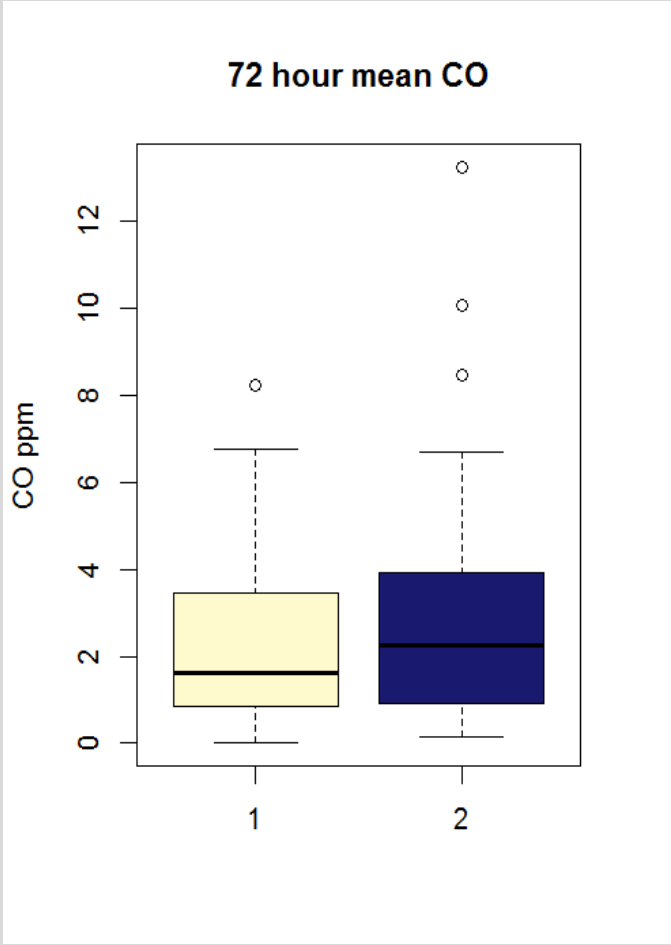
72-hour Mean CO



- The intervention participants on average were exposed to 23% less CO .
- There was significant overlap of exposures between the to groups.
- Overall CO exposures were relatively low.