

# Air Quality Of High School Kitchens Within The Kumasi Metropolis: Examining Indoor Particulate And Gaseous Pollutants

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## INTRODUCTION

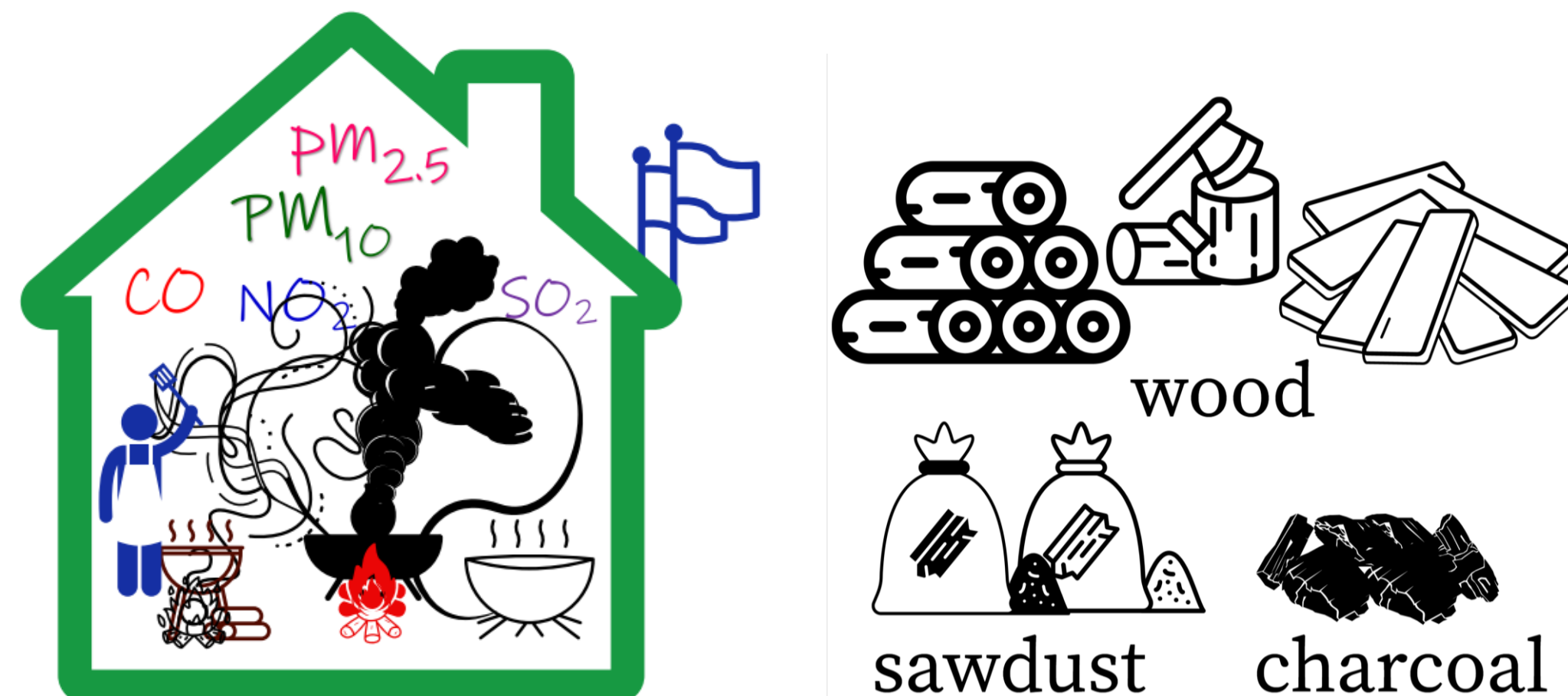


Figure 1: Cooking Air Pollutants & Biomass Sources

Combustion of solid fuels for cooking releases various air pollutants indoors. The aim of this work was to evaluate the Indoor Air Quality (IAQ) of the kitchens of 14 Senior High Schools (S.H.S.) in the Kumasi Metropolis for 8 hours with regard to the emitted levels of Indoor Air Pollutants (IAP) such as CO, SO<sub>2</sub>, NO<sub>2</sub>, Particulate Matter<sub>2.5</sub> and Particulate Matter<sub>10</sub> during cooking.

