Opportunities, Trends, and Tradeoffs in Pursuit of Clean Cooking Goals

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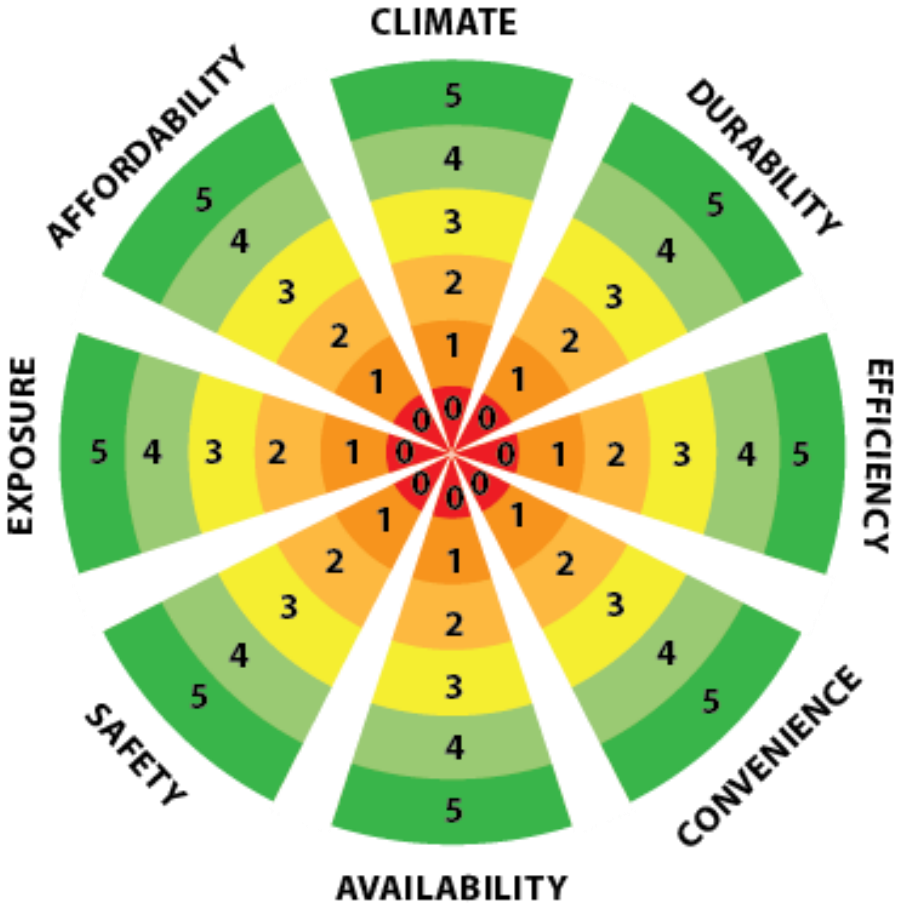
25 January 2022


CLIMATE
DURABILITY
EFFICIENCY
CONVENIENCE
AVAILABILITY
SAFETY
EXPOSURE
AFFORDABILITY

CCA works with a global network of partners to build an inclusive industry that

makes clean cooking accessible

to families around the world

CCA is building an inclusive clean cooking industry

CCA's work is built around three core pillars:

Driving consumer demand

Driving consumer demand for cleaner, more modern stoves and fuels by supporting behavior change and awareness-raising interventions

Mobilizing investment

Mobilizing investment to build a pipeline of scalable businesses capable of delivering affordable, appropriate, high-quality clean cooking products

Fostering an enabling environment

Fostering an enabling environment for industry growth by advocating for effective, predictable policies, providing trusted, relevant data, and serving as the convener and champion of the clean cooking sector




WHO’ tools to find solutions to increase access to clean cooking

World Health Organization

Defining clean vs. transitional vs. polluting

Clean

Transitional?

Polluting

What are the implications of increasing access to clean fuels, from a public health perspective?

- Public health is focused on reducing the burden of disease
- From this perspective, stoves that comply with WHO guidelines for indoor air quality (Tiers 4 and 5 for $PM_{2.5}$ and Tier 5 for CO emissions) should be prioritized
- Tier 3 stoves have limited health benefits and should only be promoted if clean stoves are not available/feasible
- Standards and testing are essential to classify stoves and identify the cleanest options for promotion

ISO VPT Tier	WHO Category for CO	WHO Category for $PM_{2.5}$
5	Clean	Clean
4	Transitional	Clean
3	Transitional	Transitional
2	Polluting	Polluting
1	Polluting	Polluting
0	Polluting	Polluting

