



# Fueling Demand: Improved Cookstoves Sales in India

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# *Why do so few people adopt improved stoves?*

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- Programs are not always successful (India; Hanna et al. 2012)
- “No easy answers” (Shell Foundation Report from India 2012; GACC)
- Demand is often low; adoption rates usually 0% - 20% (Mobarak et al.)
- However, some positive evidence that reducing risk and addressing liquidity constraints helps (Uganda; Levine and Cotterman 2012)
- Convenience and fuel savings beneficial (Senegal; Bensch and Peters 2015)

# *Why do so few people adopt improved stoves?*

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- **Don't Know** – Health risk or correct use of stove?
  - **Don't Care** - Culturally Non-ideal?
  - **Can't Pay**- High stove cost or alternative fuel cost?
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- In this context:
  - We designed set of **8 pilot programs** to sell ICS
    - Sought to learn what was effective at increasing ICS sales
    - Deliberate variation between programs to find successful mix
  - Next, applied findings to inform large ICS intervention

# Overview

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- 8 pilot programs to sell ICS in India
  - Randomly selected ~15 households per pilot
  - Household surveys
- Used social marketing framework to test:
  - Promotion (Information and marketing)
  - Product (Stove type)
  - Price (Payment plan and rebates)
  - Place (Context and Institution/NGO)
- Deliberately varied factors to find successful mix



# Promotion

- Behavior Change Communication
  - Demonstration
  - Household visit
  - Informational campaign: poster, pamphlet
- Messaging about ICS:
  - Saves wood
  - Saves time
  - Reduces smoke
- Messengers also differed (training, experience)



उन्नत चूल्हा जपान पर से आइये   जपान परिवार जोर जमल को बढ़ाइये			
चूल्हे	अंगीठी	उन्नत चूल्हा पौनवे	उन्नत चूल्हा जी-कोईल
ईंधन की जरूरत	100% खर्च	70% खर्च	
समय की बचत			
धुआँ और सेहत	100%	65% कम	
हल्का करंट			कभी कभी- हल्का सा करंट लग सकता है। * रोते की पर, बरसात या जमीन की लहराव।
दाम	0	1300 रुपए	900 रुपए
किरात	0	875 रुपए की 2 किशत हर 2 हफ्ते बाद	470 रुपए की 2 किशत हर 2 हफ्ते बाद
कम ईंधन   कम समय   कम धुआँ   स्वस्थ परिवार			



# Product

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- Three stove types
  - Natural draft ICS (Greenway Smart Stove)
  - Forced draft ICS (Annapurna/TERI Stove)
  - Electric stove (G-Coil)
- Some pilots included stove choice option
- Piloting different stoves also tested distribution and supply chain across India



# Price

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- Stove price varied
- Sold at *market price* (except forced draft)
- Payment plans varied
  - Installments (1/3 of stove price)
  - Rebates if stove used (random)
  - Optional stove return



