gira
grupo interdisciplinario de tecnología rural apropiada

ESTUFA patsari

CIECO

INTEGRATED PATSARI STOVE MONITORING PROGRAM

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Shell Foundation

Instituto de Ingeniería UNAM

The University of Liverpool

Instituto Nacional de Salud Pública

Comisión Federal para la Protección contra Riesgos Sanitarios

CONAFOR Comisión Nacional Forestal

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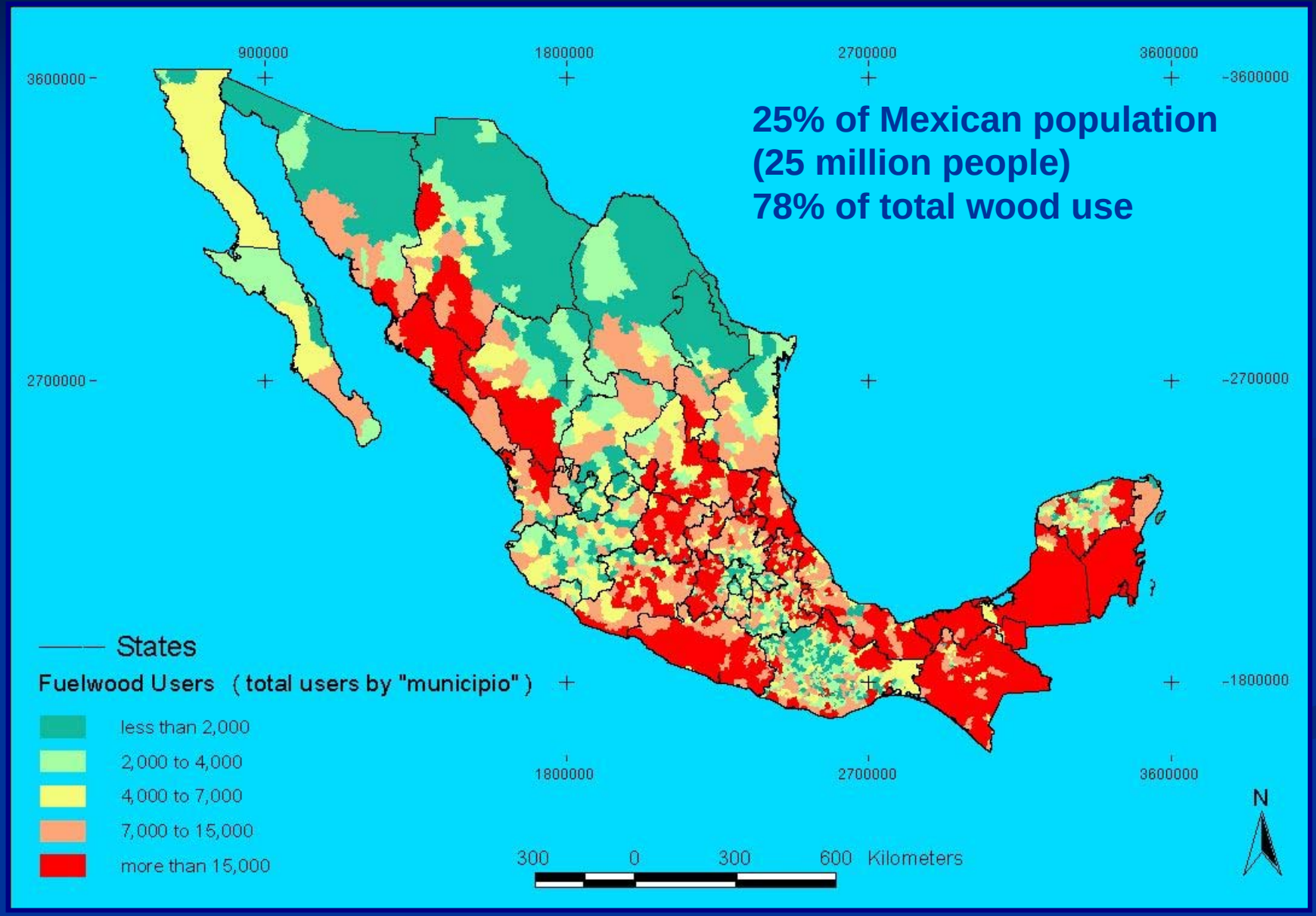
Total number of fuelwood users



25% of Mexican population (25 million people)
78% of total wood use

Challenges ... is fuel switching the solution?

