Understanding the Health Effects of Decreasing Kerosene Usage with Solar Lights in Eastern Africa

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Background

- ~500 million household globally rely on fuels for lighting
- Until recently kerosene was thought to be a “clean” fuel
- Few studies have examined kerosene exposure from lighting
- Studies have shown connections between kerosene and several health outcomes
  - pneumonia
  - tuberculosis
  - cataracts

Photo Credit: Corrie Wingate/SolarAid.

SolarAid

Photo Credit: (left) Corrie Wingate/SolarAid.
(right) Kat Harrison/SolarAid.

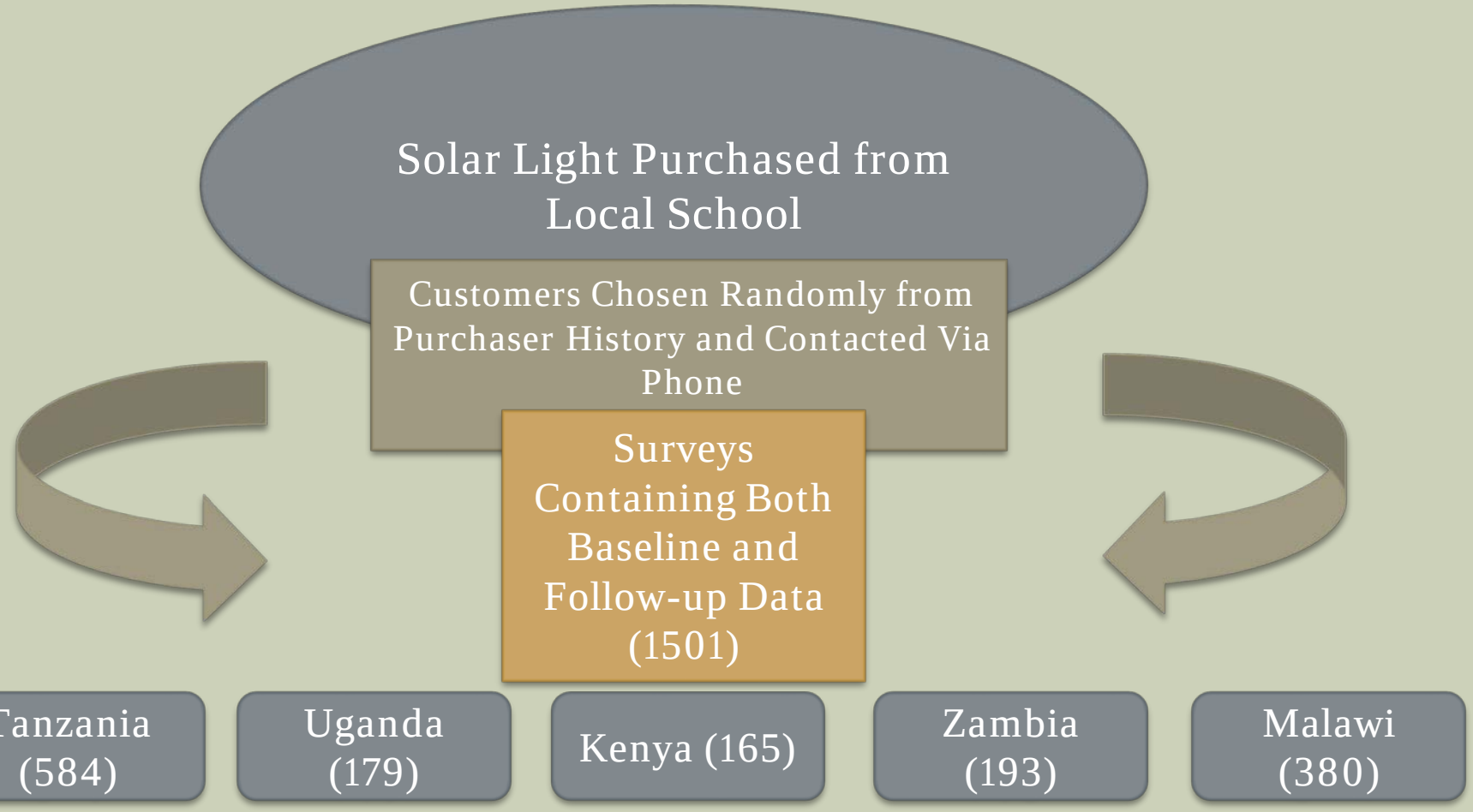
Research Questions

1. Does the purchase of at least one solar light correspond to a decreased amount of kerosene usage?

2. Do household members report improved health following a solar lamp purchase and reduction in kerosene usage?

