



Kyoto University  
Institute of Advanced Energy

# ELECTRIFICATION IN SOUTH EAST ASIA: QOL EFFECTS AND SOCIAL AGENDAS

JORDI CRAVIOTO

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膳所高等学校 S S Hサイエンスプロジェクト  
2020年第5回研究発表会

**2021.01.23**





# Content

## 1 *Introduction*

- Electrification · Social effects · South East Asia
- Academic literature · Gaps

## 2 *Case studies (quality of life)*

- Methods
- Findings
- Challenges

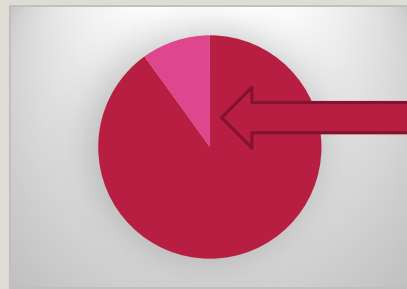
## 3 *Social research agenda*



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## HOW MANY PEOPLE LACK OF ELECTRICITY?

Around 850 million people worldwide  
do NOT have access to electricity

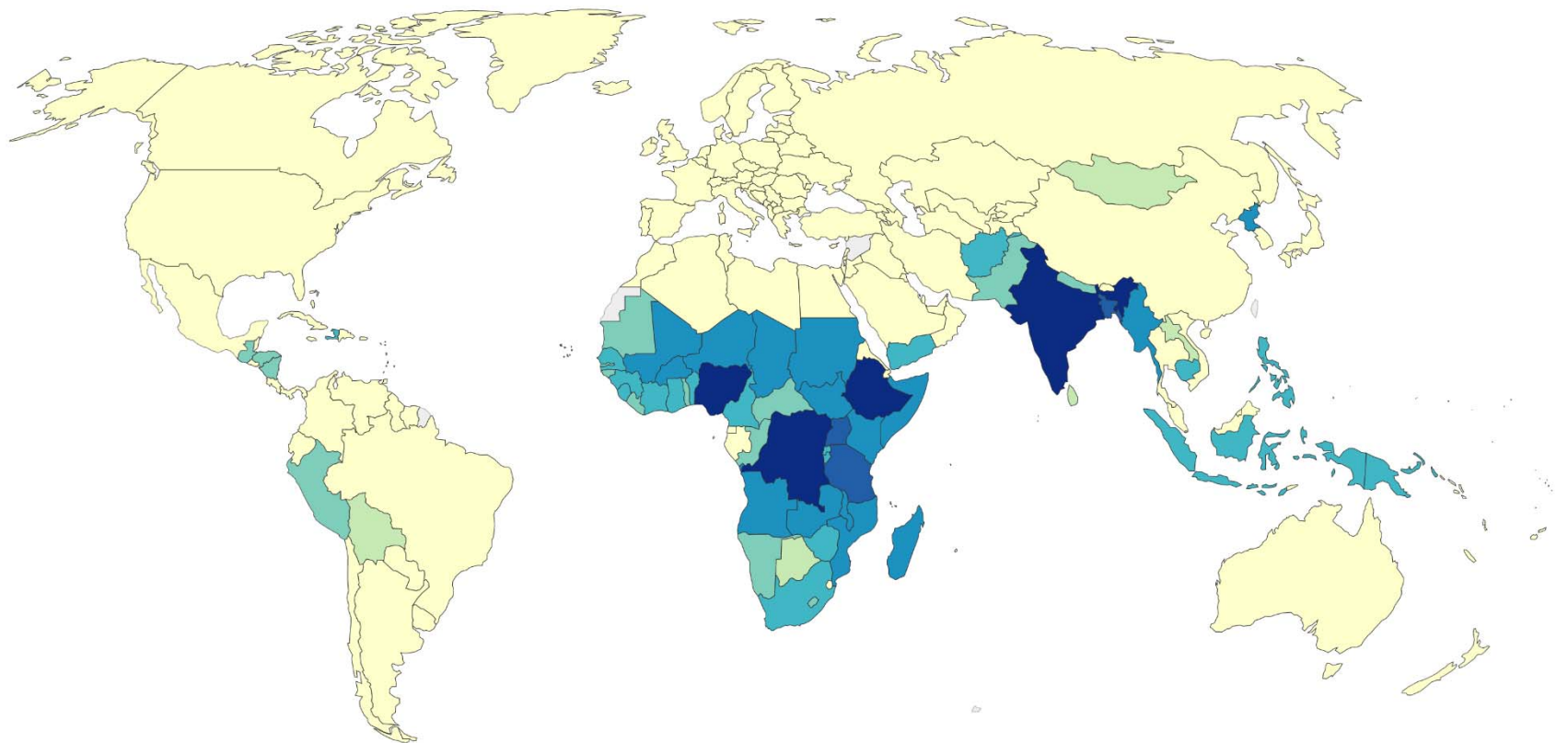


11% of 7.8 billion (2020)

- Almost SEVEN times the population of JAPAN!



- Most of them live in *rural areas of developing countries*

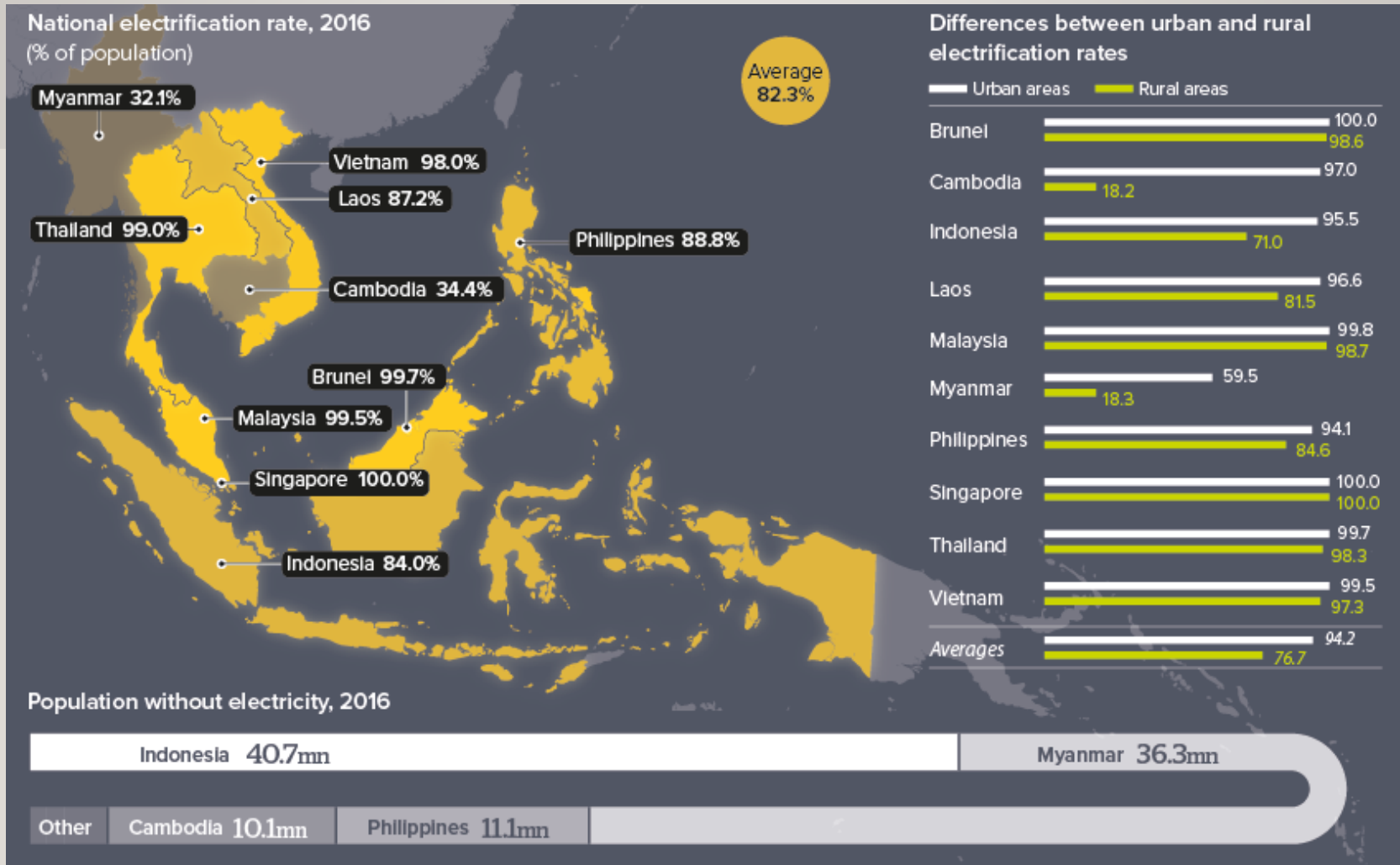


No data 0 500,000 1 million 5 million 10 million 25 million 50 million >100 million