There is no “fuel switching” but multiple fuel use

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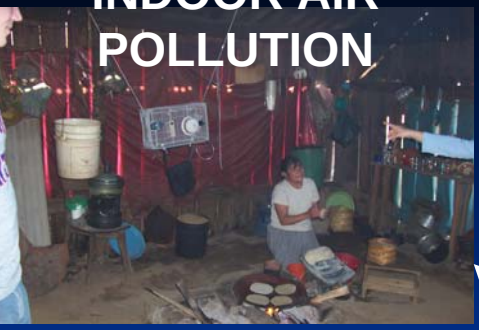
Stove Models

MONITORING PROGRAM

MAIN OBJECTIVES

- ✓ To document the impacts from open fires and Patsari Stoves
- ✓ To understand users perceptions and preferences related to stove adoption and use
- ✓ To develop replicable approaches and protocols

INDOOR AIR POLLUTION



ADOPTION

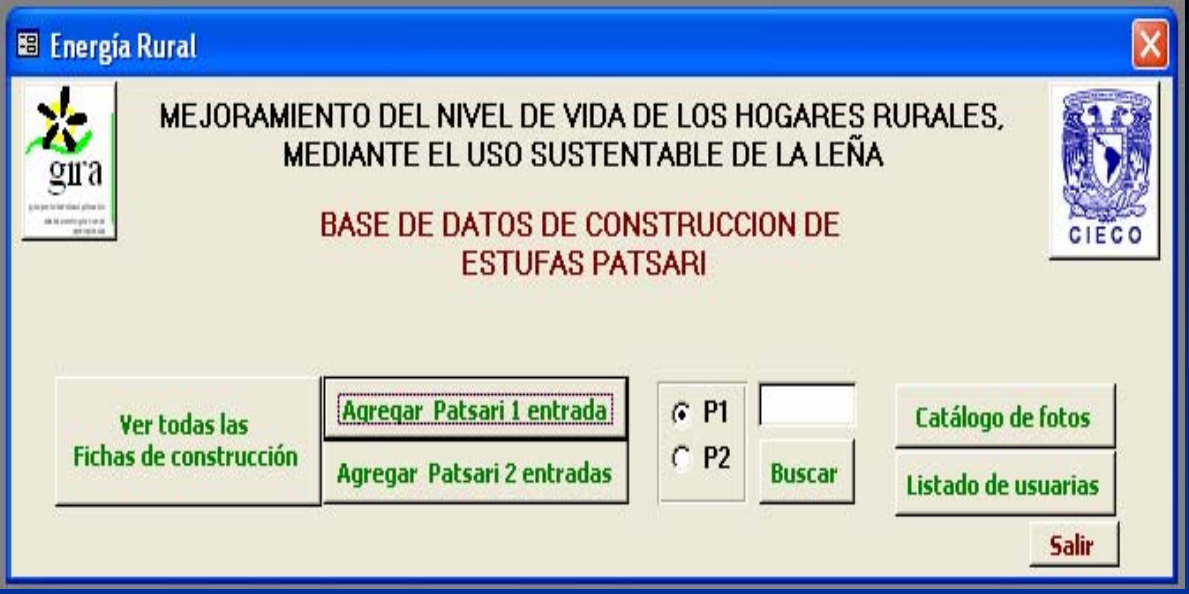
HEALTH IMPACTS

EFFICIENT TECHNOLOGY (PATSARI STOVE CONCEPT)