Hypothesis: Households having purchased solar lights will report decreased kerosene use and improved health.

Methods


Solar Light Purchased from Local School
Customers Chosen Randomly from Purchaser History and Contacted Via Phone
Surveys Containing Both Baseline and Follow-up Data (1501)
Tanzania (584)
Uganda (179)
Kenya (165)
Zambia (193)
Malawi (380)

Methods

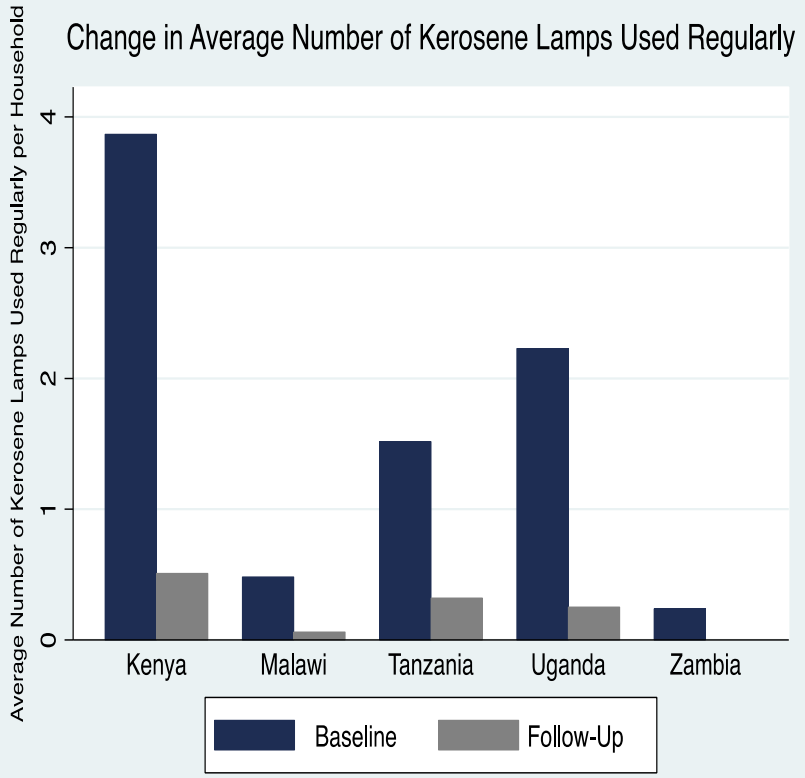
- Questions about lighting source were used to measure exposure
  - Main source of lighting at baseline
  - Number of kerosene lamps regularly used at baseline and follow-up
  - Change in number of regularly used kerosene lamps
- The outcome was based on respondent's answers to open-ended health related questions
- A number of categorical variables were created for specific symptoms
  - Cough
  - Flu
  - Eye Problems
- Stata 14
  - descriptive statistics
  - ANOVA