# Place

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Gangetic Plains of UP



Tropical Odisha



Mountains of Uttarakhand



Field partners & local institutions



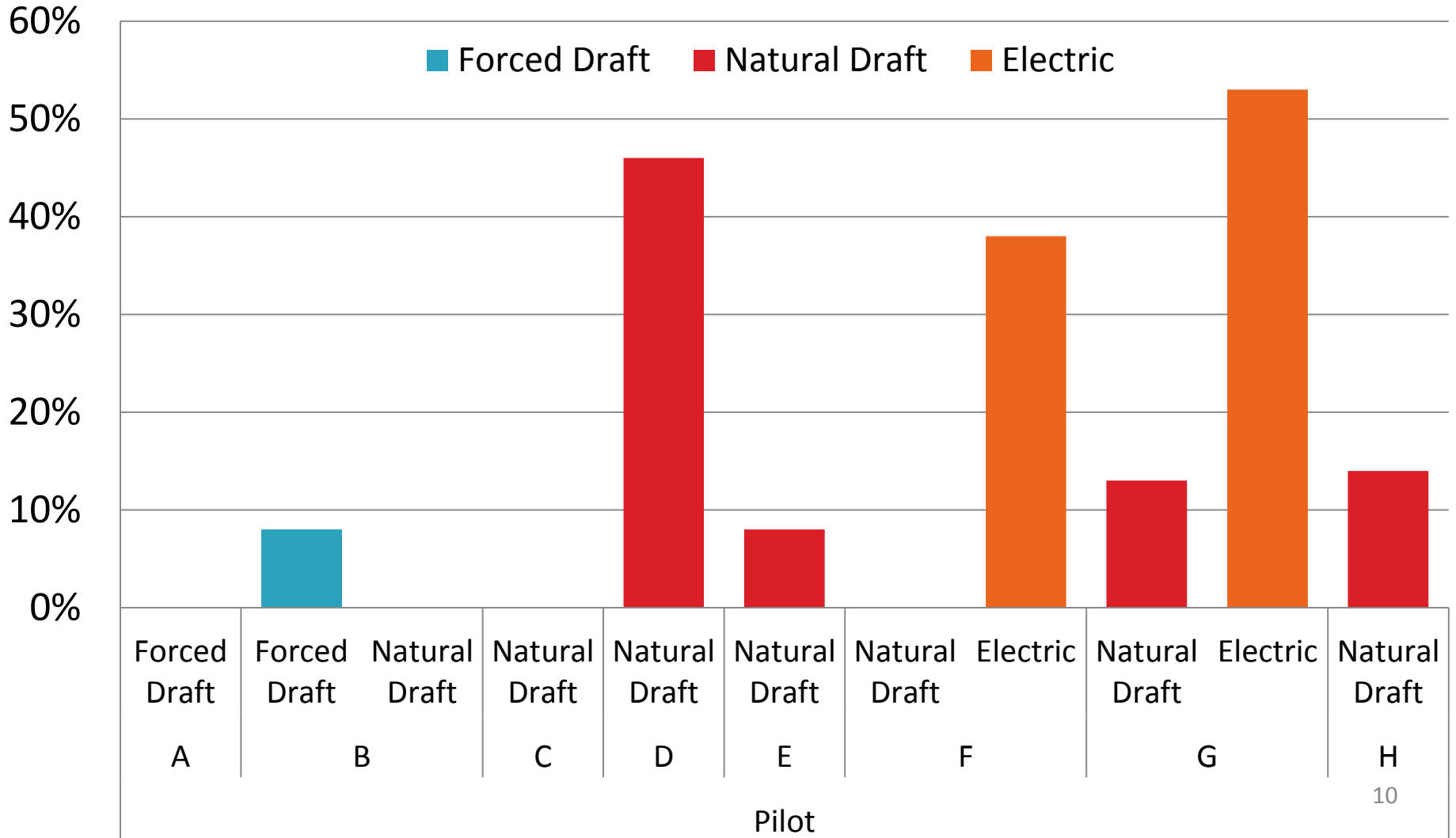


# Pilot sample characteristics

Household characteristics	Uttar Pradesh	Odisha	Uttarakhand	Total
Total # hh	23	49	45	117
BPL	48%	43%	71%	55%
Head of household educ. (yrs)	5.3	5.1	6.7	5.7
Head cook educ. (yrs)	1.4	3.4	5.1	3.6
SHG membership	9%	57%	62%	50%
# hrs electricity	5.0	18.8	20.2	16.6
% taken out a loan	9%	18%	64%	34%
% latrine access	9%	94%	98%	79%
<b>Stove / Fuel Use</b>				
% fuelwood used for heat	100%	76%	98%	89%
% trad stove ownership	100%	96%	98%	97%
% Imp stove ownership	9%	14%	60%	31%
Time gathering fuel (hrs/week)	16.3	4.5	18.8	12.3
<b>Stove Preferences</b>				
Worst attribute of ICS: <i>Cost</i>	42%	97%	48%	63%
Best attribute of ICS: <i>Fuel Required</i>	21%	95%	49%	54%