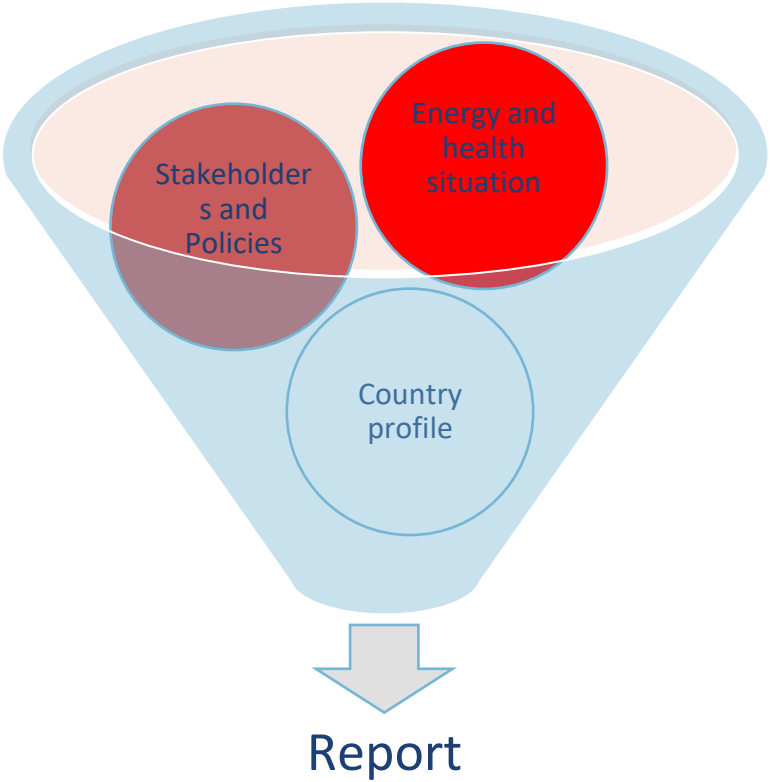
Use the tools developed by WHO like the CHEST
to find solutions to increase access to clean fuels and technologies

CHEST

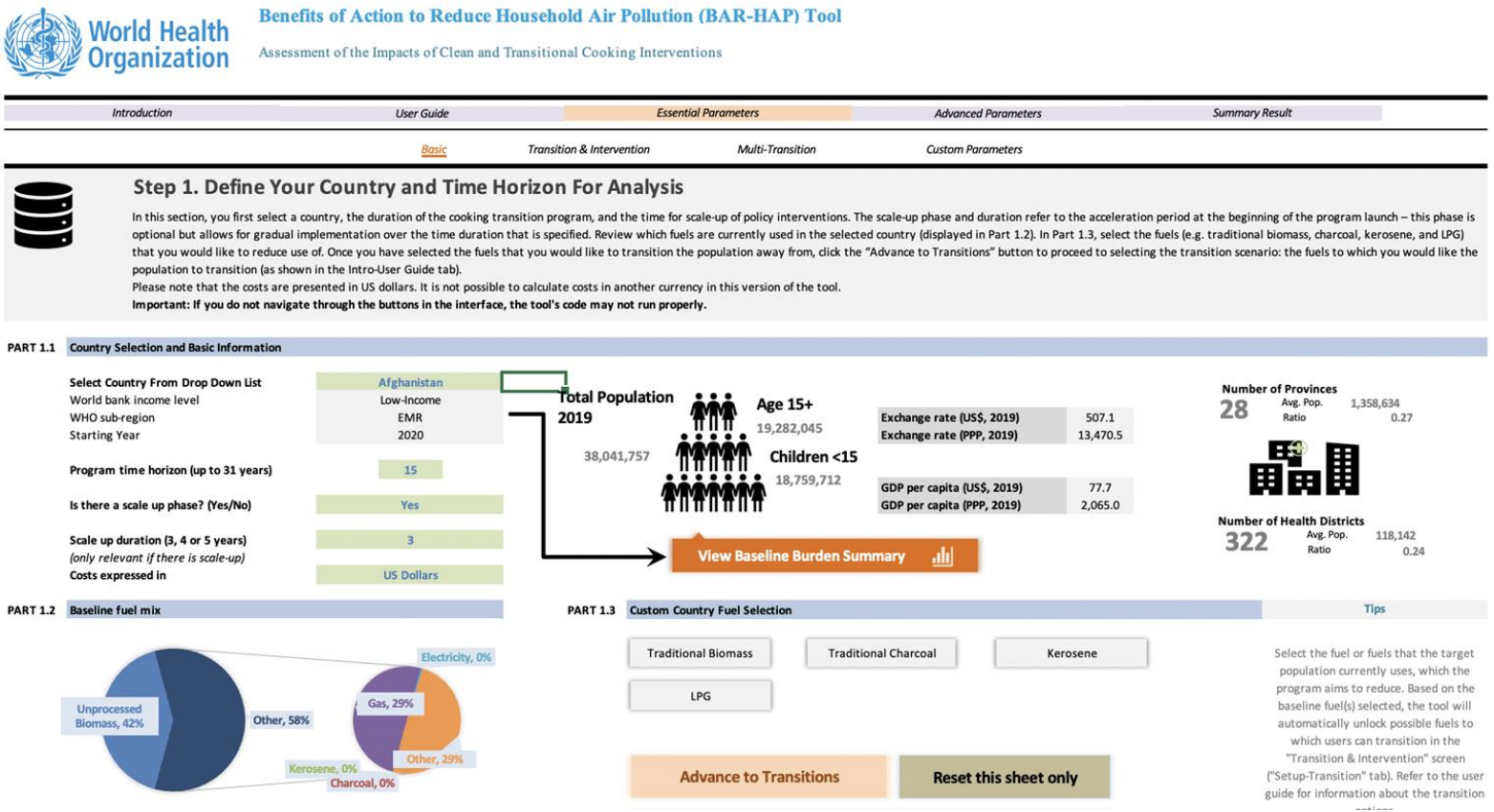
CLEAN HOUSEHOLD ENERGY SOLUTIONS TOOLKIT

https://www.who.int/tools/clean-household-energy-solutions-toolkit

Household Energy Assessment Rapid Tool (HEART)



