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## Supplemental Material

# Quantitative Guidance for Stove Usage and Performance to Achieve Health and Environmental Targets

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Supplemental material contains the corresponding figures to those of Figures 2 and 3 in the main text, but with charcoal stoves. Figures 2a, 2b, and 4 of the main text are also presented here with the additions of IWA 11:2012 tier level boundaries.

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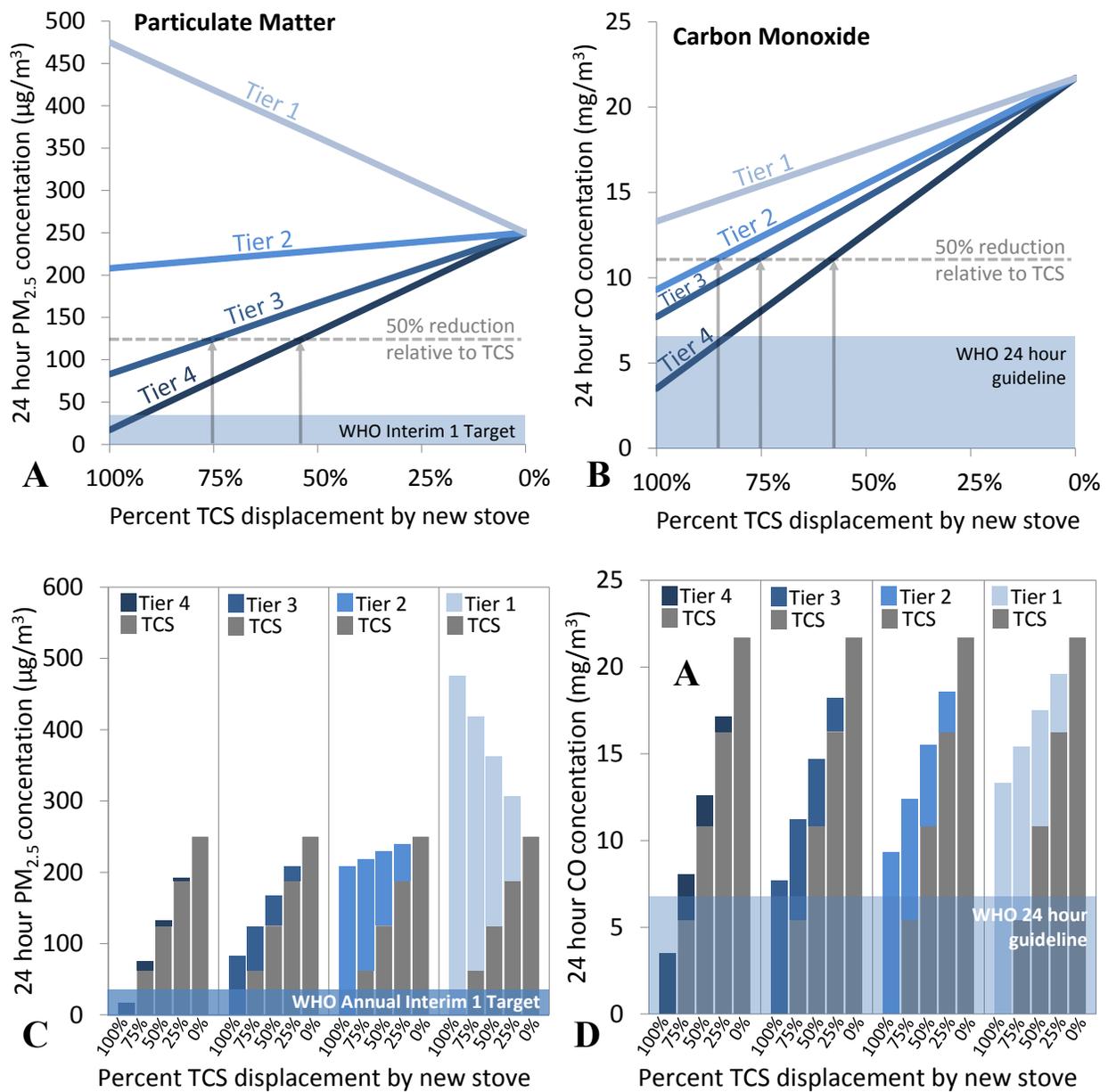
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Figure S3. Modeled relationships between three-stone-fire displacement and fuel savings for different performance-usage scenarios, estimated by the ratio of thermal efficiencies of the new to traditional stoves and the percent displacement of the traditional stove. Boundaries of the IWA 11:2012 fuel efficiency tiers have been added to illustrate the range of outcomes possible within each respective tier.