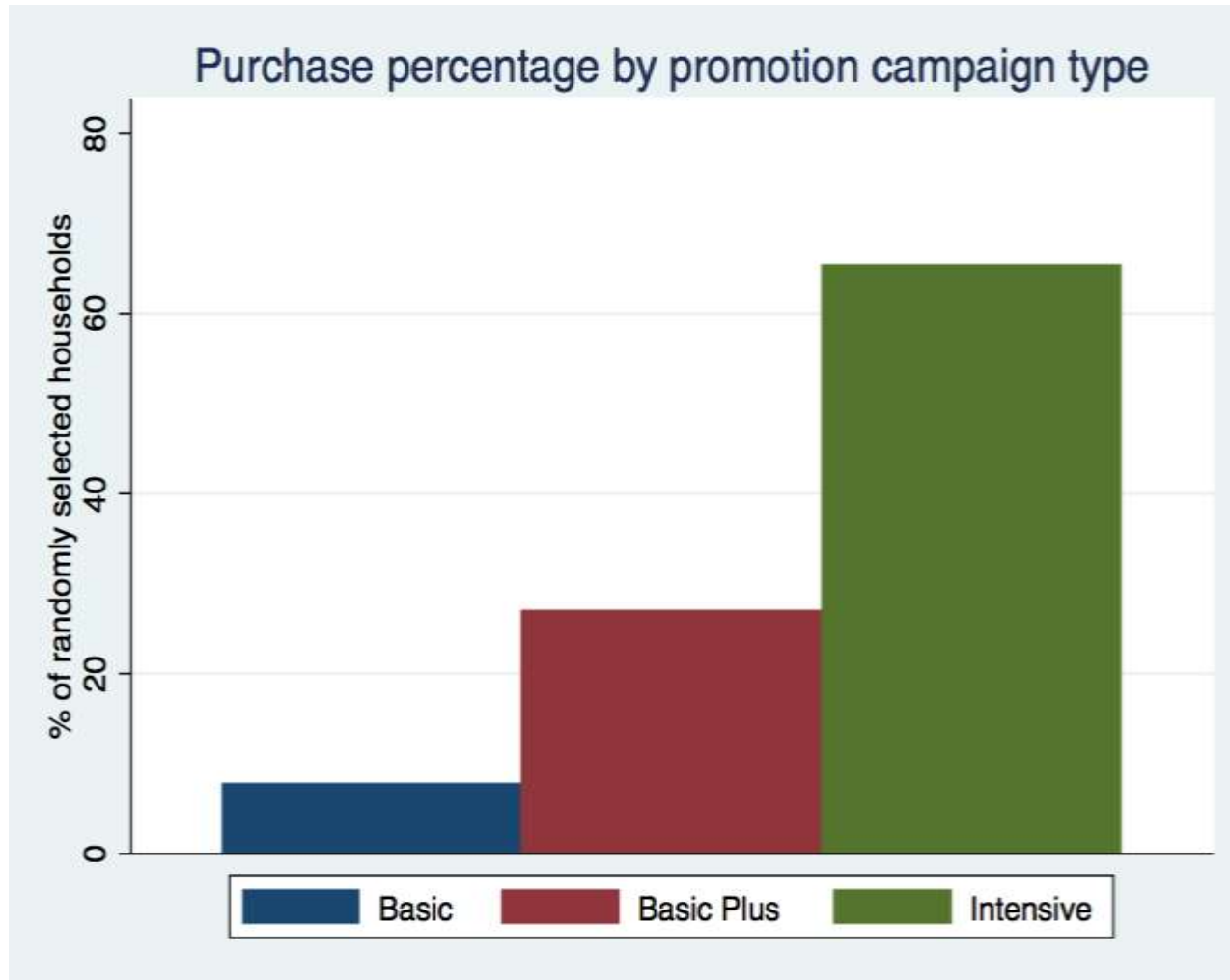
# Pilot Results

## ICS Purchase (% random households)



# Pilot Results: Promotion

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# Pilot Results

Household Characteristic	Purchasers (n=24)	Non Purchasers (n=93)	P-Value
% taken out a loan	63%	27%	0.002***
# hrs electricity	20	16	0.000***
Avg monthly expenditures	3563	3491	0.86
% Imp stove ownership	29%	31%	0.849
Time gathering trad. fuel (hrs/week)	16	11	0.062*
HH received pamphlet	92%	76%	0.036**
HH attended demonstration	88%	73%	0.084*
ICS Top 2 Attribute - Reduced Smoke	9%	53%	0.000***
ICS Top 2 Attribute - Cooking time	66%	33%	0.007***
ICS Top 2 Attribute - Fuel requirement	62%	53%	0.447

- Households used stove over all return visits (3-6 wks)
- Purchasers more likely to have received BCC program
- Purchasers value time and fuel req'd most