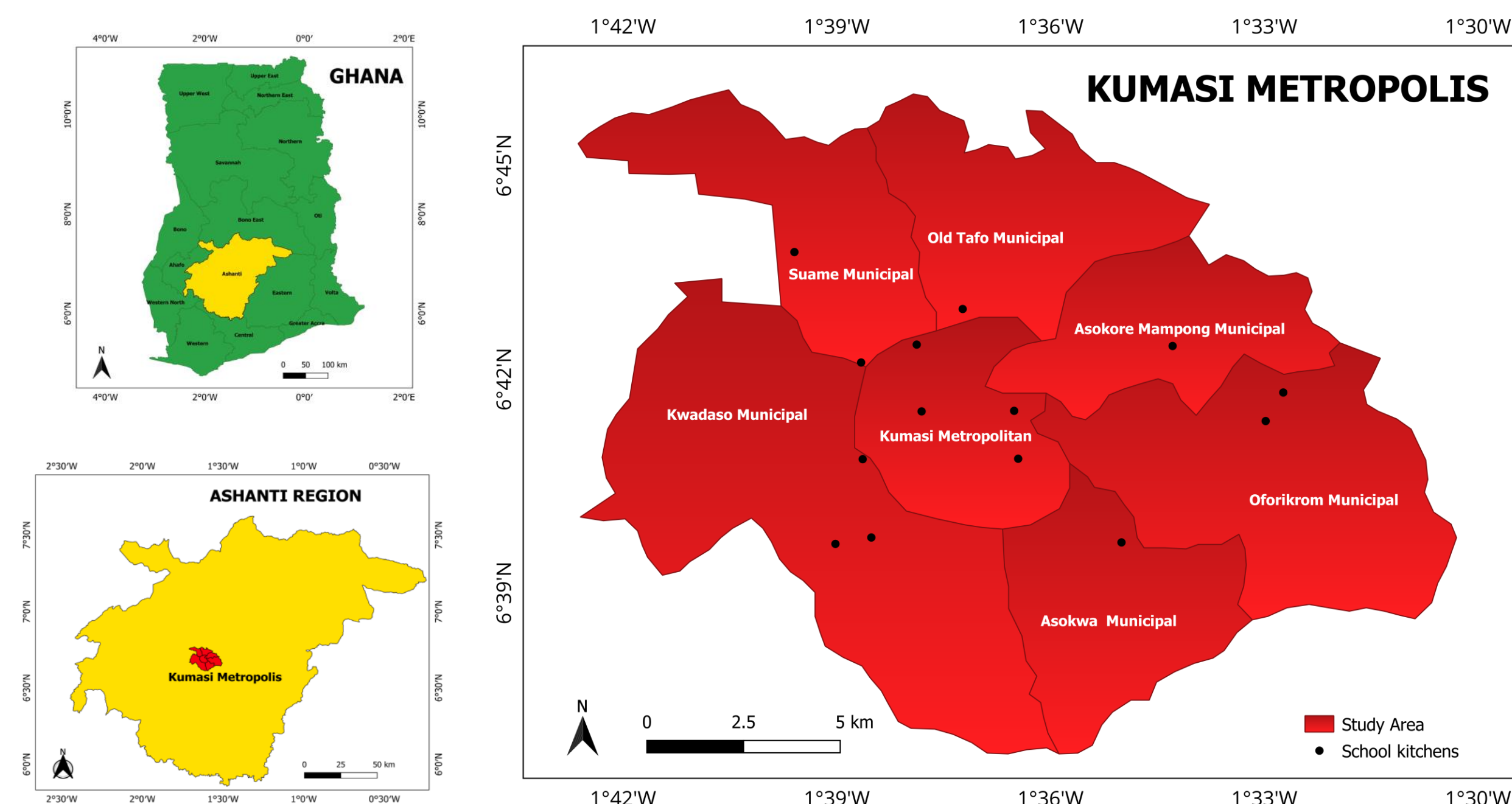
## OBJECTIVES

- Quantify the emitted levels of CO, SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> during cooking activities
- Compare levels with respective acceptable thresholds for human exposure