Source: Based on World Bank and UN Population Prospects

OurWorldInData.org/energy-access • CC BY

# ELECTRIFICATION IN SOUTH EAST (SE) ASIA



<https://dailybrief.oxan.com/Analysis/GA220581/Uneven-electrification-will-affect-ASEAN-competition>

# 6 RECENT RURAL ELECTRIFICATION (RE) STUDIES

- Mostly focus on economic, technology, or institutional issues
- Place less emphasis on social effects
- Highly concentrated in South Asia and Africa

Article	Focus point	Setting
Palit (2011)	<b>Finance, institutions and governance</b>	South Asia
Dinkelman (2011)	<b>Employment, productivity, migration</b>	South Africa
Schillebeeckx (2012)	<b>Electrification business models</b>	Review
Riva et al. (2018)	<b>Economic impacts</b>	Review
Khandker et al. (2012)	<b>Income, expenditure, poverty, schooling (infants)</b>	India
Kooijman-van Dijk & Clancy (2014)	<b>Production, financial capital</b>	Tanzania
Winther (2015)	<b>Gender (women's empowerment)</b>	Africa
Winther (2015)	<b>Impacts on living condition (household structures)</b>	Mozambique, Tanzania, India

# SE ASIA IN THE LITERATURE

- Substantially fewer studies
- Persistent less focus on social implications/effects

Article	Focus point	Setting
Martin & Sustanto (2011)	<b>Productive uses</b>	Lao PDR
Bhattacharyya (2013)	<b>Preferred systems</b>	Indonesia, Philippines, Thailand, Vietnam
Van Gevelt et al (2017)	<b>Productive uses, operation models</b>	Malaysia
Al Faruq et al (2016)	<b>Challenges</b>	Indonesia
Saing (2017)	<b>Household consumption and children education</b>	Cambodia

# RE EFFECTS & SDGS



- ✓ *Energy services access*
- ✓ *Use of pumps*
- ✓ *Refrigeration, cooling-heating*
- ✓ *Lighting*
- ✓ *Active time*
- ✓ *Diversify activities, productivity, higher incomes*



- ✗ *Disrupt local practices and culture*
- ✗ *Increase inequalities*
- ✗ *Create environmental and land rights controversies, etc.*



# PROBLEM

- Solid knowledge about:
  - Economic effects (income, productivity, etc.)
  - Technology options and applications
  - Institutional effectiveness
- Less so for social effects, because...
  - Effects are highly contextual
  - Several factors involved
  - Usually more difficult to examine
- Information on SE Asia is limited
  - Indonesia/Phillipines (critical by total population)
  - Myanmar and Cambodia (critical by % of population)

# PURPOSE

- Present findings on electrification effects using quality of life (QoL) domains
  - Discuss limitations, challenges
  - Agenda on the study of social effects of electrification

Full details in:

- Cravioto et al. (2020) *The effects of rural electrification on quality of life: A Southeast Asian perspective*. *Energies*, 13, 2410



# QUALITY OF LIFE (QOL) MEASURES

Quantitative categories:

## 1) Objective QoL indicators (more common)

- Infant mortality rate, life expectancy, mean years of schooling, gross domestic product, gross national income, water access, etc.

## 2) Subjective QoL indicators

- Self-reported quality of life, satisfaction levels, self-reported health, psychological well-being, social relations, aspirations, activities, etc.