Costs and benefits of actions to reduce air pollution in homes. BAR-HAP Tool



https://www.who.int/tools/benefits-of-action-to-reduce-household-air-pollution-tool

World Health Organization

Policies Countries Evaluations Resources About

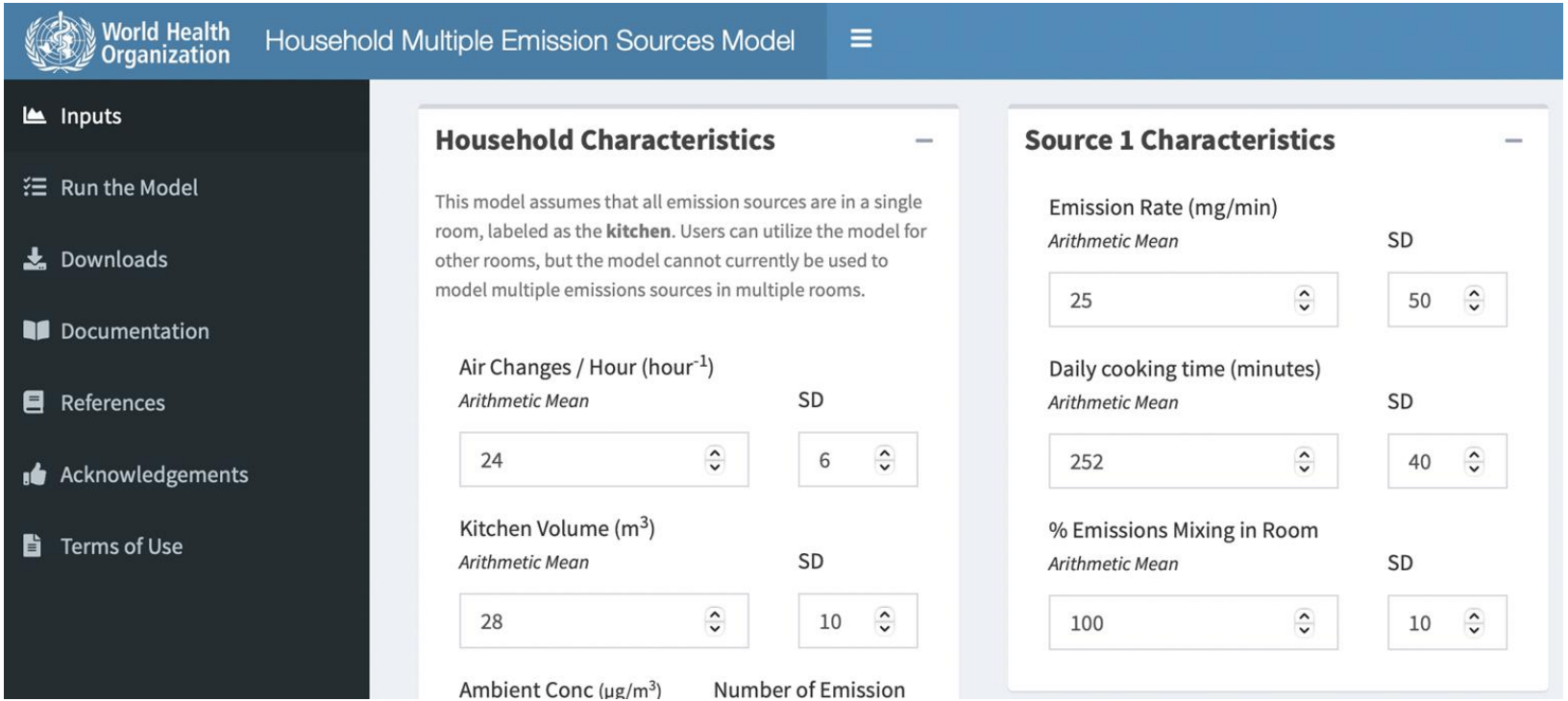
WHO Household Energy Policy Repository

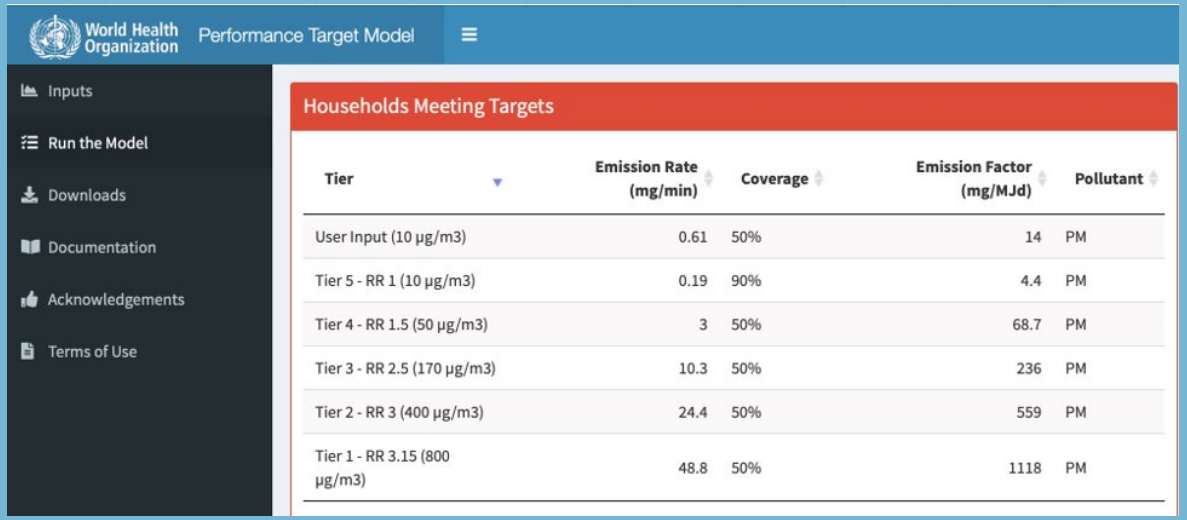
A compilation of policies promoting access to clean energy for household cooking, heating, and lighting

Search

Title	Description	Country	Policy T...	Energy ...	Techno...
PERU - Proyecto Nina (2011)	This is a project undertaken by Peru's Ministry of Energy and Mines (MINEM) i	Peru	Direct investment	Cooking	Stove
PERU - El Programa Nacional de Cocinas Familiares (Cocina Perú) (2012)	The 'Programa Nacional de Cocinas Familiares' (National Family Kitchens	Peru	Financial	Cooking, Heating,	Stove
PERU - El Fundo de Inclusión Social Energetico - 'FISE' (Fund for Social Inclusion for Energy) (2012)	This program was created with the passage of law No. 29852 in 2012, with	Peru	Financial	Cooking, Heating,	Stove