## RELEVANCE OF STUDY

- High School Kitchens in Ghana undertake large-scale cooking to cater for a large number of students and staff using solid fuels
- The study sheds light on the status of Indoor Air Pollution of Senior High School Kitchens to ascertain if the levels of criteria air pollutants are harmful for human inhalation

## MAP OF STUDY AREA



## MONITORING INSTRUMENTS



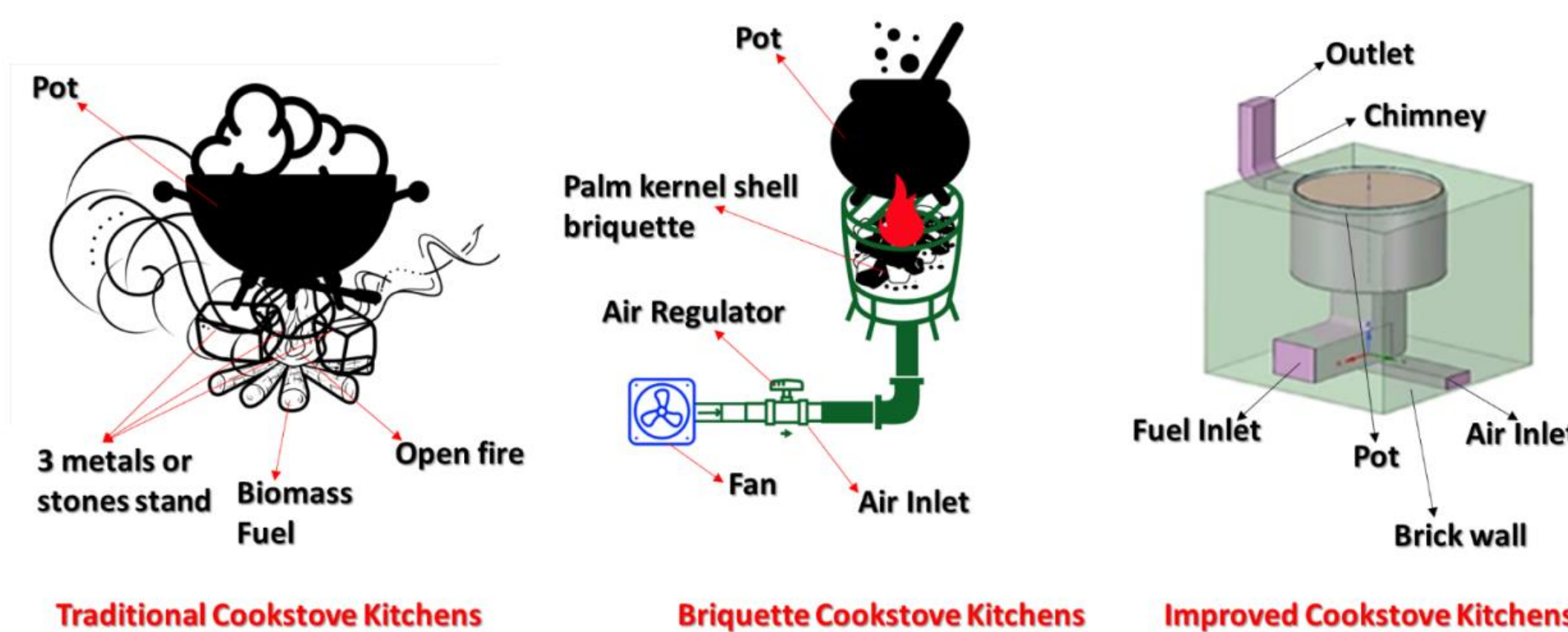
Figure 2: Gas and Particulate Matter Monitoring Instruments