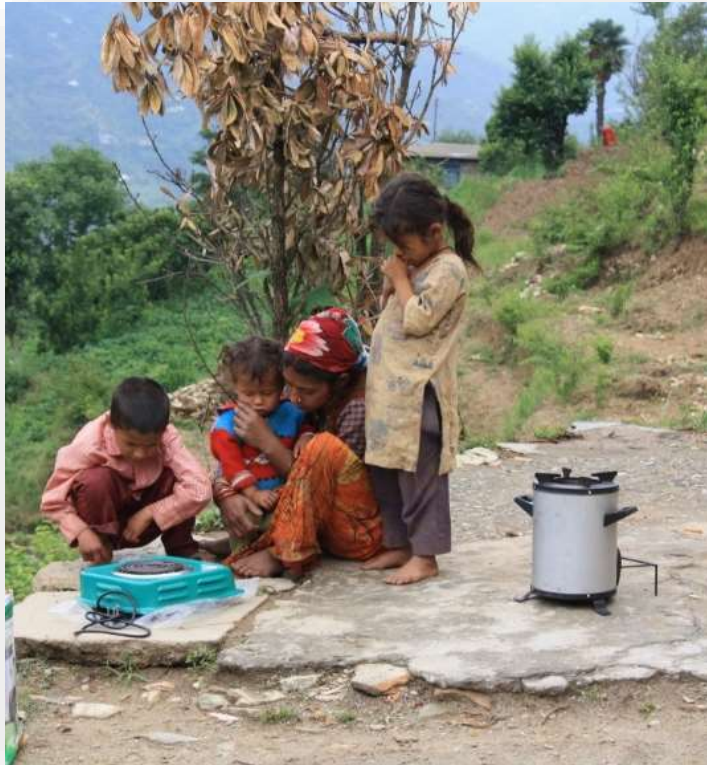
# Pilots Discussion

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- Demand side: Achieved 40-70% sales with:
  - Choice of attractive, affordable stoves (electric)
  - Personalized demonstrations / visits, and detailed explanations
  - Installment payment options critical (cost is an obstacle)

Supply: Getting stoves into villages no easy task!

- No existing ICS supply networks
- Maintenance concerns
- Implementing organization must be trusted and effective



# Moving from Pilot to Intervention

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- Based on results of pilot programs, planned ICS intervention
- 1,000 households in Uttarakhand (Himalaya)
- Randomly selected:
  - 770 HH: Intervention group (received stove sales offer)
  - 230 HH: Control group (no stove sales offer)
  - Confirmed intervention & control group were similar



# Intervention design

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1. Information campaign – Fact sheets comparing two available improved stoves (electric G-coil and natural draft biomass) to traditional stoves; explanation



Promotional material  
& product sales plan



Natural draft & electric stoves

# Intervention design

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1. Information campaign – Fact sheets comparing two available improved stoves (electric G-coil and natural draft biomass) to traditional stoves; explanation
2. Personalized household demonstrations, to all sample households in intervention communities



Training & messaging



Field testing & demonstrating



# Intervention design

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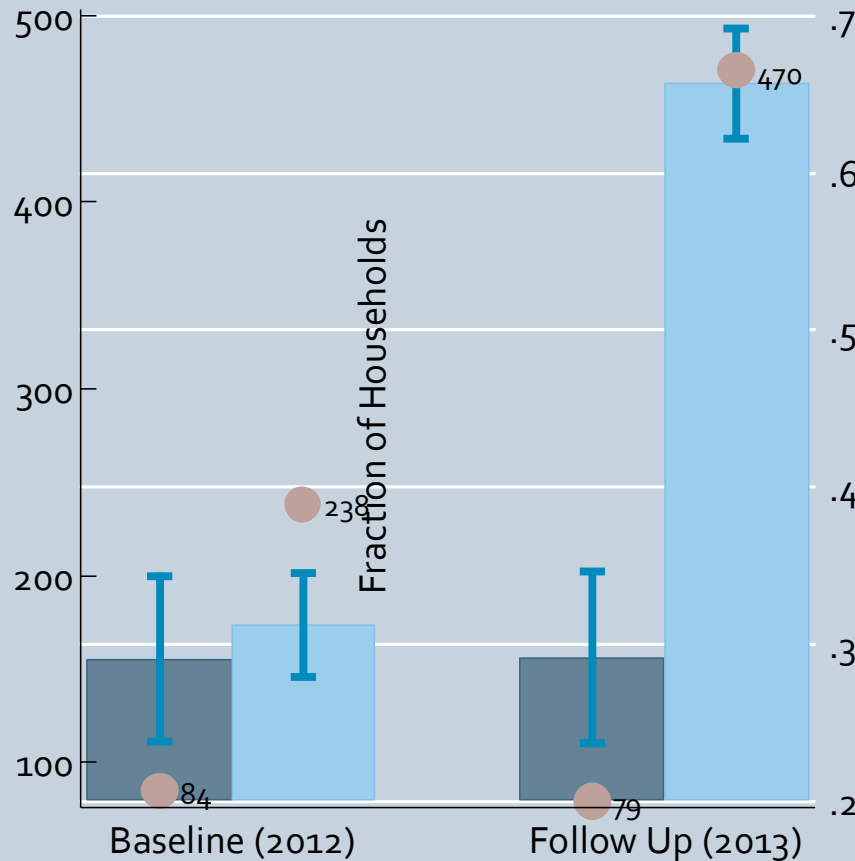
1. Information campaign – Fact sheets comparing two available improved stoves (electric G-coil and natural draft biomass) to traditional stoves; explanation
2. Personalized household demonstrations, to all sample households in intervention communities
3. Payment in 3 even installments
4. Rebates randomized at the household level