EL SALVADOR - Decreto No.698: Reforma Ley reguladora del depósito, transporte y distribución de productos de petróleo [Decree no. 698 - Reform of the Law regulating the deposit, transportation and distribution of petroleum products] (2011)	This law was passed to initiate a reform of El Salvador's long-standing LPG subsidy. The objective was to 'expand the coverage of the benefit of the gas subsidy, to all those people who need it for their survival'. Beneficiaries included domestic	El Salvador	Financial	Cooking	
EL SALVADOR - Acuerdo No.197: Reglas de operación - Subsidio al GLP [Agreement No. 197 - LPG Subsidy Operating Rules] (2014)	This agreement laid the foundation for the current form of El Salvador's LPG subsidy program. The reform process began in	El Salvador	Financial	Cooking	
EL SALVADOR - Generalidades del Subsidio al Gas	This document summarizes the evolution	El Salvador	Financial	Cooking	

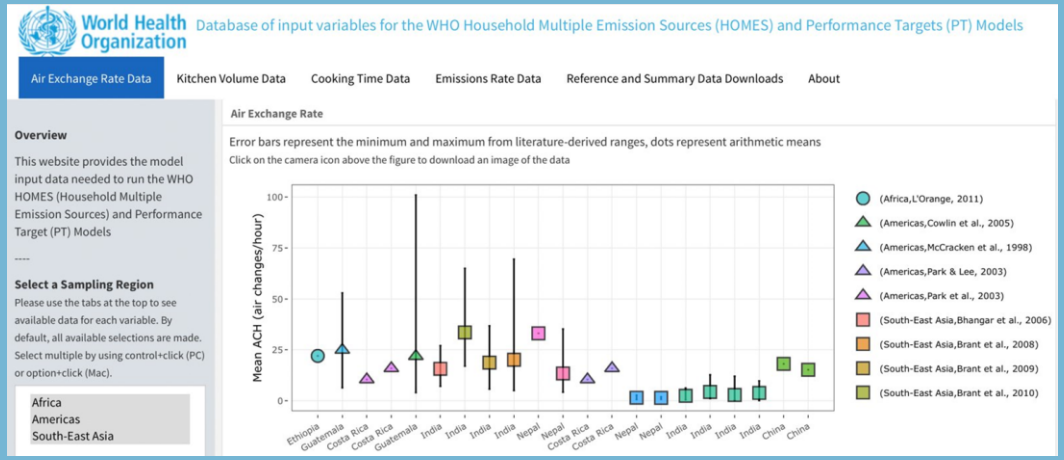
Model for estimating exposures based on emissions from different sources





Model for determining performance levels

https://www.who.int/tools/performance-target-model






Thank you!