Table S1: ISO IWA Tiers for Indoor Emissions and Efficiency.

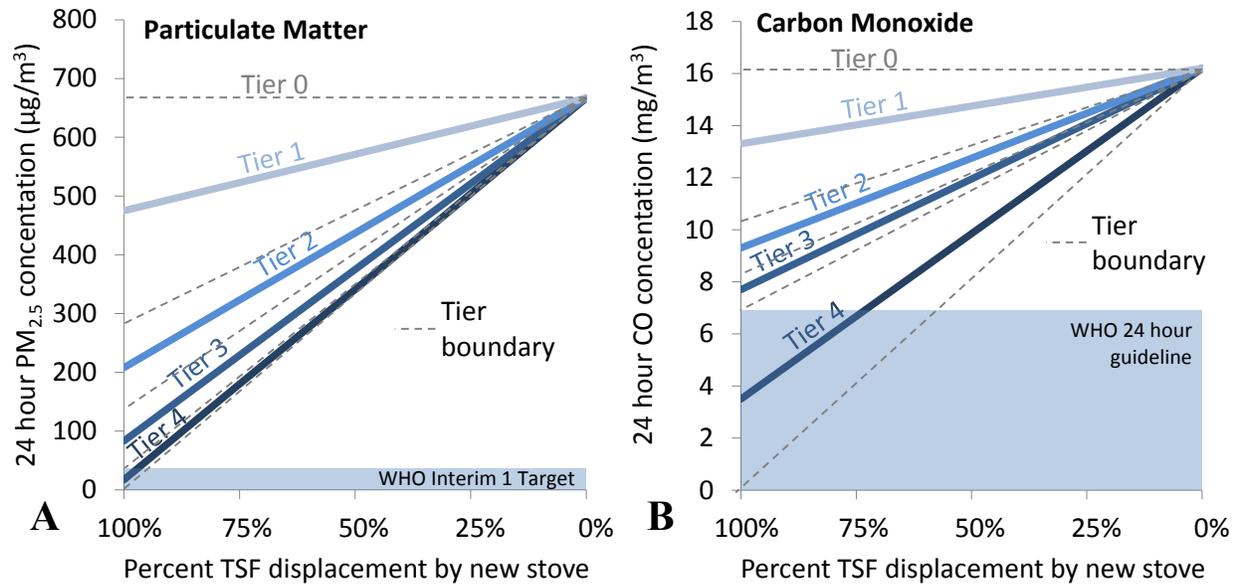
References



Notes: TCS = traditional charcoal stove; source for WHO Annual Interim 1 Target PM<sub>2.5</sub> (WHO 2006); source for WHO 24 hour CO guideline (WHO 2010).