Finance plan  
including random  
rebates conditional  
on use



# Intervention Results 1: Purchase

## Improved Cookstove Ownership



**Large purchase response at market price**

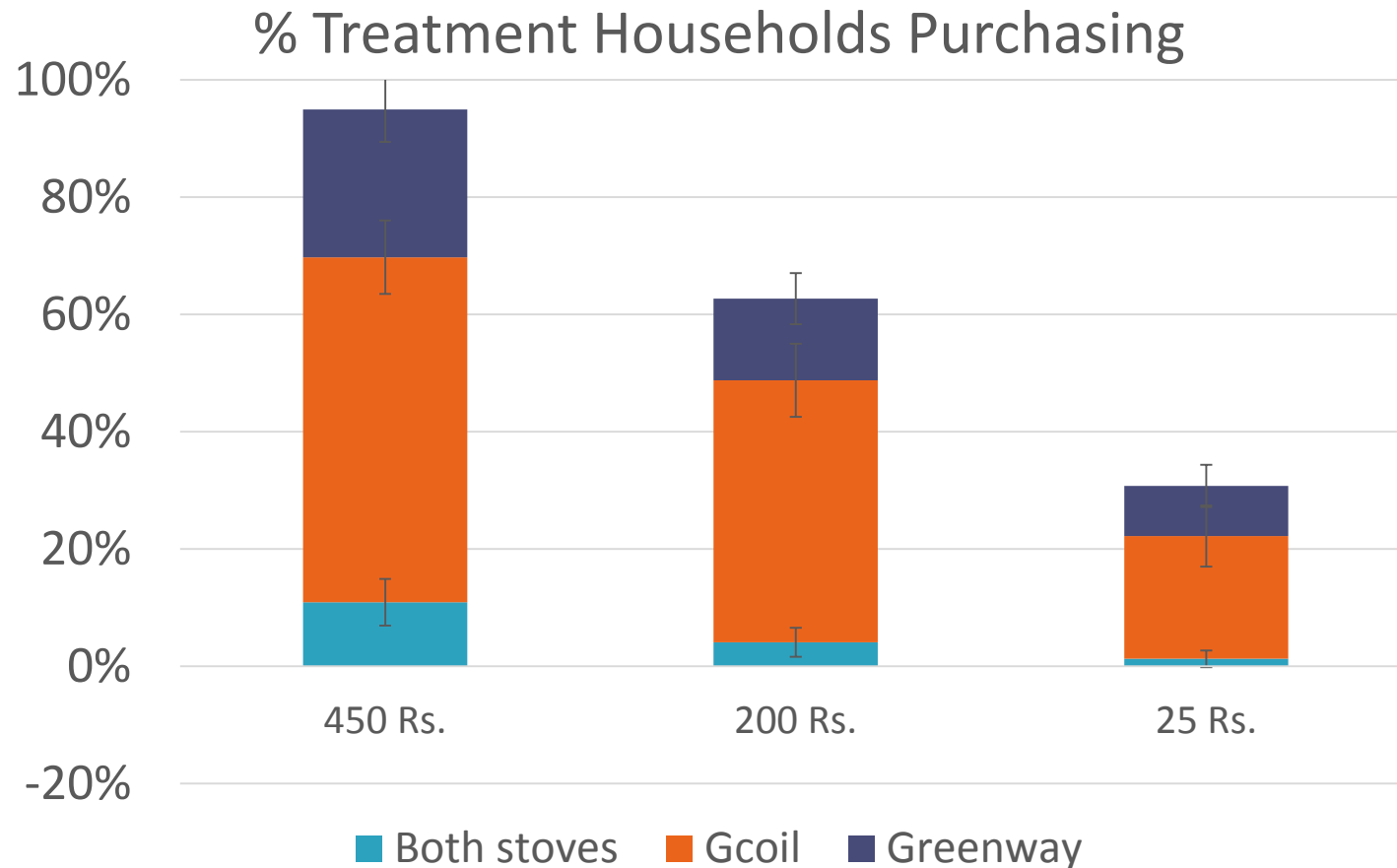
Possible to achieve high ICS adoption in low income settings!

