

Killer Smoke in the Kitchen

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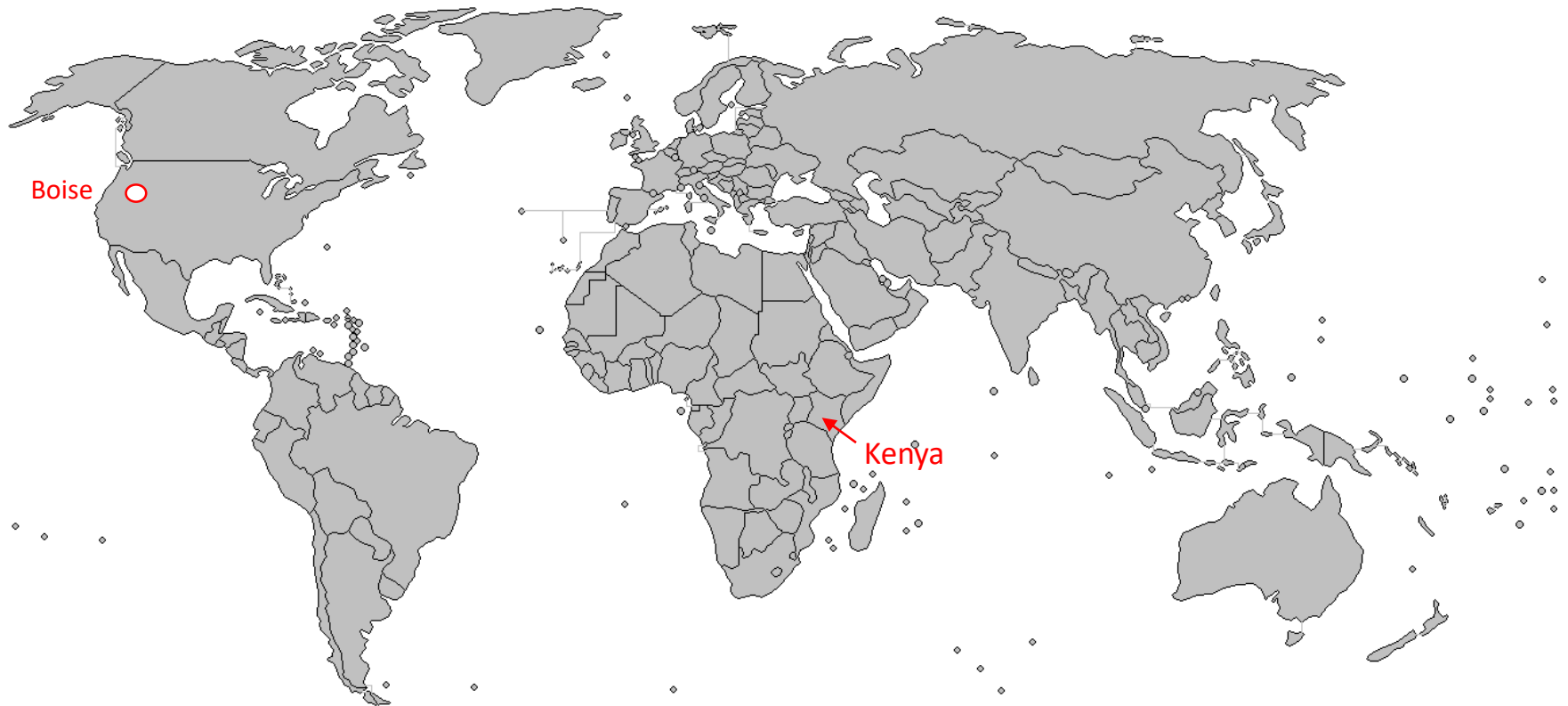
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World Health Organization:

“More than 2 million women die prematurely each year in developing countries as a result of excessive exposures to indoor air pollution in kitchens”.



Our project



Rural Kitchens: Typical construction



Indoor environment



Characteristics:

- Cooking stoves: Open fire
- Fuels: Wood, dried cow-dung and agricultural residue
- Hazards: Toxic smoke
- Consequences: Asthma, emphysema, bronchitis, cancer

Possible solutions:

- Use of more efficient fuels
- Use of more efficient stoves
- Improvements in ventilation

Limitations:

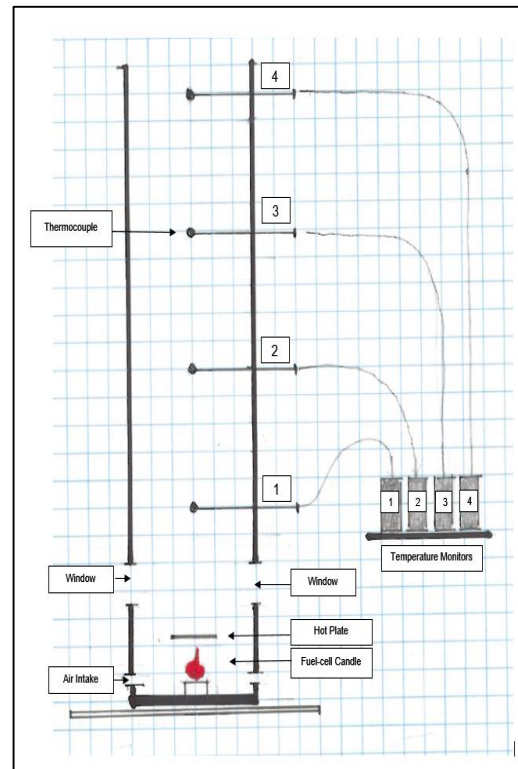
- Alternative fuels are expensive and are not always available
- New stove technologies are complex and costly
- Ventilation solutions are “counter-intuitive”

Historical perspective:

Smoke exposure problems have existed for hundreds of years

- Why are there no windows or other ventilation openings?
- Why are there no chimneys?
- Simulations were conducted using scaled models

Convection Tower

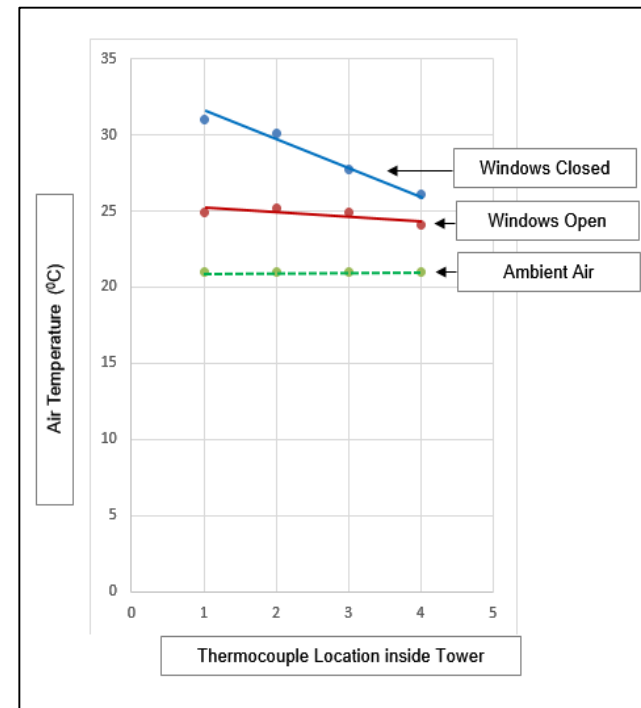


Findings:

- Outside air cools the smoke
- Cooling reduces the upward convection
- Smoke cannot rise to higher levels

Solution:

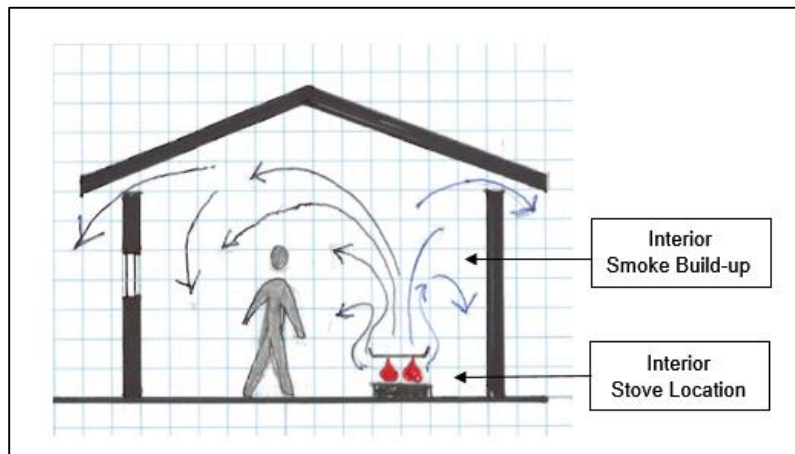
- Limit air flow through windows and door openings