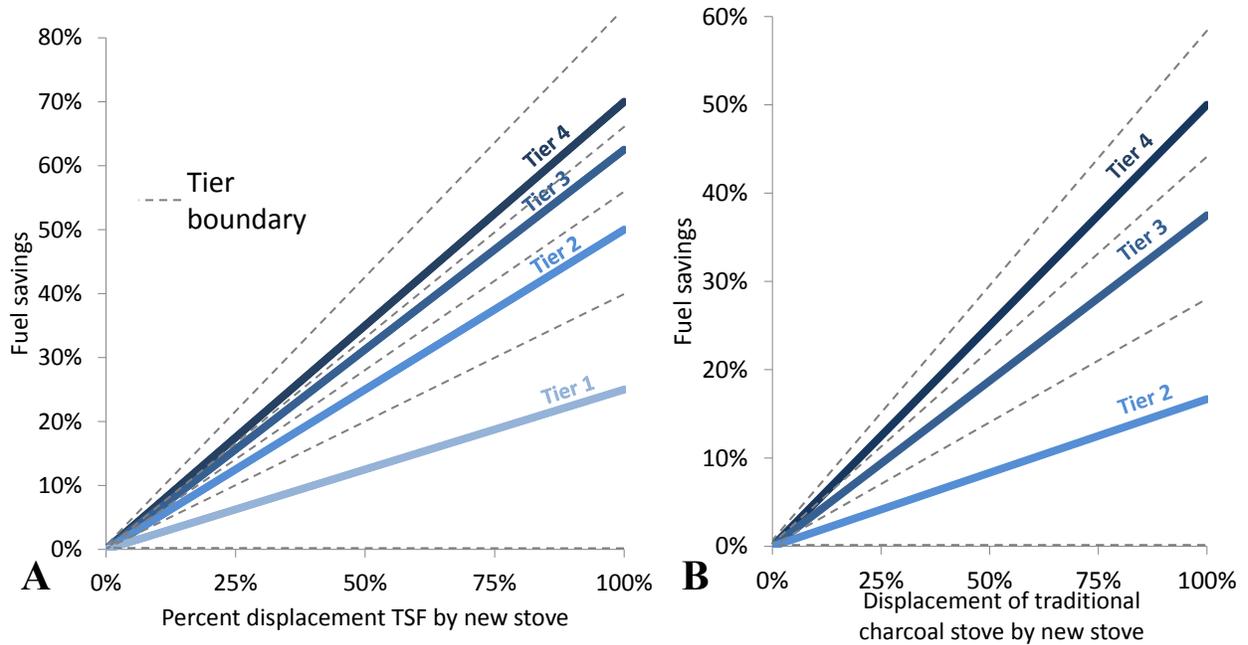
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Table S1: ISO IWA Tiers for Indoor Emissions and Efficiency.

<b>Indoor emissions Sub-tiers</b>		
	<b>Indoor emissions CO (g/min)</b>	<b>Indoor emissions PM<sub>2.5</sub> (mg/min)</b>
<b>Tier 0</b>	>0.97	>40
<b>Tier 1</b>	≤0.97	≤40
<b>Tier 2</b>	≤0.62	≤17
<b>Tier 3</b>	≤0.49	≤8
<b>Tier 4</b>	≤0.42	≤2

<b>Efficiency/fuel use Sub-tiers</b>		
	<b>High power thermal efficiency (%)</b>	<b>Low power specific consumption (MJ/min/L)</b>
<b>Tier 0</b>	<15	>0.050
<b>Tier 1</b>	≥15	≤0.050
<b>Tier 2</b>	≥25	≤0.039
<b>Tier 3</b>	≥35	≤0.028
<b>Tier 4</b>	≥45	≤0.017

The overall Tier for Indoor Emissions and Efficiency is the minimum Sub-tier value within that indicator category. For example, the Indoor Emissions Tier is the minimum of the Sub-tiers for PM<sub>2.5</sub> and CO emissions. Additional Tier values are available at <http://cleancookstoves.org/technology-and-fuels/standards/iwa-tiers-of-performance.html>.

These tiers were aligned with Water Boiling Test 4.2.3 and Biomass Stove Safety Protocol 1.1

(<http://cleancookstoves.org/technology-and-fuels/testing/protocols.html>).

## References

WHO. 2010. *WHO guidelines for indoor air quality: selected pollutants*. World Health Organization Regional Office for Europe, Bonn.

WHO. 2006. *WHO guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide*. World Health Organization Press, Geneva.