troncosok@who.int

World Health Organization

A (very brief) tale of two studies…

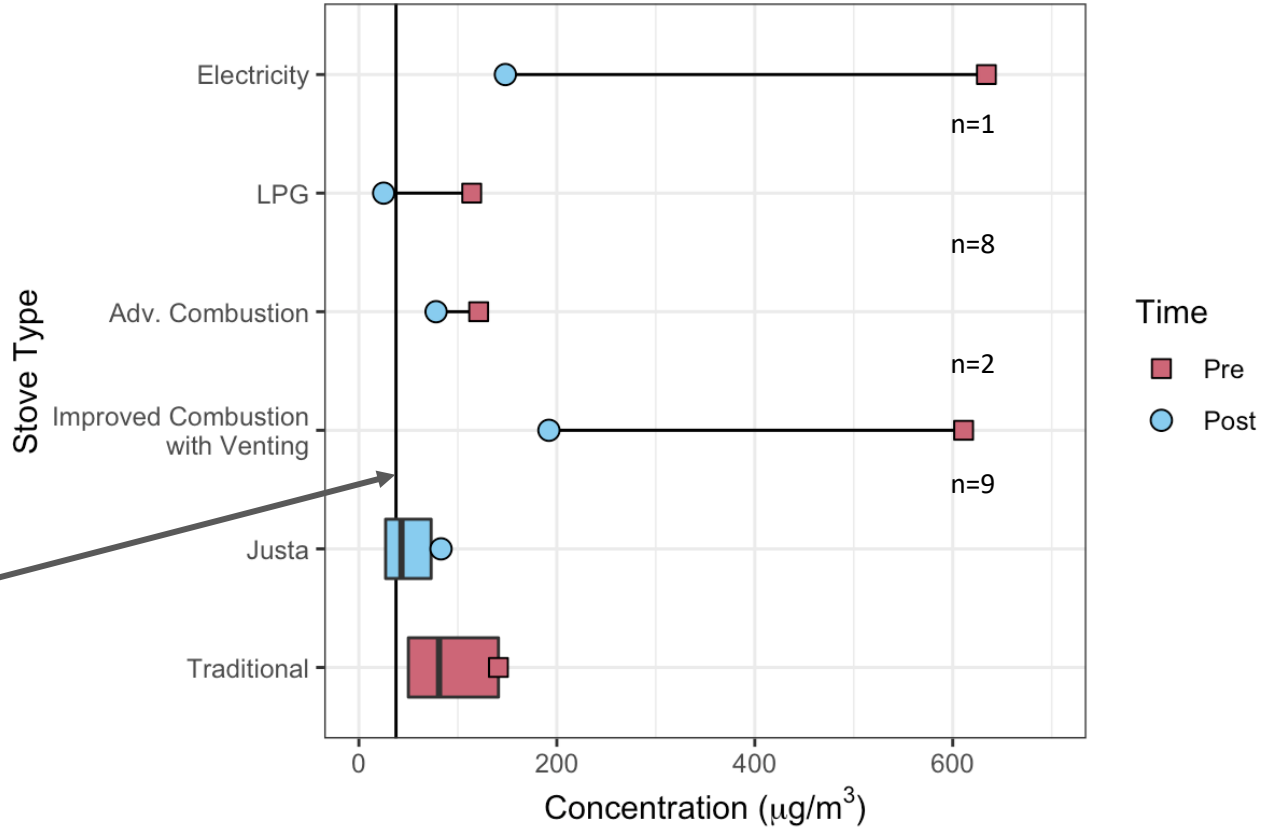
Household air pollution (HAP) from burning solid fuels is a major risk factor for adverse human health

- **HAP:** top 10 risk factor for premature death and disability in 2019
  - Premature deaths: 2.3 million (95% CI: 1.6 to 3.1 million)
  - Lost years of “healthy” life (DALYs): 91.5 million (95% CI: 67 to 119 million)
- **State-of-the-science**: While large % reductions in air pollutants have been observed with stove/fuel interventions, most interventions have not resulted in attainment of WHO guidelines

Photos: Joanna B. Pinneo

Sources: Murray et al., GBD 2020

Comparison to stoves in Pope et al. 2021 review



WHO IT-1 Annual Guideline of 35 ug/m3

Data from Pope et. al 2021; PM Honduras Study

Chimney Stove Intervention to Reduce Long-term Wood Smoke Exposure Lowers Blood Pressure among Guatemalan Women

John P. McCracken,[1,2] Kirk R. Smith,[3] Anaité Díaz,[4] Murray A. Mittleman,[1,5] and Joel Schwartz[1,2]

VOLUME 115 | NUMBER 7 | July 2007 • Environmental Health Perspectives

- Daily average $PM_{2.5}$
  - Control: 264 µg/m^3
  - Intervention: 102 µg/m^3
- Intervention impacts on BP:
  - 3.7 mm Hg lower SBP (95% CI, –8.1 to 0.6)
  - 3.0 mm Hg lower DBP (95% CI, –5.7 to –0.4)

Effects of a Household Air Pollution Intervention with Liquefied Petroleum Gas on Cardiopulmonary Outcomes in Peru