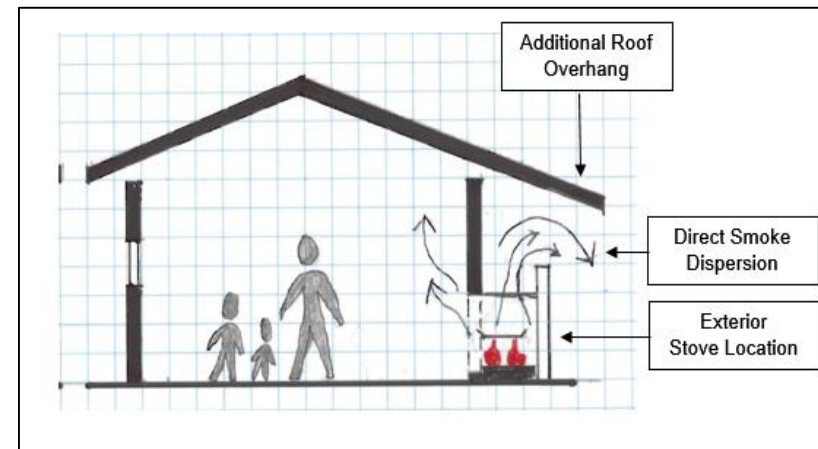
Design interventions:

- Increase temperature of fire to improve upward convection
- Limit the smoke from entering the kitchen
- Place stoves outside the kitchen where smoke cannot enter the kitchen
- Provide convenient access to stoves from inside the kitchen

Design solution:

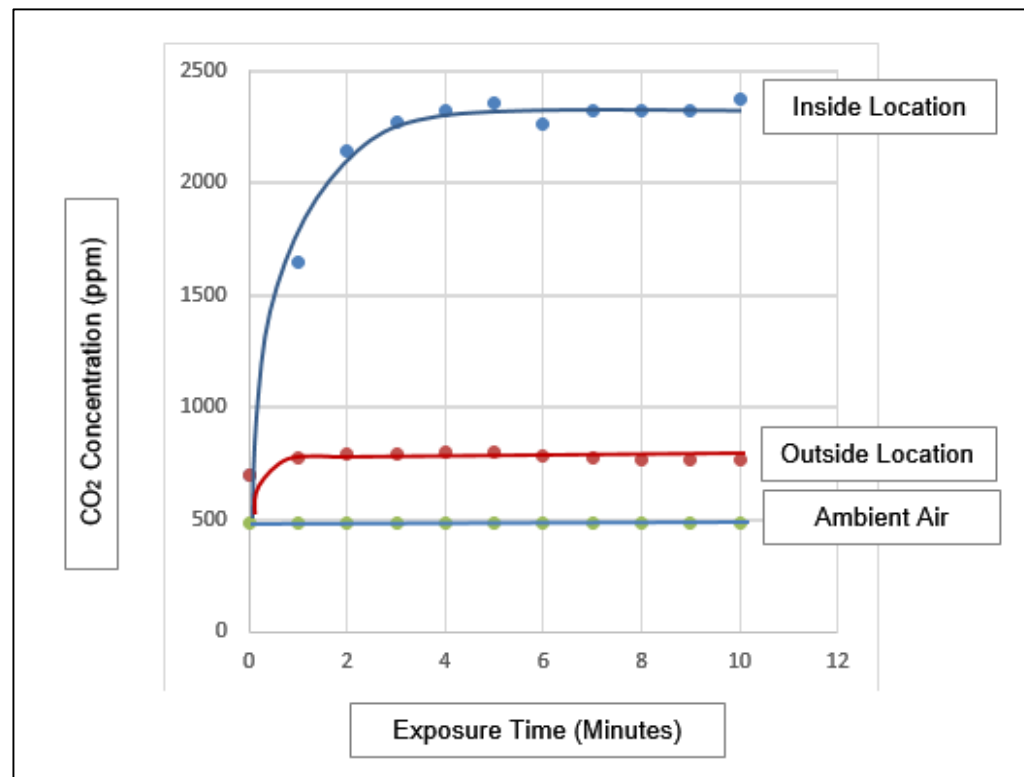


Traditional Design



New Design

Performance evaluation of scale model:



Prototype kitchen in use:



Interior View



Exterior View

Stove Location

Outcome:

- Successful application of a simple design solution
- Reduction of indoor smoke exposure by 75%

Future:

- Encourage families to consider simple “retrofit” options for moving stoves to the exterior of their kitchens.

Responses from rural women:

Question:

- Why have the kitchens not been improved (changed) in the past ?

Answers:

- “Men make all of the decisions. Men do not enter the kitchens. Men do not know much about cooking”.
- “Wind coming through windows and doors make the smoke conditions worse”.
- “Open windows increase the risk of theft. Animals (chicken, ducks dogs, cats, etc.) have to be safe at night. Predators will kill the animals if they are not protected”.

Responses from rural women:

Question:

- Do you think smoke in your kitchen will make you sick?

Answer:

- Smoke will make older people sick.
- Dirty water will make our babies sick.

Thank You