# QOL QUANTITATIVE MEASUREMENT

No.	Category	Dimensions	Domains	Items	Type of Variable
I	Demographics	-	(1) Gender, (2) age, (3) education, (4) family type, (5) occupation	5	Nominal
II	Quality of Life	Quality of life (Self-reported and satisfaction sub-domains)	Self-reported quality of life	1	Ordinal (10p scale)
			Satisfaction sub-domains: (1) Time use, (2) time alone, (3) housing, (4) cooking, (5) personal safety	5	Ordinal (5p-likert scale)
			Psychological well-being	1	Ordinal (5p-likert scale)
			Physical health well-being	1	Ordinal (5p-likert scale)
			Social well-being	1	Ordinal (5p-likert scale)
		Economic well-being	(1) Feelings about personal wealth, (2) regularity of lack of money preventing activities, (3) income	3	Ordinal (5/4p scale)/Scale
III	Occupations	-	Satisfaction with (1) main activity, (2) hours of work	2	Ordinal (5p-likert scale)/Scale
IV	Time of activities	-	Total active time	1	Time scale

5p likert Scale: very unsatisfied (1) – very satisfied (5)

# SCALES OF ANALYSIS

Different scales involved

- Household (individuals)
- Community (households, local authorities)
- Municipal (communities, two level of authorities)
- Etc.

# RE-QOL METHODOLOGY

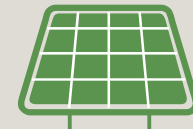
## 1. Villages selection:

- No electrification, similar conditions
- Community willingness to take part in the project



## 2. Electrification scheme based on:

- Geographical location and proximity to grid
- Economic capacity in the project



## 3. Surveys (QoL questionnaire):

- Prior (baseline) and after (endpoint) electrification



## 4. Post-collection analysis:

- Use statistical methods to reveal differences between stages.



# LOCATIONS

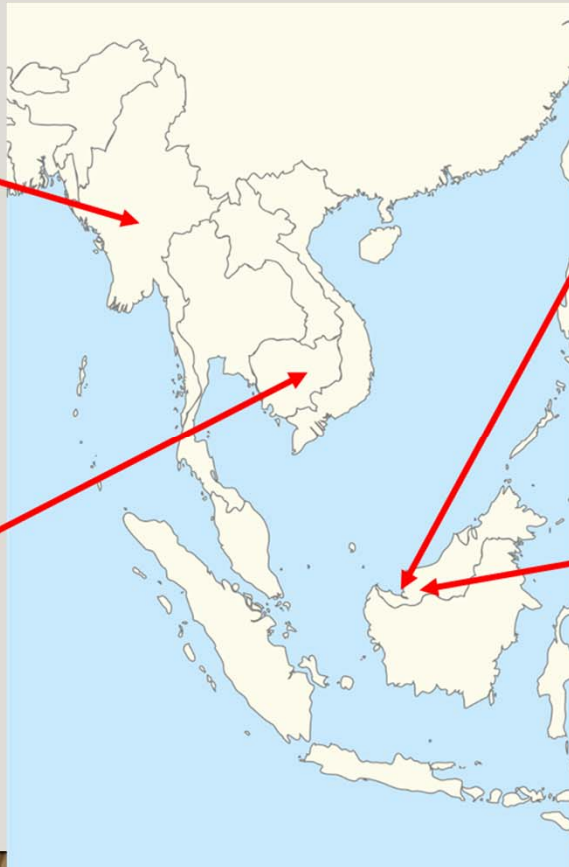
- Similar Income levels (usually below national average)
- Similar economic activities (mostly farming and fishing)
- Similar climate (tropical typical of the South-east Asian region)



**Oak Pho, Myanmar**



**Thmor Keo, Cambodia**



**Kampung Sungai Merah,  
Malaysia**



**Menangkin, Malaysia**

# SCHEMES AND SURVEYS

## Electrification schemes

Centralised – Grid Hybrid (PV+diesel)

Individual – Solar Home (PV)



## Surveys +1 year after

Electrification Scheme	Village	Country	Demographics	Cultural profile	Surveys	
					Baseline	Endpoint
Grid Extension	Menangkin	Malaysia	22 households (~100 inhab.)	Iban	n=19 (Apr 2016)	n=12 (18m after)
	Thmor Keo	Cambodia	215 households	Khmer	n=17 (Mar 2017)	n=21 (13m after)
Hybrid system	Oak Pho	Myanmar	400 households (~2000 inhab.)	Bamar	n= 19 (Nov 2017)	n=35 (15m after)
Solar Home System	Kampung Sungai Merah	Malaysia	5 households (~20 inhab.)	Iban	n=6 (Dec 2016)	n=7 (17m after)