GREENHOUSE GASES

PERCEPTIONS

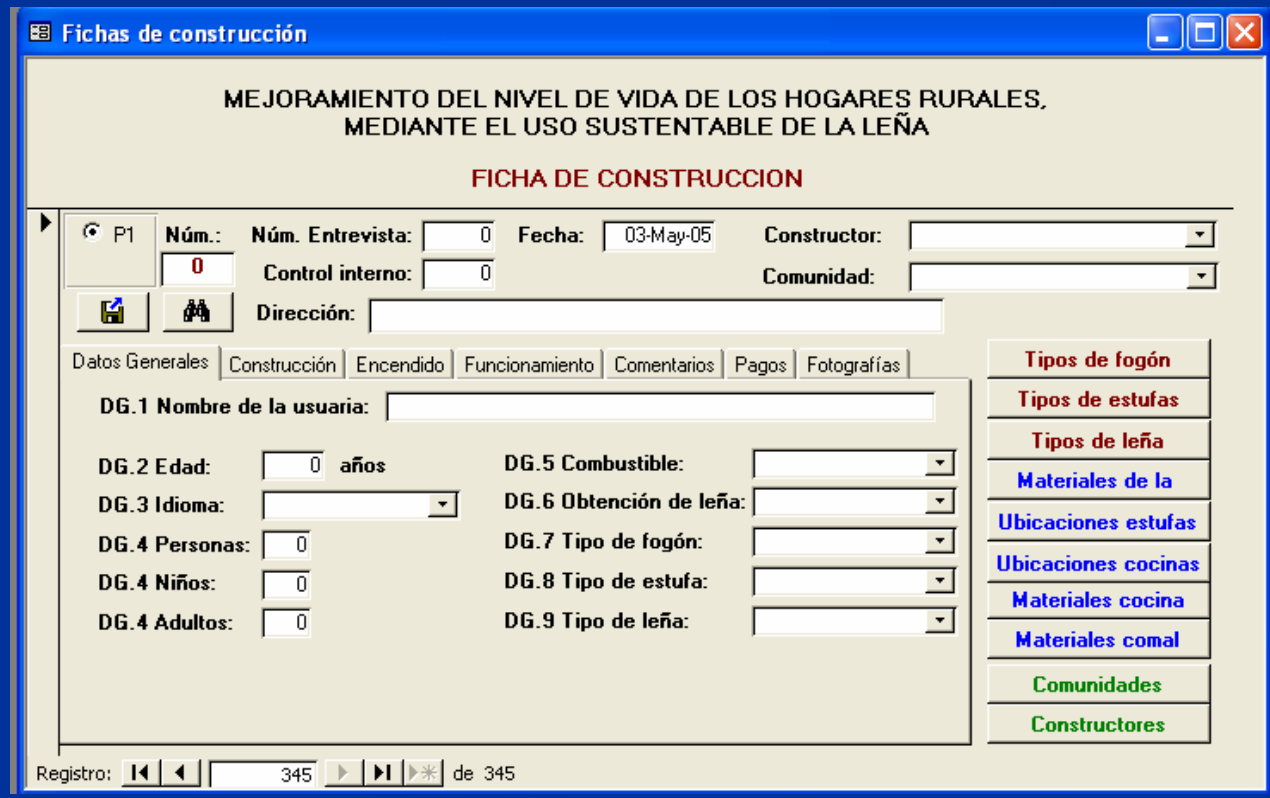
TECHNOLOGY PERFORMANCE



Stove Monitoring Data Base

Data on:

Household
Stove
Cookstove Builder
Maintenance Issues



USERS PERCEPTIONS

OBJECTIVES

Understand users perceptions and attitudes related to stove adoption and use in terms of:

- Social and cultural aspects
- Health
- Time/ Activities
- Cooking preferences

TOOLS

- Focus Groups (20)
- Key informants (interviews in depth) Questionnaires (60)

Stove Adoption

Ultimate goal for cookstoves programs → having each stove used properly

Key: understanding stove "adoption" and use (poorly researched up to now)

Lessons learned

- Is a process not a simple "switching"
- Cookstoves will never be better than open fires on all aspects
- Dynamic process –the stove changes households habits;
  - Savings are many times less than technically expected because of increased consumption (elasticity of demand)
- Learning process
  - Feeding fuel (size, amount), stove maintenance (chimney, tunnels)
  - Needs monitoring -30% do not adopt even if paying full cost-

Stove Adoption

Lessons learned

- Use of open fires may continue for specific tasks, however…
- Spin-off effects → stoves foster further changes in kitchen design, social gathering
- Users Priorities change before/after adoption
  - Having a nice kitchen most important before adoption
  - Smoke and fuelwood savings acknowledged after adoption
- Households are not the same (even within same income group)
  - Target the right group (early adopters or "innovators")

PRELIMINARY RESULTS

Improved Stoves- Expectations

- Don't return smoke
- Heat fast and uniformly
- Use ceramic "comal"
- Save fuelwood

Time/Activity

- About kitchen
  - Spend much time (between 6 and 7 hours per day)
  - Open fire is burned between 2 and 4 times/day
- About fuelwood
  - Spend a lot of time in fw collection (between 3 and 7 hours)
  - If they will have free time they will use it for domestic activities

HEALTH IMPACTS

OBJECTIVES

- To evaluate the health benefits of Patsari Stoves

METHODS:

- Survey (600 households; 18 months)
- Medical records:
  - spirometry, oximetry, CO exhalado, hemoglobin, inmunoglobuline

STOVE PERFORMANCE

OBJECTIVES:

To evaluate the Stove performance, both in Laboratory and field conditions

METHODS:

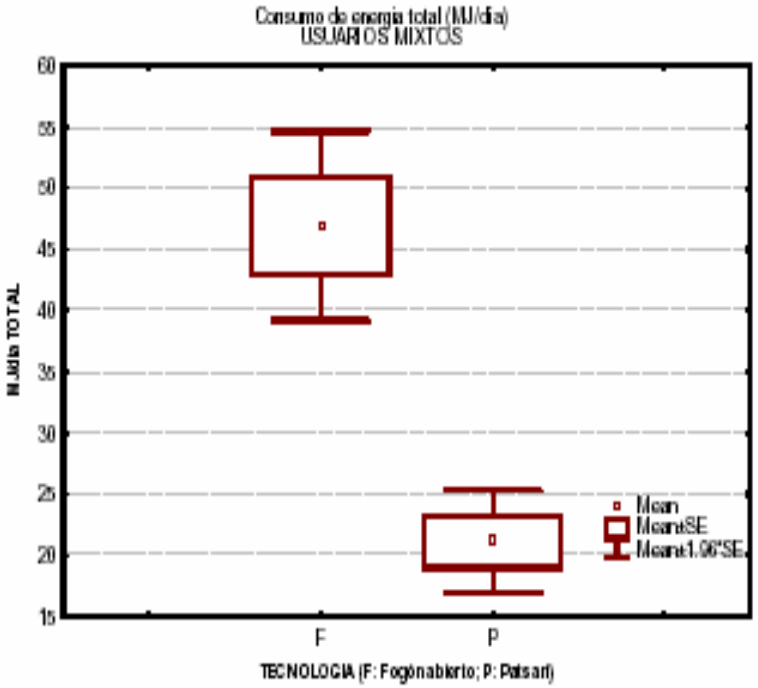
- Water Boiling Test (WBT)
- Controlled Cooking Test (CCT)
- Kitchen Performance Test (KPT)

