

# **Impact of electricity on children's health in Peru: *Evidence from panel data***

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# Motivation

- Having electricity at home is considered to improve health outcomes by enabling better food preservation (refrigerators, freezers), cleaner and safer cooking mechanisms, and access to internet resources for better health information and healthcare professional contact.
- Should we prioritise electricity rollout in homes to improve health outcomes?
- Use as proxy to understand the impacts of high capital investments, like infrastructure improvements, on human behaviour and outcomes.
- Juxtapose the effects of infrastructure investments with those from micro-targeted interventions, behavioural nudges, and light-touch incentives.
- Identify heterogeneous effects by geography and gender beyond average effects.
- Address any damage or unintended consequences from previous or future capital-intensive projects.

# Research Questions

- Does electrification impact children's health, esp. over a period of time?
- Does the impact vary across gender and geographic categories?
- Is this causal or just a spurious correlation?
- Identify potential mechanisms

# Data

- Young Lives Data, University of Oxford
- Countries included: Peru, Ethiopia, Vietnam, India
- Cohort study: HH survey → 2002 to 2016--every 3 years → 5 time points
- Rich sets of variables (on numerable themes) over periods of time



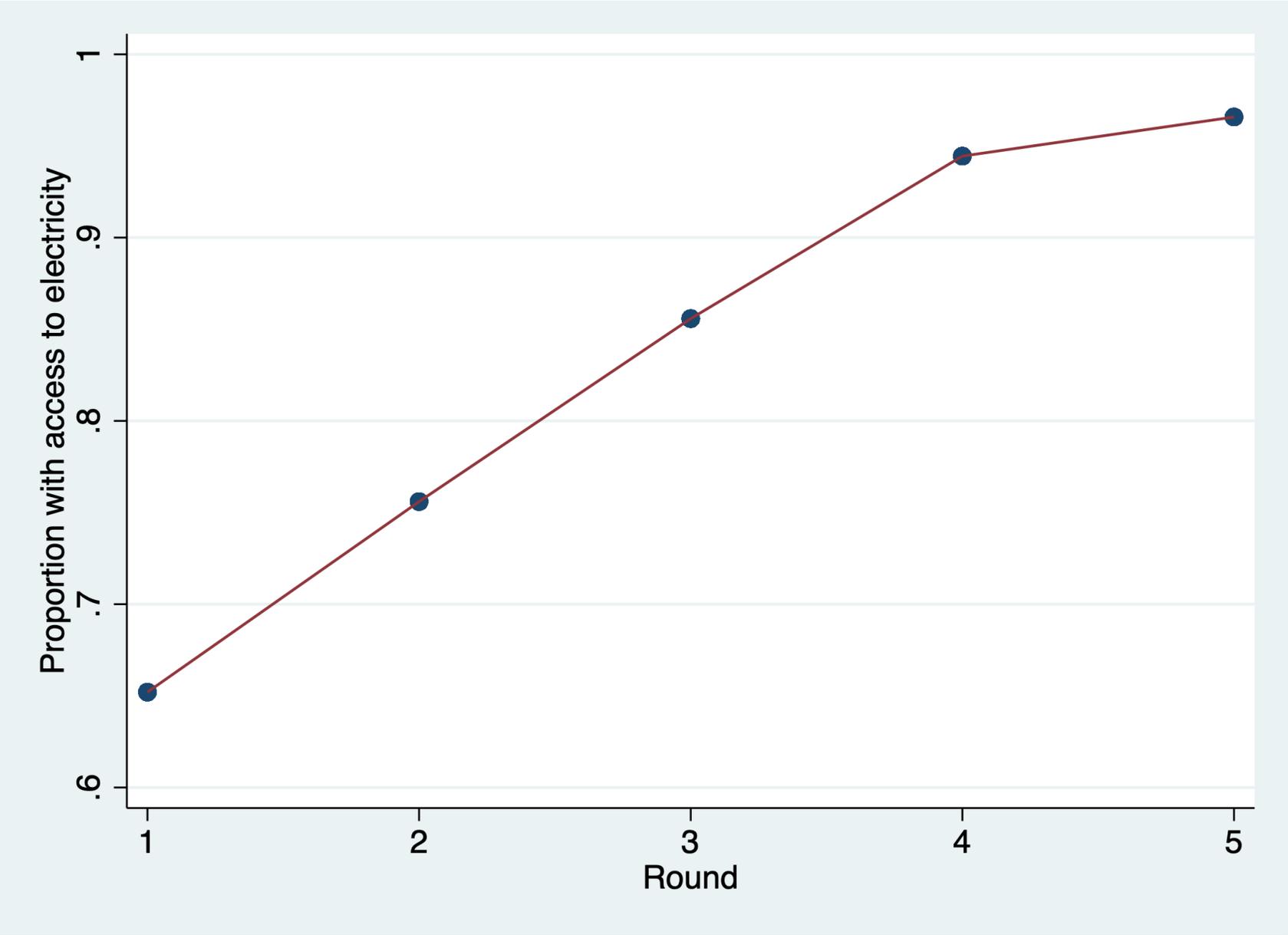
Young Lives study sites in Peru

- 20 districts are chosen using systematic random sampling → cluster units → HHs
- Sample size ~ 3000 individuals  
(2000 Younger cohort)  
(1000 older cohort)

# Electrification in Peru

- In the 1990s, Peru had one of the lowest electrification rates in Latin America.
- Rural Electrification Program started in 1993 and the **Rural Electrification Law enacted in 2006 aimed to increase access to electricity in rural areas.**
- Extensive reforms to liberalize local markets and encourage private investment.
- Projects included microgrids, off-grid solar PV stations, wind energy, and Public-Private-Partnerships.