(Pattanayak et al., in prep.)

# Intervention Results 2: Price effect

## Modest price incentives make a big difference

- Sales increase from ~35% to >80% across rebate levels
- These incentives translate into greater use, despite our fears



# Intervention Results 3: Other outcomes

<b>Adoption/Use Outcome</b>	Treatment at follow-up	Control at follow-up	DiD estimate (std. error)
Own any improved stove	66%	29%	0.365*** (0.0589)
Own intervention stove	52%	0%	0.521*** (0.0290)
Own traditional stove	97%	99%	-0.0211* (0.0115)
Own Greenway stove	15%	0%	0.150*** (0.0207)
Own G-Coil stove	39%	0%	0.391*** (0.0254)
Used improved stove (prior week)	58%	27%	0.309*** (0.0555)
Used intervention stove (prior week)	29%	0%	0.288*** (0.0247)
Used clean fuel daily	48%	25%	0.230*** (0.0580)
Hours of traditional stove use daily	2.44	3.14	-0.700** (0.347)
N	716	271	987

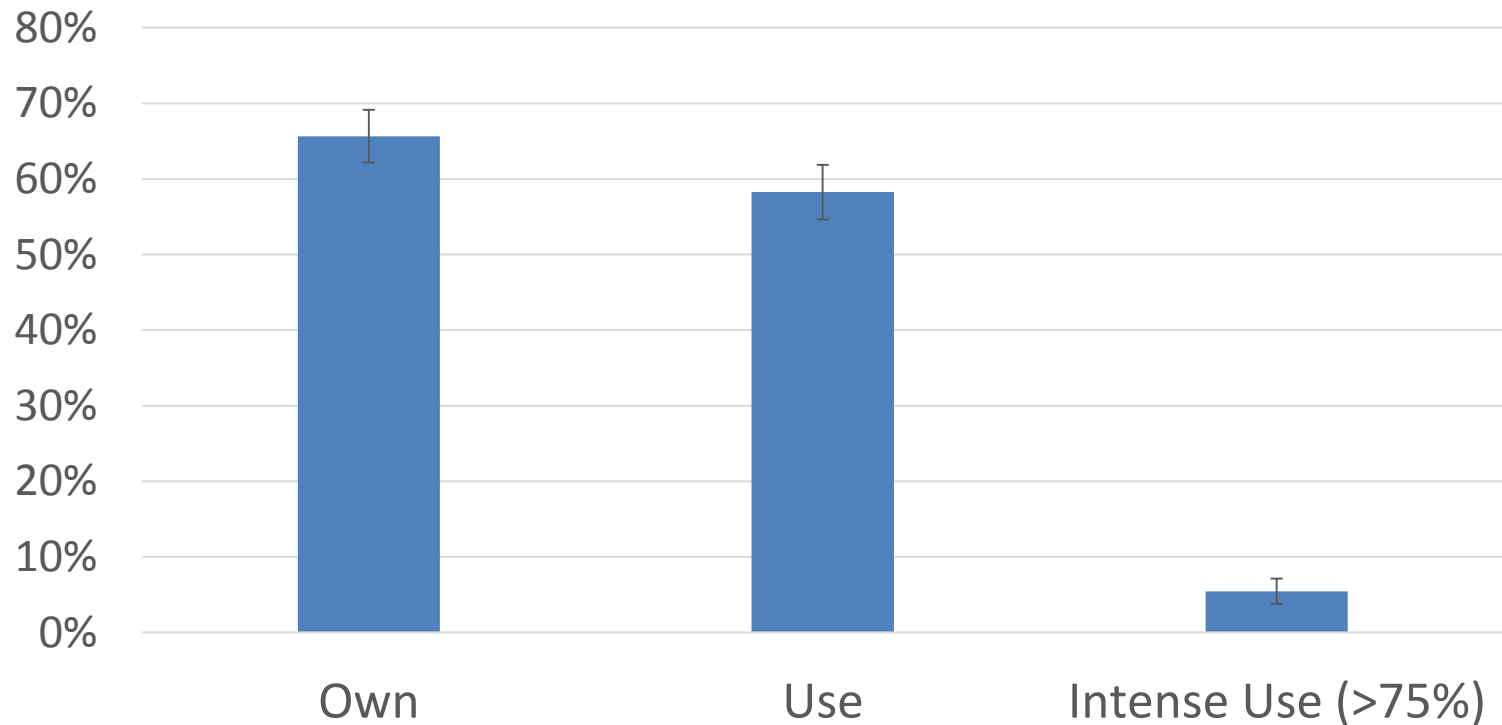


# Intervention Results 4: Use?

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- Ownership does not guarantee intensive use
- Households use multiple stoves

Any Improved Stove  
(Intervention Households)



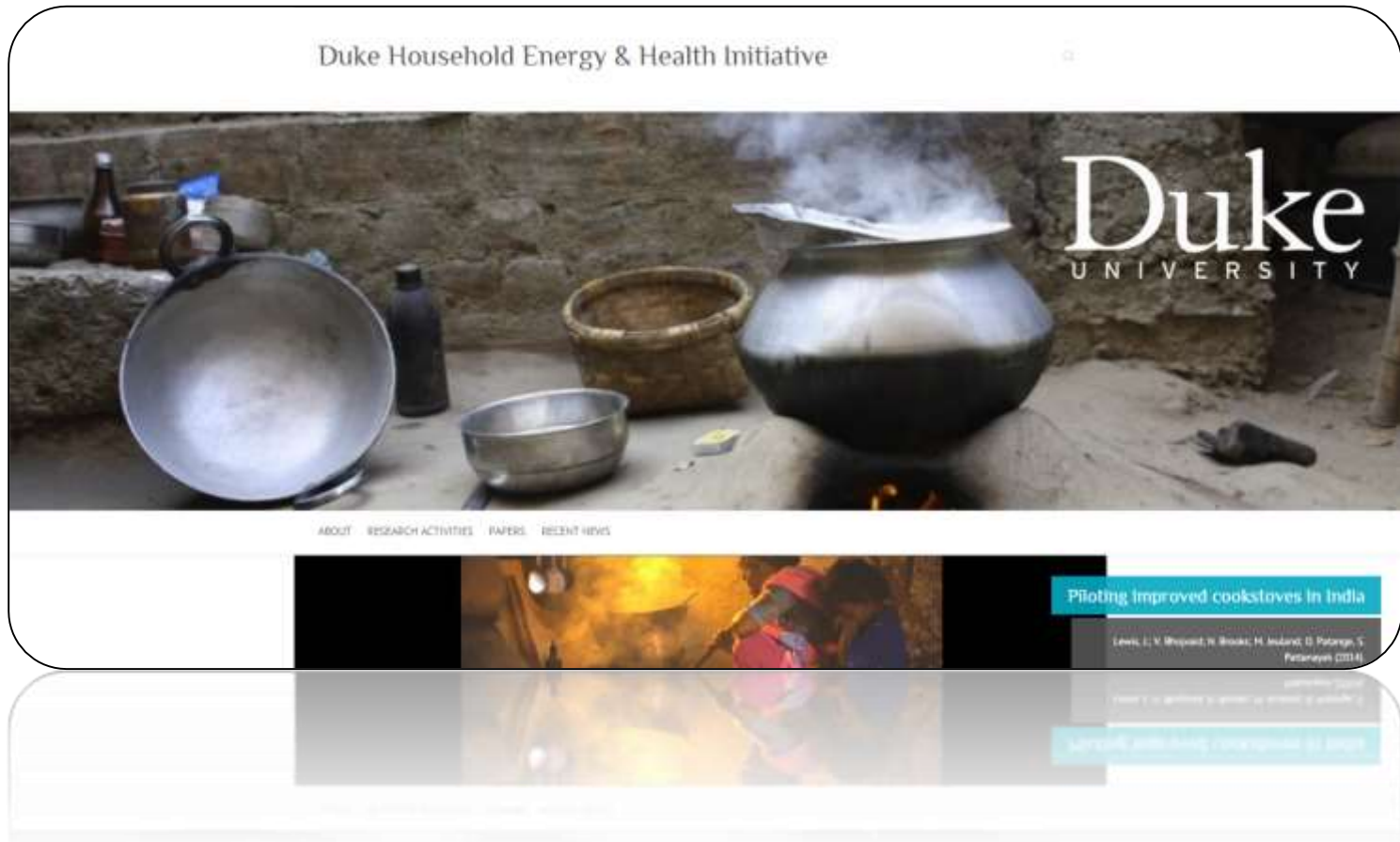
# Intervention: Lessons Learned

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1. Important to consider what people want before selling
2. Field testing critically important
3. Possible to achieve high adoption
4. Sustained use remains difficult