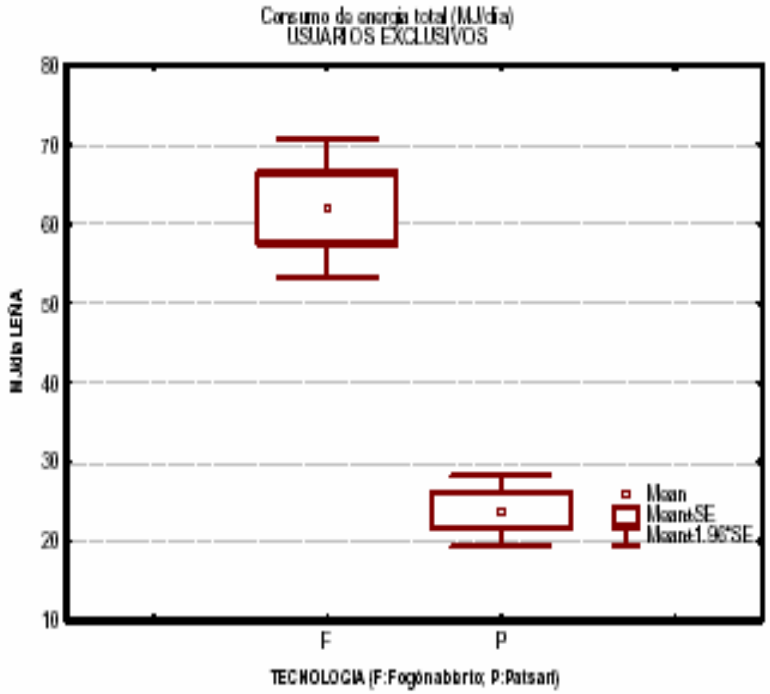
Controlled Cooking Tests for Tortillas

Stove type	Fw CL (kg leña/kg tortilla)	Fw Saved (%)
Patsari 1 entry (metal comal)	0.63	**66%**
Patsari 2 entry (pottery comal)	0.91	**51%**
Open Fire (3 Stones)	1.49	19%

Kitchen Performance Tests

55% fuelwood savings on field conditions
40% savings also on LPG!





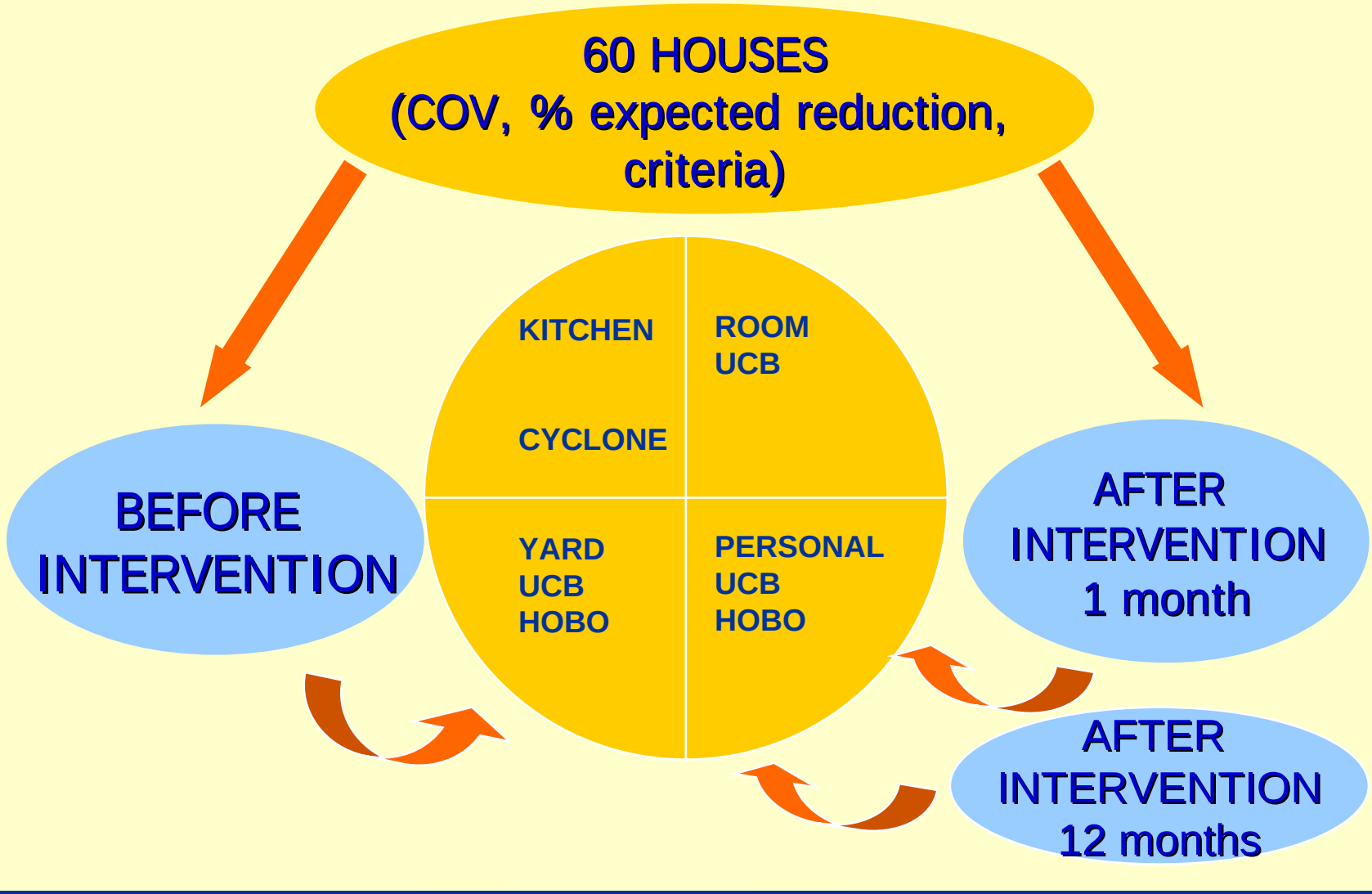
47 households, before/after stove installation