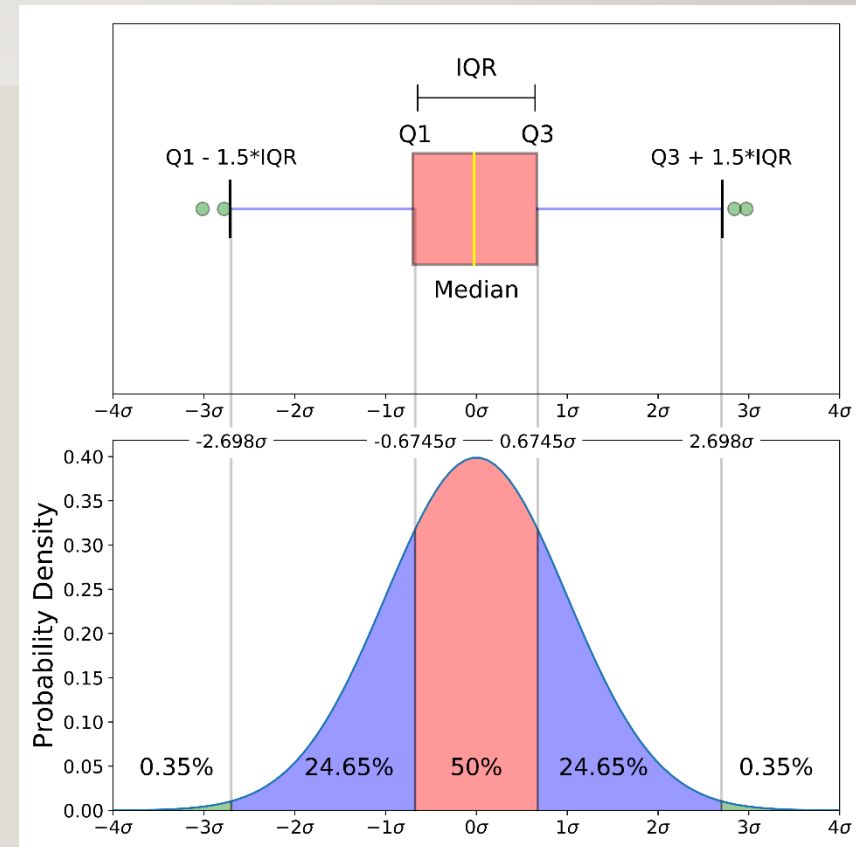


# DATA ANALYSIS METHODS

## Boxplot analysis

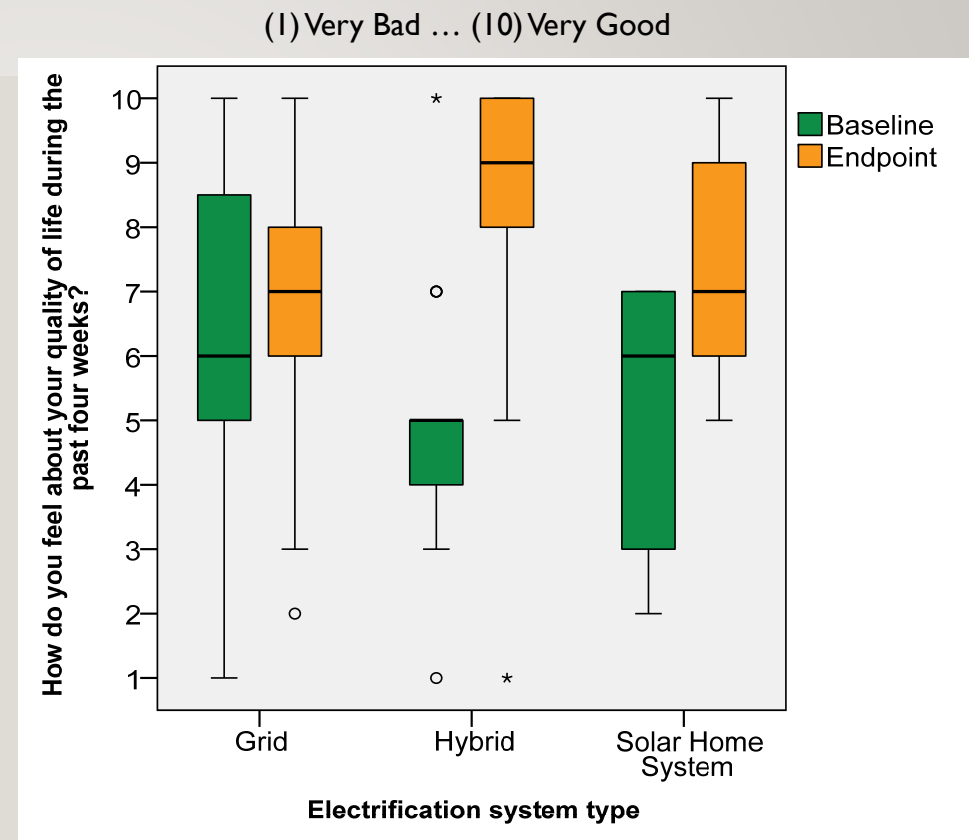
5 key measures:

- ✓ Median (center of data)
- ✓ Q1, Q3 (quartiles)
- ✓ Min ( $Q1 - 1.5 * IQR$ )
- ✓ Max ( $Q3 + 1.5 * IQR$ )
  
- ❖  $IQR = Q3 - Q1$



# RESULTS: QOL (SELF-REPORTED WELL-BEING)

- Is electricity positive for integral well-being levels?
  - ❖ Expands energy services for daily life
  - ❖ Cultural/leisure activities, productivity, communication, cooking/preservation food, sanitation.
- **Finding: Increase after electrification**



# QOL DOMAINS

## HOUSING

Satisfaction with housing

- **Finding: No change after electrification**

## SAFETY

Positive feelings about personal safety

- **Finding: Slight increase (Grid / Solar Home)**



## TIME USE / ALONE

Satisfaction with time spent, spent alone

- **Finding: No change after electrification**
- Weak correlations between self-reported QoL and both measures ( $r_s = 0.36$ ,  $p < 0.05$  for overall time use and  $r_s = 0.069$ ,  $p = 0.438$  for time alone)



## COOKING

Satisfaction with the food consumed

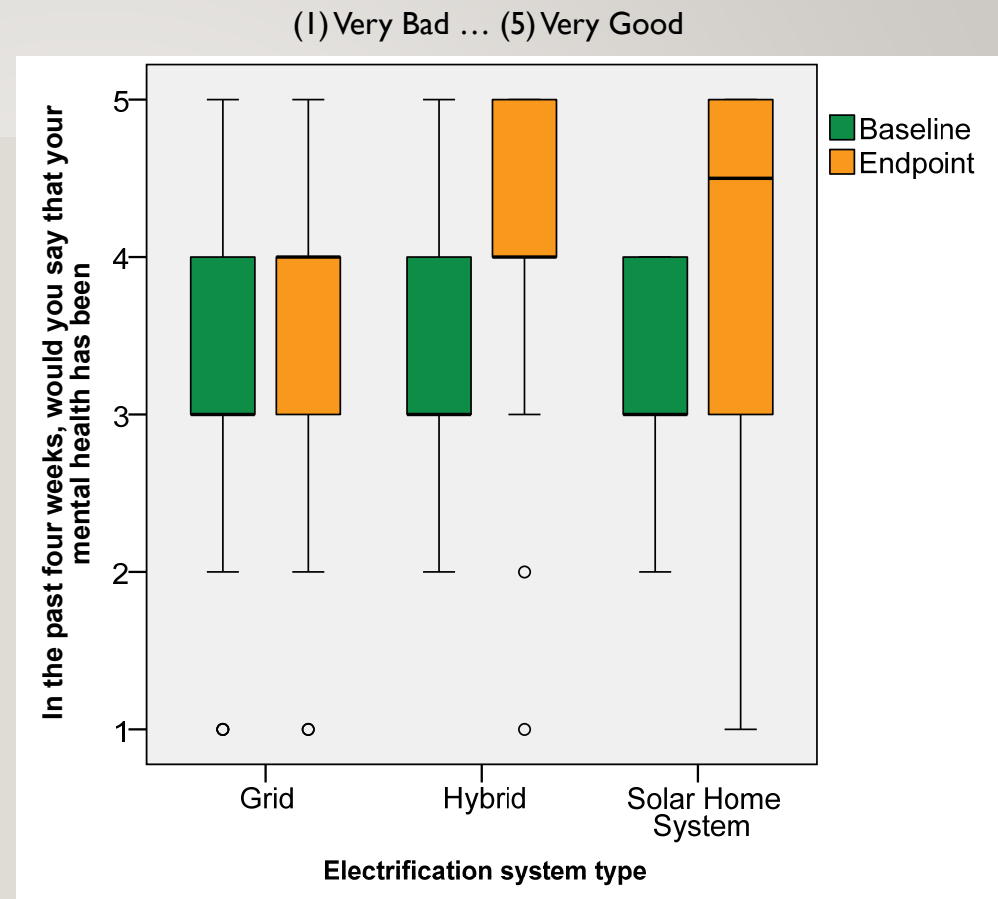
- **Finding: Slight increase after electrification (Grid)**