# Thank You



<http://dukeenergyhealth.org>

# Extra Slides

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# What we varied in these pilots

Plan	Partner	Payment design	Social marketing	Stoves offered	Sales
<b>Uttar Pradesh</b>					
A Non-TERI	TERI	<ul style="list-style-type: none"> <li>• Upfront payment</li> <li>• Rebates w/use</li> </ul>	Basic: <ul style="list-style-type: none"> <li>• Pamphlets</li> <li>• HH demos</li> </ul>	Natural + Forced draft	0 stoves
B		<ul style="list-style-type: none"> <li>• Installments</li> </ul>	Basic	Natural + Forced draft	3 stoves
C		<ul style="list-style-type: none"> <li>• Installments</li> <li>• Rebates w/use</li> </ul>	Intensive: <ul style="list-style-type: none"> <li>• Basic activities + ...</li> <li>• Community demos</li> <li>• Village posters</li> </ul>	Natural draft	4 stoves
<b>Orissa</b>					
D	Gram Vikas	<ul style="list-style-type: none"> <li>• Installments</li> <li>• Rebates w/use</li> </ul>	Intensive + NGO	Natural draft	14 stoves
E		<ul style="list-style-type: none"> <li>• Installments</li> </ul>	Intensive + NGO	Natural draft	4 stoves
<b>Uttarakhand</b>					
F	Chirag	<ul style="list-style-type: none"> <li>• Installments</li> <li>• Rebates w/use</li> </ul>	Extended Intensive + NGO <ul style="list-style-type: none"> <li>• Extended village demos</li> <li>• New pamphlets</li> <li>• HH visits and demos</li> </ul>	Natural draft + Electric stove	19 stoves
G		<ul style="list-style-type: none"> <li>• Installments</li> <li>• Stove return option</li> </ul>	Extended Intensive + NGO (see Plan F)	Natural draft + Electric stove	17 stoves
H		<ul style="list-style-type: none"> <li>• Installments</li> <li>• Rebates w/use</li> </ul>	Extended Intensive + NGO (see Plan F)	Natural draft	2 stoves

# Results: Correlates of clean stove / fuel use (baseline)

Variable	A. Own clean stove		B. Used clean stove; past wk		C. Used clean fuel; past wk	
	Logit		Logit		Logit	
	Coef.	St.Err.	Coef.	St.Err.	Coef.	St.Err.
Relative wealth	0.93***	0.12	0.90***	0.12	0.34***	0.10
# Rooms	0.10**	0.04	0.08**	0.03	0.11***	0.04
Head of household education	0.13***	0.02	0.12***	0.02	0.07***	0.01
Household size	-0.14***	0.04	-0.13***	0.05	-0.07	0.03
Female respondent only	0.22	0.15	0.14	0.16	-0.06	0.16
Female-headed household	0.66***	0.20	0.77***	0.19	0.35**	0.14
Household head age	0.02***	0.01	0.02***	0.01	-0.00	0.00
Uttar Pradesh (state dummy)	1.57***	0.34	1.50***	0.37	1.34***	0.26
Awareness of clean stoves	-0.49**	0.24	-0.43	0.30	-0.60***	0.18
Can change negative impacts	0.61***	0.22	0.50***	0.24	0.68***	0.17
Household uses/owns toilet	2.32***	0.26	2.47***	0.27	1.10***	0.21
Most patient	-0.00	0.15	-0.00	0.14	0.49***	0.15
Most risk-taking	-0.32**	0.15	-0.25**	0.14	-0.68***	0.16
Constant	-4.48***	1.64	-4.91***	1.69	-3.02***	1.06
Observations	1,857		1,857		1,857	
Pseudo-R <sup>2</sup>	0.335		0.335		0.125	

**Notes:** Several variables not shown, s.e. clustering at village level