Indoor Air Pollution

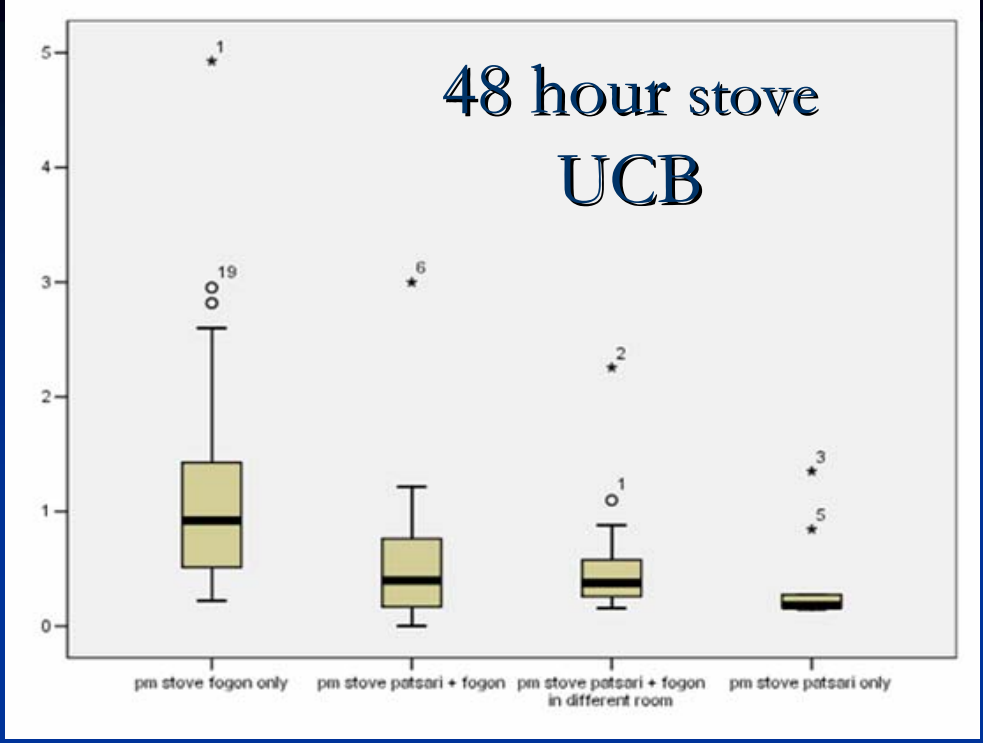
Total: 60 households

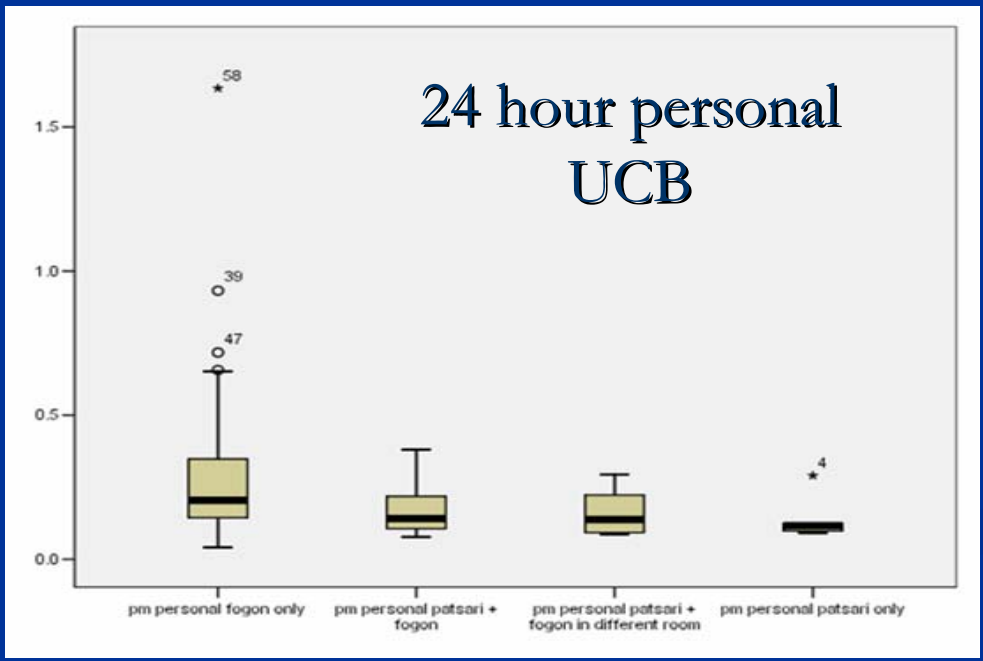
Before/ After Measurements

Sampling Frame and Experimental Design



Indoor Air Pollution Monitoring Tools