# PSYCHOLOGICAL WELL-BEING

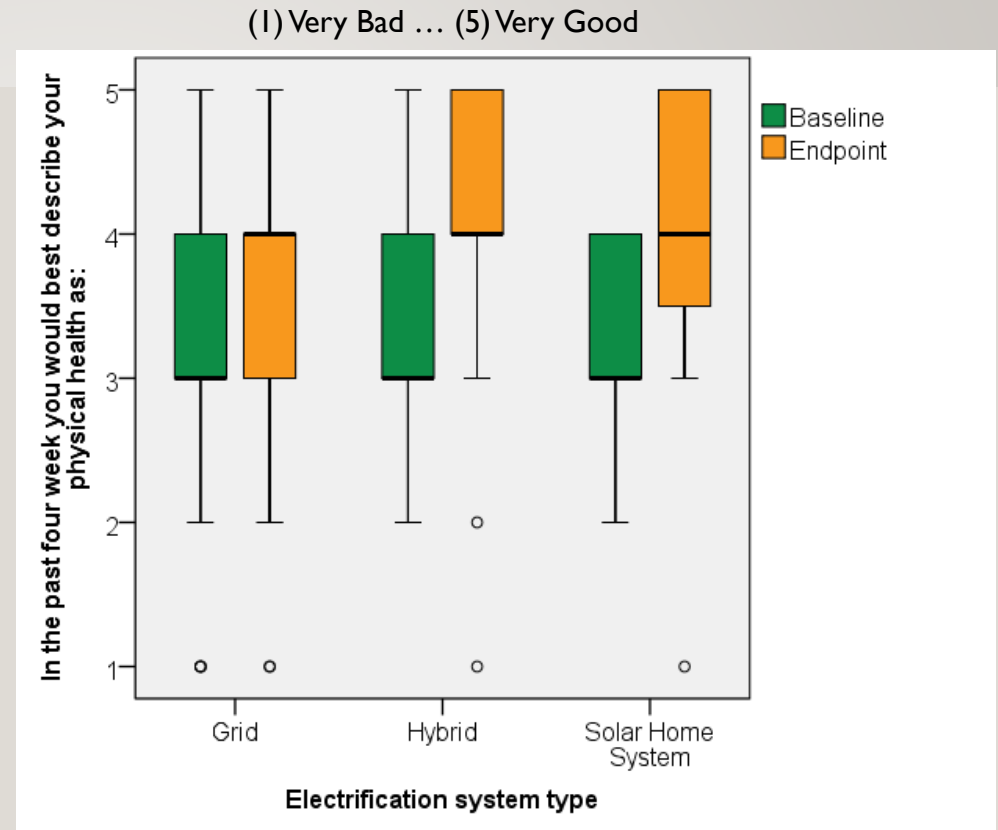
- Would having electricity be positive for mental health levels?
  - Possibly due to increased gatherings, recreation time and activities

➤ **Finding: Increase after electrification**



# PHYSICAL HEALTH

- Would electricity increase physical health levels?
- **Finding: Increase without apparent direct effect**
- No use of refrigerators to preserve medicines*
- Herbs and traditional medicines are the preferred way of curing illness or injuries*