## METHODOLOGY

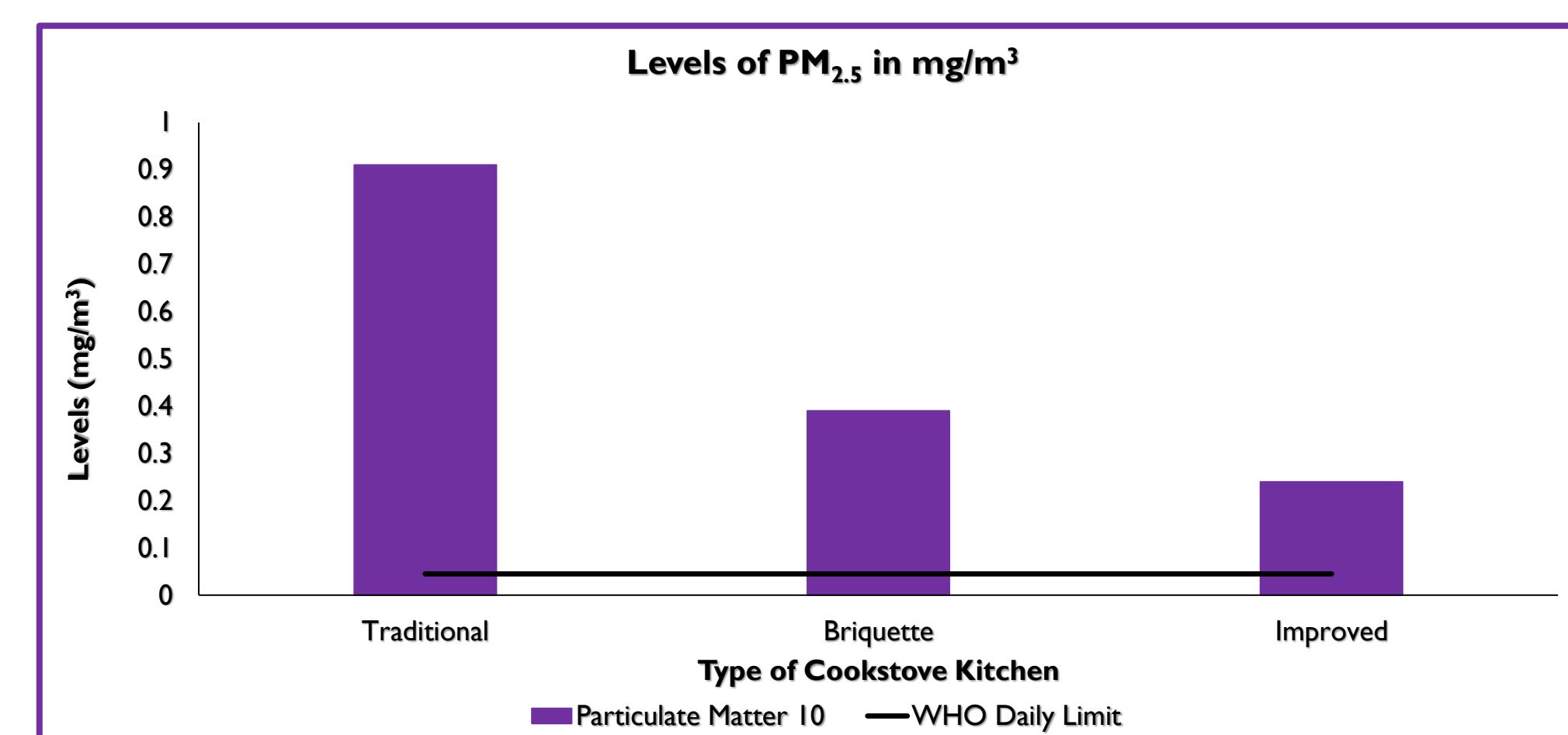