A Randomized Controlled Trial

William Checkley[1,2], Kendra N. Williams[1,2], Josiah L. Kephart[2,3], Magdalena Fandiño-Del-Rio[2,3], N. Kyle Steenland[4], Gustavo F. Gonzales[5,6], Luke P. Naeher[7], Steven A. Harvey[8], Lawrence H. Moulton[9], Victor G. Davila-Roman[10], Dina Goodman[1,2], Carla Tarazona-Meza[2,11], Catherine H. Miele[1,2], Suzanne Simkovich[1,2], Marilu Chiang[11], Ryan T. Chartier[12], Kirsten Koehler[2,3], and the CHAP Trial Investigators

American Journal of Respiratory and Critical Care Medicine Volume 203 Number 11 | June 1 2021

- 48-hr time weighted means, $PM_{2.5}$
  - Control: 98 µg/m^3
  - Intervention: 30 µg/m^3
- Intervention impacts on BP:
  - 0.7 mm Hg higher SBP (95% CI, -2.1 to 3.4)
  - 0.3 mm Hg higher DBP (95% CI, -1.5 to 2.0)

Where do we go from here?

- Our Honduras Intervention results demonstrate that wood-burning stoves like the *Justa* can reduce exposures
- Cleaner cookstoves often reduce exposures but typically have not improved health in the context of randomized trials
- Why is this? Exposures not reduced enough? Short study timeframes? Underlying context of the population?
- What else can we do?

Photo: Joanna B Pinneo

Towards Cleaner Cooking Systems

Omar Masera

Bioenergy and Ecotechnology Innovation Group

IIES- UNAM
Universidad **N**acional **A**utónoma de **M**éxico

Grupo **I**nterdisciplinario de **T**ecnologia **R**ural **A**propiada
MEXICO

The perfect storm… economic crisis/gas prices rocketting/subsidies removal

- Massive switch back from LPG to… “open fires” in urban and rural areas

High oil prices and restricted supplies (climate change, peak oil) will be the norm in the future!

LOCAL / LUNES 4 DE OCTUBRE DE 2021

[Video] Fogones y leña sustituyen gas LP

La Comisión Reguladora de Energía fijó el décimo aumento al precio del combustible en apenas dos meses

Ya más amas de casa usan leña para cocinar | José Luis Tapia

India/Mexico/Brasil…

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News / India / That's how kitchen gas is burning a bigger hole in our pockets

That's how kitchen gas is burning a bigger hole in our pockets

More than ever: supporting CLEAN (ER) BIOMASS OPTIONS is urgently needed

The Pathway to Clean(er) Cooking Systems

- **Understanding users needs and priorities** - STACKING IS THE NORM!!
    - *Cooking practices, other needs and cultural aspects;*
- **Tailor solutions to local socio-environmental context**
    - Segmentation of users*: urban-rural, income level, biomass availability;*
    - *User-centred design*
- **Foster local innovation -- Regional Testing-Innovation Centers**
    - *Universities/Govt/NGOs/Private Sector partnerships*
    - *More emphasis on **local materials/knowledge/shorter supply chains***

The future is local/regional NOT GLOBAL

The Pathway to Clean(er) Cooking Systems -Implementation

- Promoting integrated portfolios of "cleaner stacking" options:
  - improved practices (moving the open fire outside, drying wood, use of pressure cooker),
  - devices (stoves, water heaters, space heating)
  - fuels (**biomass!!!**, solar (thermal also!)
- Participatory approaches; longer-term program monitoring and results-based incentives

No one should be left behind, particularly the poorest!!!

LINEB

LABORATORIO DE INNOVACIÓN Y EVALUACIÓN EN ESTUFAS DE BIOMASA

gira

Thank you

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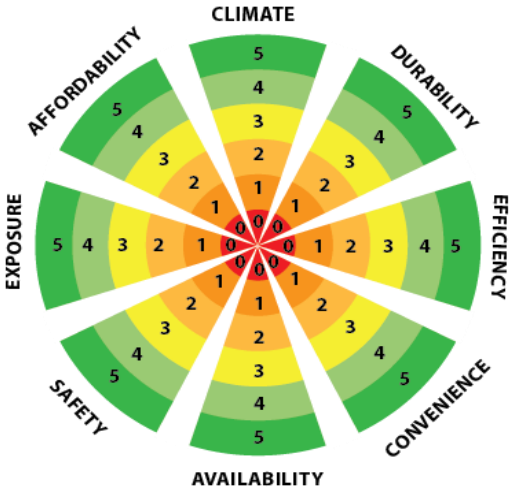
ETHOS: Opportunities, Trends, and Tradeoffs: Cooking, Health, and Climate

What are the most important factors when seeking best outcomes from a clean cooking intervention?