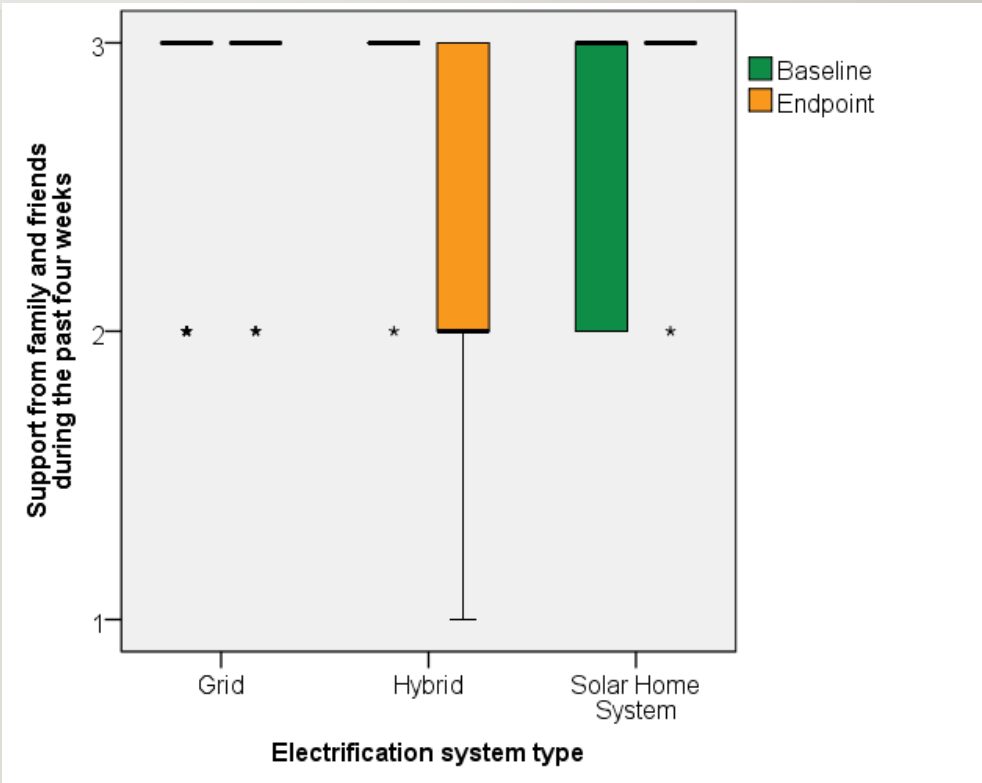
# SOCIAL WELL-BEING

- Would electricity change social interactions with friends and family and feelings towards support received from others?

## ➤ Finding: No change

- ❑ *Electrification exert little influence on family support*
- ❑ *Migration and longer spans are worth analysing*

(1) infrequent (2) moderate (3) good support



# ECONOMIC WELL-BEING

- Would electricity increase expenses? How about income?

➤ **Finding: electricity impose minimal economic burden**

- ❑ *It substantially reduces household expenses for those using diesel generators*
- ❑ *This is consequential with the total household income*

Scheme	Village	Country	Electricity Expenses	ΔIncome% after Electrification
Grid Extension	Menangkin	Malaysia	↓	From 30% to 3%-7%
	Thmor Keo	Cambodia	↑	From 1% to 5%-6%
Hybrid system	Oak Pho	Myanmar	↑	From 0% to 1%
Solar Home System	Kampung Sungai Merah	Malaysia	↓	From 20% to 4%

# SUMMARY

- Electrification have positive effects on Quality of Life
- Yet, for specific QoL domains effects can range from positive to neutral, or negative
  - Notably, for ways of spending time and housing, there was no effect
  - Also, no effects in social well-being
  - Possible increase on inequalities
- These results reflect short-term effects, so longer-spans are worth analysing



## CHALLENGES – RURAL ELECTRIFICATION (RE) AND QOL NEXUS

- Complexity in the analysis:
  - Diverse paths in the RE-QoL nexus (culturally driven)
- Need for careful examination
  - Look into people priorities
- Consider alternative social interactions
  - Collective systems (systems of exchange / use of objects)
  - Family life and roles



# AGENDA ON THE SOCIAL EFFECTS OF ELECTRIFICATION

- Deeper understanding of social domains
  - What has changed in daily life
- Explore cultural meanings in detail
  - Underlying explanations of the outcomes
- Explore other lenses
  - Inequality among groups: gender relations, family types, occupations, other stakeholders, etc.
- Longer spans of observation



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Thank you  
for your attention



Jordi Cravioto  
[jordi.cravioto@gmail.com](mailto:jordi.cravioto@gmail.com)