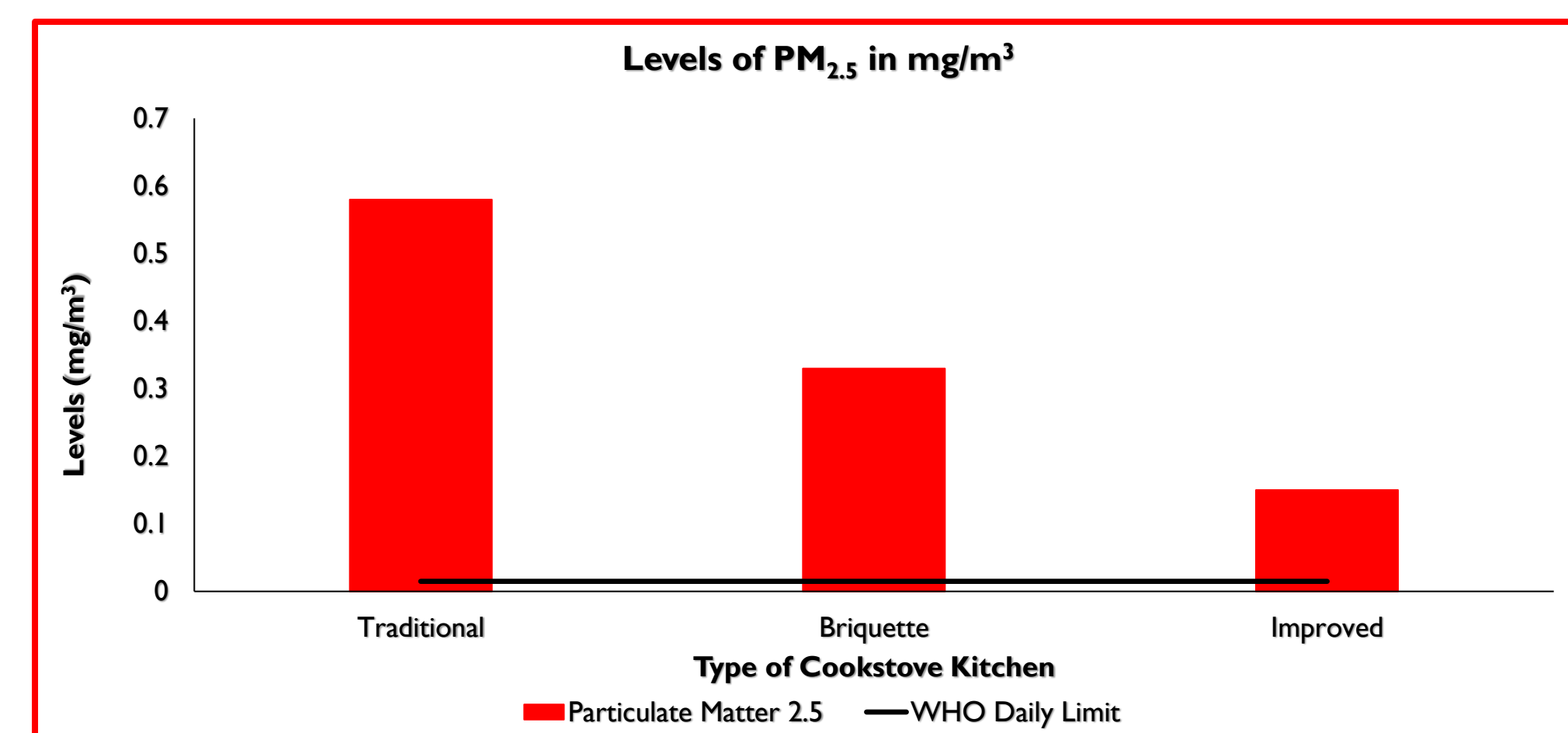
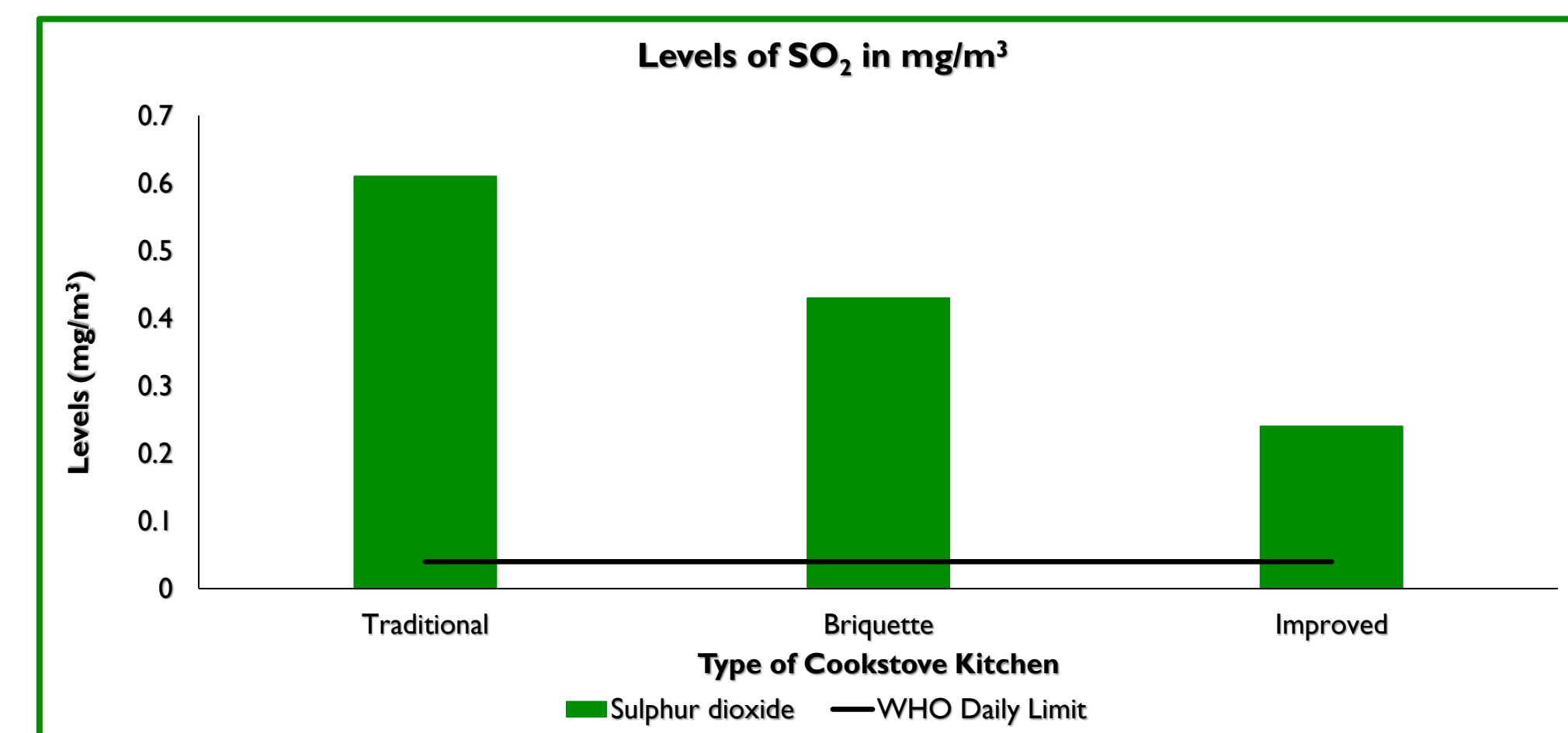
