Randomized Evaluation of Improved Cooking Stoves in Orissa, India

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Motivation

- One half of the world population, and up to 95% in poor countries, continues to rely on solid fuels, including biomass fuels (wood, dung, agricultural residues) and coal, to meet their energy needs

- Using these fuels on traditional stoves can result in high levels of indoor air pollution (IAP)

Traditional “Chulha”

Improved Cooking Stoves

- To combat the potentially large health threats of IAP, many organizations and governments advocate the distribution or subsidy of the improved cooking stove

Improved Cooking Stove

Improved Cooking Stoves

- For example, in the 1980s and 1990s, the government of India subsidized over 32 million improved cooking stoves
- Conservative estimates place that about a third of the stoves broke and were not replaced, and many stoves were not used properly
  - For example, if you do not clean the chimney properly, it becomes clogged
- Little evidence of the effectiveness of the stoves in improving health

Questions

- What is the impact of IAP on the health and well-being of the rural poor? Specifically…women and young children….
- Do the improved cooking stoves reduce exposure to IAP? Do they improve health?
- Can we devise mechanisms to improve the effectiveness of the improved cooking stove program?
- What is the benefits of the improved cooking stoves versus their costs? How does this program compare to other development interventions?

Gram Vikas

- Gram Vikas is a rural development organization that has worked with poor, marginalized communities in rural Orissa, India since 1979
- In 2005, they began a stove distribution program (15,000 stoves in 5 years)
- They wanted to understand the impacts of the program, and therefore decided to design an impact evaluation of their program

The Evaluation Strategy

- Estimating the impacts of the stoves is a challenge
- Cannot just compare households that have and do not have a stove:
  - Households with cleaner stoves tend to be richer and may, therefore, be able to afford other inputs into health
  - Households that choose to purchase stoves may value health more than those that do not have the stove. These households may also invest in other health prevention methods.
- Thus, this strategy may confuse the effect of the stove with other unobservable factors that can also impact health

The Evaluation Strategy

- Instead, we use a randomized design
- In the 40 study villages, the stove program will be randomly phased in across 2500 households over a three year period
  - A household that receives a stove at the beginning of the program looks very similar to a household that receives the stove at the end of the program
  - Thus, a household that receives the stove at the end will serve as a comparison group for those that have received the stove

Data Collection

- Data collection effort spearheaded by the Centre for Microfinance of the Institute of Financial Management and Research
- Collect data on IAP, health, and wellbeing to assess the impacts of the program
- Baseline data prior to the intervention was collected, and the first third of stoves installed
- Very preliminary data on smoke inhalation

Baseline data

- Poor respiratory health
  - About a third of adults and half the children had experienced symptoms of respiratory illness in the 30 days preceding the survey
  - 10% of adults and 20% of children experienced a serious cough
- High smoke inhalation levels (based on CO tests)
  - About half of adults could be qualified as light smokers, and about a quarter can be qualified as heavy smokers
  - About third of children could be qualified as light smokers, and about 15% can be qualified as heavy smokers

Baseline data

- Prior to the intervention, a large fraction of households used traditional fuels

Table 2: Stove Types, for All Households and by Income

	All Households (1)	Above Median PCE (2)	Below Median PCE (3)
Number of Meals Per Week	14.18	14.26	14.09
Household Primarily Uses "Dirty Stove"	93.6%	91.4%	95.6%
Percent of Households that own….			
LPG Stove	4.6%	7.0%	2.3%
Electric Stove	11.4%	16.2%	6.6%
Biogas Stove	3.2%	3.1%	3.4%

Note: Median monthly per capita income (pce) in the sample is 401.61

Who owns a stove?

- The data confirm that households that have cleaner stoves before the intervention:
  - Richer
  - Women more likely to have a savings account
  - More likely to have a literate head of household
- Thus, we cannot just compare health outcomes of those who have the stove and those who do not to understand if the stove is causing the poor respiratory health, or it is another one of these factors
- Indeed, a randomized design is needed

After the randomized intervention

- Very preliminary results on CO
  - Women who received a stove as a result of the intervention breathe in less smoke

	No Controls		Including Baseline Controls	
	CO>6	CO>10	CO>6	CO>10
	(1)	(2)	(3)	(4)
Treat	-0.063	-0.029	-0.062	-0.028
	(0.023)***	(0.013)**	(0.023)***	(0.013)**
N	1176	1176	1176	1176

Moving Forward

- Assessing Health Impacts:
  - Continuous Health Survey, Stove Monitoring Survey, and Pregnancy Survey in place
  - Mid-line survey begins in April 2008 → Short run health Impacts
  - End-line Survey in 2010→ Long run health Impacts