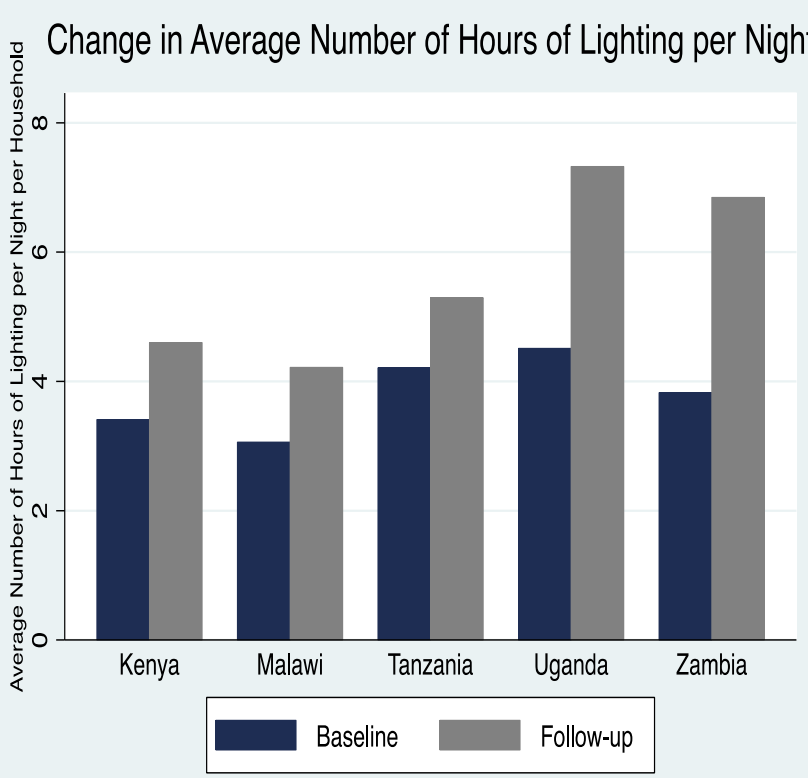
Results

	Kenya	Malawi	Tanzania	Uganda	Zambia	Total
Total Surveys	11%	25.3%	38.9%	11.9%	12.9%	1501
Kerosene as Main Lighting Source at Baseline	78.8%	28.1%	58.7%	76.0%	6.22%	48.5%
Electricity Present in Home	15.8%	2.4%	69.2%	14.5%	20.2%	18.6%
Solar Lamp Prior to Purchase	13.9%	2.6%*	20.6%*	10.1%	6.7%	12.2%

*147 responses from Malawi and 97 responses from Tanzania were missing in regard to if solar was present in home before the purchase

Results


Change in Average Number of Kerosene Lamps Used Regularly
Average Number of Kerosene Lamps Used Regularly per Household
0
1
2
3
4
Kenya
Malawi
Tanzania
Uganda
Zambia
Baseline
Follow-Up


Change in Average Number of Hours of Lighting per Night
Average Number of Hours of Lighting per Night per Household
0
2
4
6
8
Kenya
Malawi
Tanzania
Uganda
Zambia
Baseline
Follow-up

Results

	Response	Mean Decrease in Kerosene Lamps Regularly Used	N	p-value
Change in Health Reported:	Yes	85.5%	59.5%	.01
	No	79.1%	40.5%	
Decreased Coughing:	Yes	89.3%	13.2%	.01
	Not Reported	80.5%	86.7%	
Decreased Flu:	Yes	87.1%	6.4%	.21
	Not Reported	81.3%	93.6%	
Decreased Eye Problems:	Yes	79.1%	13.9%	.37
	Not Reported	82.1%	86.1%	

Discussion

- These findings are consistent with previous studies
  - Respiratory health conditions (TB and ALRI)
- Evidence that solar is effective in replacing kerosene as a source of light
  - Decrease in kerosene use
  - Increase in hours of household light per night
- A larger decrease in kerosene lamp use may be associated with improved health
  - Decreased coughing
  - Little evidence for flu and eye problems

Study Limitations

- Survey Construction
  - Health questions were asked directly in relation to kerosene use
  - Personal belief about kerosene
  - Health questions were open-ended
  - Questions differed as to whom they were directed at (you vs. household members)
- Selection Bias
  - 20% of customers invited to participate declined or were unreachable
  - Customers without a telephone were unable to participate

Study Limitations

- Information Bias
  - All data were self-reported
  - Baseline interviews occurred sometime after purchase, possibly resulting in inaccurate memories of previous health status
- Confounding
  - Possible seasonal Variation of Health Symptoms

Conclusions

- Reduced kerosene use for lighting
- Longer hours of night-time lighting use
- Limited evidence of the health improvement
- Extensive study limitations

Photo Credit: Patrick Bentley/SolarAid

References

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