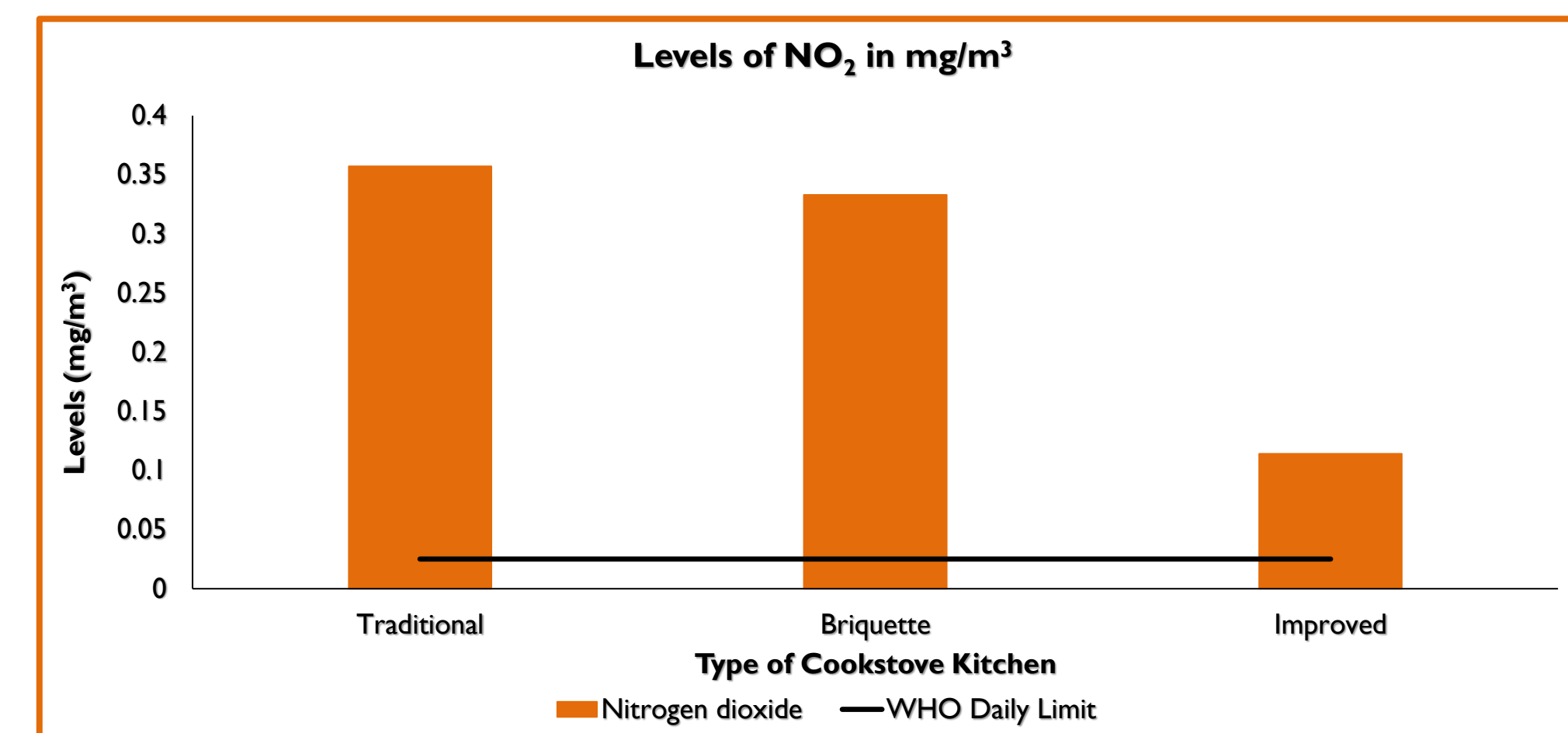
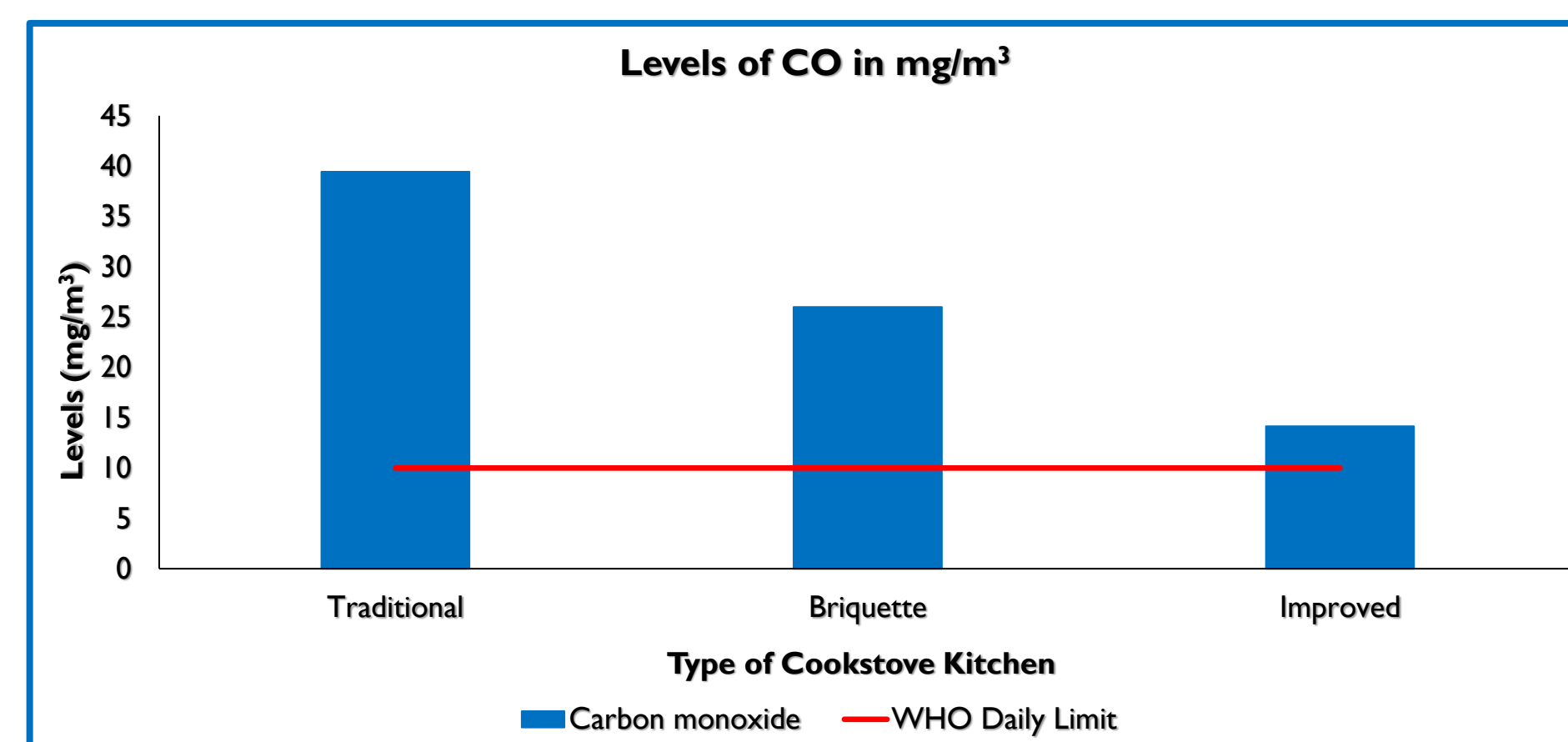
An 8 hour Real Time Indoor Air Monitoring of the Target Pollutants