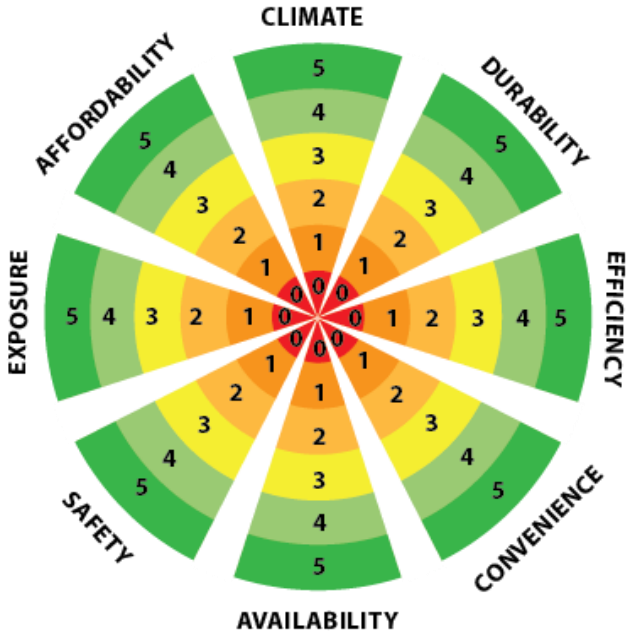
The ISO 19867 Voluntary Performance Targets include Thermal Efficiency, PM2.5, CO, Safety, and Durability.

The World Bank added Convenience, Availability, and Affordability.

ARC suggests completing a multi-tiered framework with Climate.

Stoves that score well enough on these eight metrics might be more successful interventions?

Corn cobs?
LPG?



The Energy Progress Report defines clean fuels and technologies as "electricity, LPG, natural gas, biogas, solar, and alcohol fuels" (IEA et al. 2020). Biomass is not included.

However, most electricity and all LPG, natural gas, and alcohol derived from fossil fuels emit dangerous amounts of CO_2, responsible for climate change.

New York City just became the largest city in the US to ban natural gas in new buildings. (SF, and 51 cities in California enacted similar laws.)

The Sustainable Development Goal (SDG) 7.1.2 indicator, access to clean fuels and technologies for cooking, uses a proxy of whether households cook primarily with "clean" fuels.

Since the "clean" fuels are largely fossil fuels that are being banned:

What would Kirk Smith recommend we do now?

Does carbon neutral biomass rise up an "energy ladder?"

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Appendices

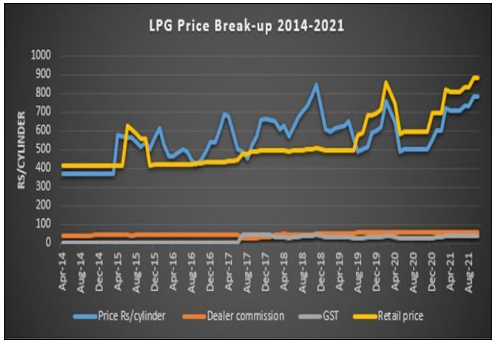
Additional Material

A caution note from the world´s largest LPG subsidy program in India

According to many early studies, **the PMUY scheme** did not result in widespread adoption of LPG in poor households as the primary cooking fuel. The scheme was short-term oriented with one-time subsidies that targeted voters in poll bound states. Spending on PMUY fell by more than 50 percent from INR29.9 billion in 2015-16 to about INR12.93 billion in 2019-20.

As there was no improvement in incomes of households receiving LPG connections under PMUY, they were unable to purchase replacement cylinders.

Phasing out of subsidies for LPG has made it even more difficult for PMUY recipients to purchase refill cylinders. This often means reverting to burning biomass.



Observer Research Foundation Jan 2022
https://www.orfonline.org/expert-speak/lpg-subsidies-a-quiet-phase-out/