PM in mg/m^3

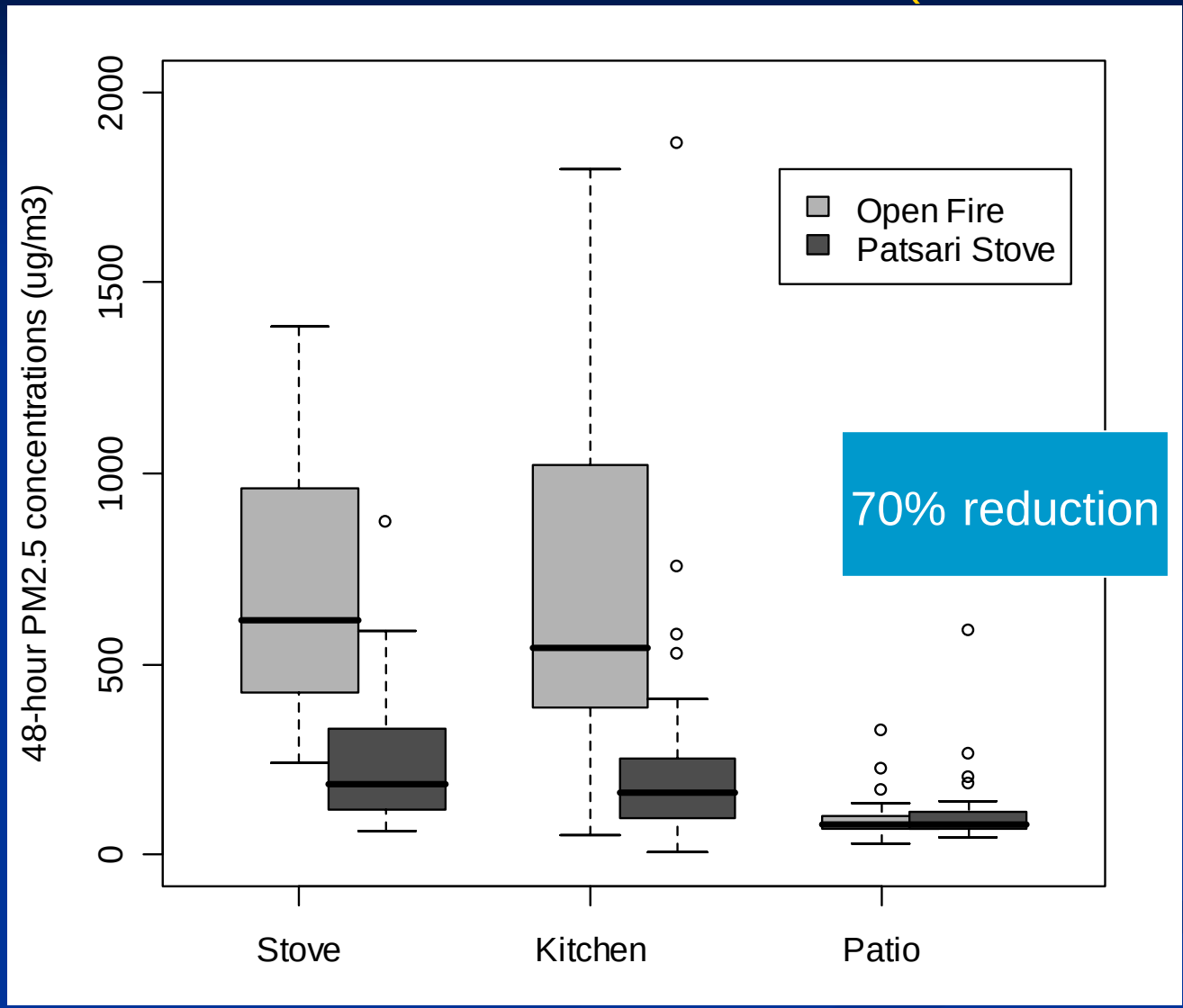
PM STOVE	N	Mean	Wilcoxon SRT* Sig
fogon only	62	1.09	
patsari + fogon	20	0.60	0.006
patsari + fogon in different room	26	0.51	0.000
patsari only	10	0.37	0.005