- Instruments were placed at 1.5 m away from cookstoves
- Instruments were placed at 1.5 m height

## TYPES OF COOKSTOVE KITCHENS IN THE HIGH SCHOOLS



## RESULTS



| Type of Cookstove Kitchen | AQI | CLASSIFICATION                 |
|---------------------------|-----|--------------------------------|
| Traditional               | 395 | Hazardous                      |
| Briquette                 | 226 | Very Unhealthy                 |
| Improved                  | 126 | Unhealthy for Sensitive Groups |

AQI = Air Quality Index, Orange Colour = Unhealthy for Sensitive Groups, Purple Colour = Very Unhealthy, Maroon Colour = Hazardous

## DISCUSSION

- The lowest indoor levels of the measured indoor pollutants in this study were found in Improved Cookstove kitchens
- Traditional Cookstove and Briquette Cookstove kitchens had offensive levels of indoor air pollutants which were far beyond recommended exposure limits

## RECOMMENDATIONS

- Immediate temporary interventive measures such as chimneys, and clean institutional cookstoves should be employed in traditional cookstove school kitchens to reduce the emissions of pollutants
- Effective policies should be put in place by the government to transition all high school kitchens to cleaner cooking energies such as LPG and electricity

## CONCLUSION

- This study provides novel data as far as indoor air quality in school kitchens is concerned, and offers the basis for expedited action on the transitioning to cleaner cookstoves and fuels for cooking

## REFERENCES

- Ababio, B.A., Nkansah, M.A., Hogarh, J.N., Agyekum, T.P. and Commeh, M.K., 2023. In-kitchen particulate matter emissions in high schools in the Kumasi metropolis, Ghana: Levels and the health risk assessment. Journal of Hazardous Materials Advances, 11, p.100358.
- Ababio, B.A., 2023. Evaluation of indoor air quality of senior high school kitchens in the Kumasi metropolis (Masters Dissertation).