PM Results in Context

Intent-to-treat models with 6 repeated measurements for each household

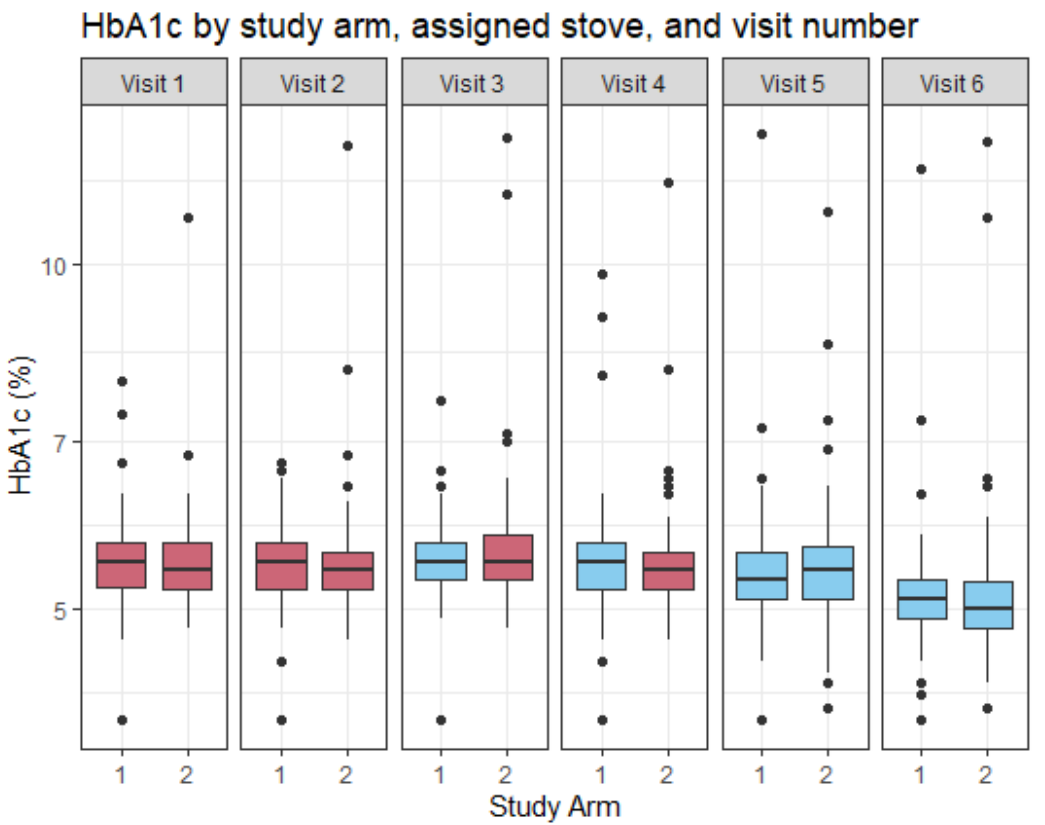
Large percent reductions in exposures

WHO IT-3 target for 24-hours of 37.5 µg/m^3

- For personal samples, 41% (dry season) and 53% (rainy season) of *Justa* stoves reached the target

$PM_{2.5}$ by assigned stove type	Percent reduction in PM concentrations
Personal $PM_{2.5}$ µg/m^3	
Justa	32.3% (19.8, 42.9)
Traditional	reference
Kitchen $PM_{2.5}$ µg/m^3	
Justa	56.0% (45.7, 64.7)
Traditional	reference

Results: HbA1c by visit, study arm, and stove type

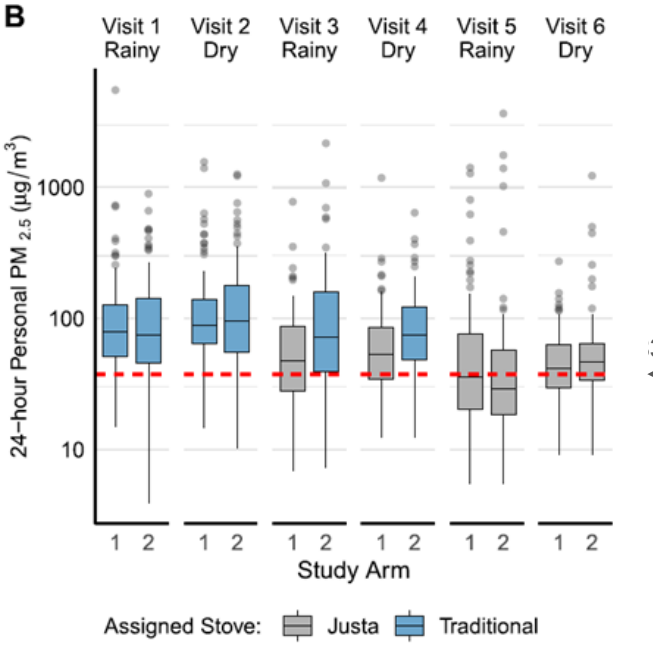


HbA1c total obs=1,208 (without diabetes medication use)

Arm 1: n=114, obs=621; **Arm 2**: n=113, obs=587

$PM_{2.5}$ by assigned stove type	n	Mean (SD)	Geometric Mean (GSD)	Median (25th, 75th percentile)
Personal $PM_{2.5}$ µg/m^3				
Justa	585	83 (216)	45 (2.5)	43 (27, 73)
Traditional	622	141 (281)	87 (2.4)	81 (50, 141)
Kitchen $PM_{2.5}$ µg/m^3				
Justa	578	107 (211)	58 (2.7)	53 (29, 103)
Traditional	629	427 (724)	182 (3.7)	178 (69, 440)

$PM_{2.5}$



Personal $PM_{2.5}$

24-Hour IT-3 WHO Guideline of 37.5 ug/m3

Benka-Coker et al. 2021

Black Carbon

BC by assigned stove type	n	Mean (SD)	Geometric Mean (GSD)	Median (25th, 75th percentile)	Percent reduction in BC concentrations[1]
Personal BC (µg/m^3)					
Justa	582	23.3 (121.9)	3.6 (6.4)	3.5 (1.5, 11.7)	53% (95% CI: 35-65%)
Traditional	612	33.6 (71.7	11.5 (4.6)	11.8 (5.0, 29.4)	Reference
Kitchen BC (µg/m^3)					
Justa	579	52.3 (169.5)	7.7 (6.7)	6.6 (2.3, 26.1)	76% (95% CI: 66-83%)
Traditional	609	130.6 (201.3)	39.7 (6.1)	46.7 (11.8, 160.3)	Reference