PM PERSONAL	N	Mean
fogon only	51	0.29
patsari + fogon	10	0.18
patsari + fogon in different room	9	**0.16**
patsari only	7	0.13

PM and CO Reduction

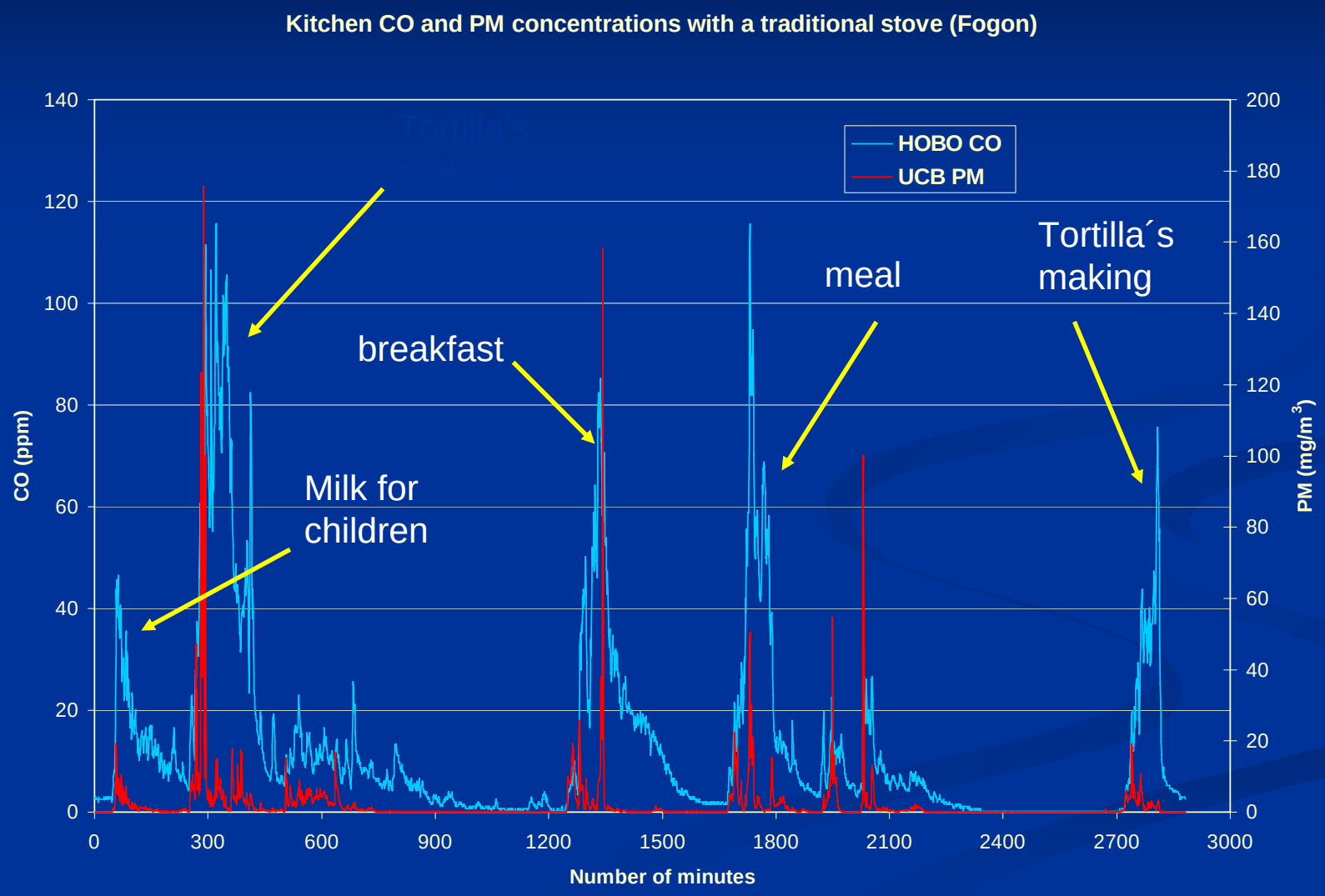
		PM (mg/m^3)		CO (ppm)	
		Stove	Personal	Stove	Personal
Fogón	Mean	1.09	0.29	8.20	1.82
Patsari + Fogón	Mean	0.60	0.18	3.75	0.83
	Reduction (%)	45	38	54	54
Patsari + Fogón different room	Mean	0.51	0.16	3.31	0.91
	Reduction (%)	53	47	60	50
Patsari only	Mean	0.37	0.14	1.50	0.97
	Reduction (%)	66	54	82	47

$PM_{2.5}$ Concentrations in Stove, Kitchen and Patio microenvironments within the homes (Gravimetric)

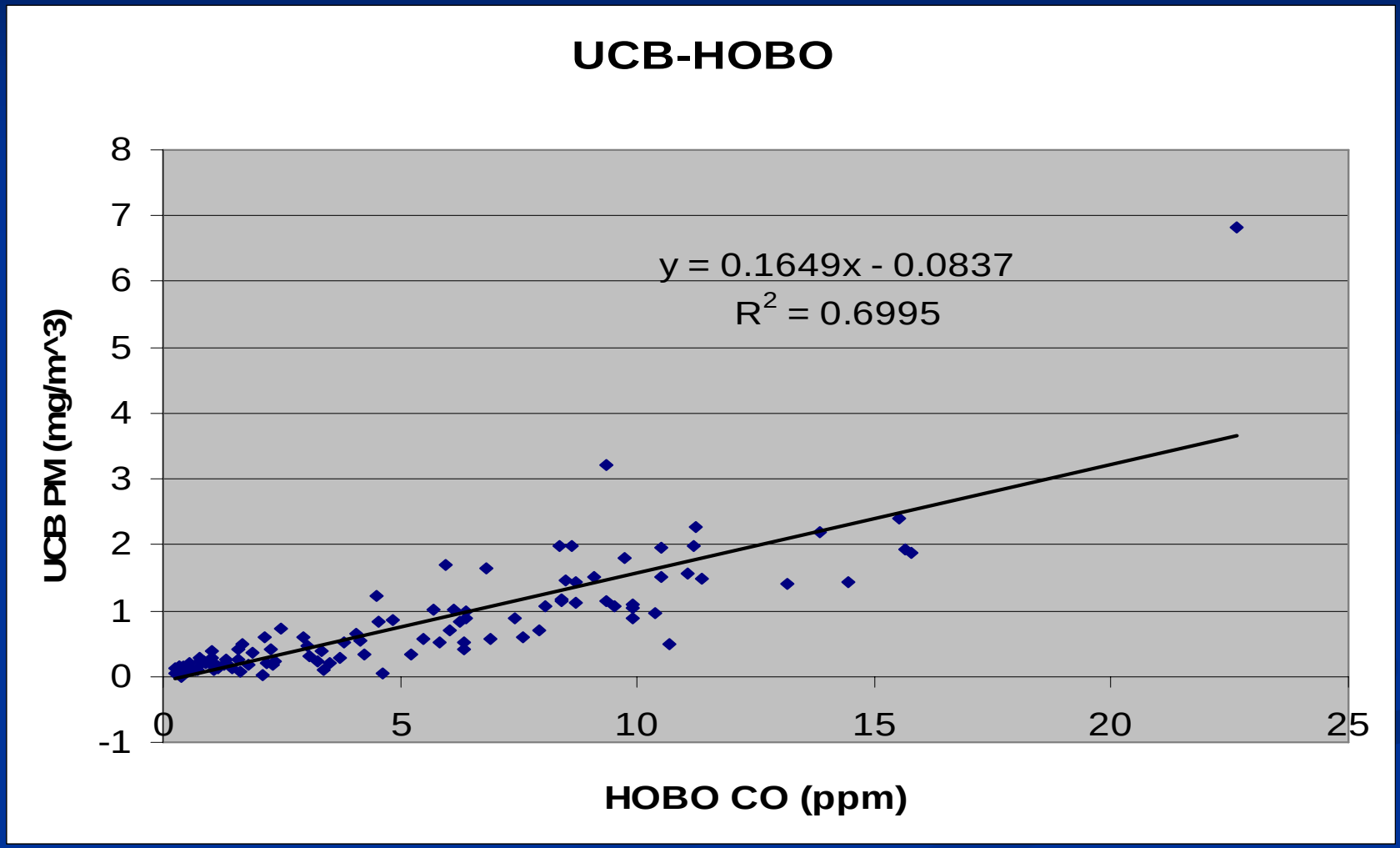


Source: Zuk et al. 2006

Continuous data give an idea of activities inside homes



CO (HOBO) vs. $PM_{2.5}$ (UCB)



GREENHOUSE GAS EMISSIONS

OBJECTIVE:

Quantify GHG emissions from open fires and Patsari Stoves

- Measure emissions on the field with a portable hood

TOOLS:

- Gas Cromatography
- Gas analyzer
- Measurements of CO, CH4, TNMHC

GASES DE EFECTO INVERNADERO

Sample

Lab and Field Measurements

- ✓ Fogones
- ✓ Patsari Stove

Total: 30 households

Lessons learned

- Expected Patsari Stoves benefits provide a strong case for intervention (health, local and global environmental, and socio-economic benefits achieved)
- Stove adoption is a "process" that takes time, users and stove influence each other, stove can foster long-term changes –kitchen re-modelling; etc- More work here is needed
- Need of sustainability (multi-criteria) assessments for proper stove evaluation
- Need to simplify protocols and to provide less expensive and easy-to-use measurement devices

Thanks!