# Electrification



# Empirical Strategy

- Two-way fixed effects estimation:
- $Outcome_{it} = \alpha_i + \beta(Electricity)_{it} + controls + \lambda_t + \varepsilon_{it}$
- $\beta$  : Effect of electricity
- Controls (only time variant): age, HH size, wealth index, highest parental education, regional fixed effects
- $\lambda_t$ : Year/round fixed effects

# Findings

|                       | Height-for-age z-score |                    |                                   | Underweight (low weight for age) |                      |                                    | Stunting              |                    |                                   | Health is better compared to peers |                       |                                     |
|-----------------------|------------------------|--------------------|-----------------------------------|----------------------------------|----------------------|------------------------------------|-----------------------|--------------------|-----------------------------------|------------------------------------|-----------------------|-------------------------------------|
|                       | (25)                   | (26)               | (27)                              | (28)                             | (29)                 | (30)                               | (31)                  | (32)               | (33)                              | (34)                               | (35)                  | (36)                                |
| Access to electricity | 0.180***<br>(0.0251)   | 0.025<br>(0.0283)  | <b>0.001</b><br><b>(0.0278)</b>   | -0.013**<br>(0.0055)             | -0.011*<br>(0.0060)  | <b>-0.011*</b><br><b>(0.0060)</b>  | -0.099***<br>(0.0134) | -0.011<br>(0.0148) | <b>-0.001</b><br><b>(0.0145)</b>  | -0.043**<br>(0.0169)               | -0.082***<br>(0.0195) | <b>-0.075***</b><br><b>(0.0196)</b> |
| Controls              | x                      | ✓                  | ✓                                 | x                                | ✓                    | ✓                                  | x                     | ✓                  | ✓                                 | x                                  | ✓                     | ✓                                   |
| Year fixed effects    | x                      | x                  | ✓                                 | x                                | x                    | ✓                                  | x                     | x                  | ✓                                 | x                                  | x                     | ✓                                   |
| N                     | 9629                   | 9373               | <b>9373</b>                       | 5923                             | 5737                 | <b>5737</b>                        | 9617                  | 9361               | <b>9361</b>                       | 9627                               | 9358                  | <b>9358</b>                         |
| <b>Sample: Urban</b>  |                        |                    |                                   |                                  |                      |                                    |                       |                    |                                   |                                    |                       |                                     |
| Access to electricity | 0.152***<br>(0.0465)   | 0.043<br>(0.0488)  | <b>0.045</b><br><b>(0.0480)</b>   | 0.002<br>(0.0049)                | 0.005<br>(0.0049)    | <b>0.005</b><br><b>(0.0050)</b>    | -0.073***<br>(0.0209) | -0.013<br>(0.0218) | <b>-0.011</b><br><b>(0.0219)</b>  | -0.009<br>(0.0270)                 | -0.058**<br>(0.0290)  | <b>-0.067**</b><br><b>(0.0295)</b>  |
| Controls              | x                      | ✓                  | ✓                                 | x                                | ✓                    | ✓                                  | x                     | ✓                  | ✓                                 | x                                  | ✓                     | ✓                                   |
| Year fixed effects    | x                      | x                  | ✓                                 | x                                | x                    | ✓                                  | x                     | x                  | ✓                                 | x                                  | x                     | ✓                                   |
| N                     | 6881                   | 6731               | <b>6731</b>                       | 4135                             | 4023                 | <b>4023</b>                        | 6873                  | 6723               | <b>6723</b>                       | 6876                               | 6721                  | <b>6721</b>                         |
| <b>Sample: Rural</b>  |                        |                    |                                   |                                  |                      |                                    |                       |                    |                                   |                                    |                       |                                     |
| Access to electricity | 0.182***<br>(0.0316)   | -0.051<br>(0.0411) | <b>-0.068*</b><br><b>(0.0402)</b> | -0.032***<br>(0.0112)            | -0.022*<br>(0.0131)  | <b>-0.022*</b><br><b>(0.0130)</b>  | -0.090***<br>(0.0188) | 0.041*<br>(0.0247) | <b>0.048**</b><br><b>(0.0241)</b> | -0.070***<br>(0.0237)              | -0.070**<br>(0.0322)  | <b>-0.060*</b><br><b>(0.0323)</b>   |
| Controls              | x                      | ✓                  | ✓                                 | x                                | ✓                    | ✓                                  | x                     | ✓                  | ✓                                 | x                                  | ✓                     | ✓                                   |
| Year fixed effects    | x                      | x                  | ✓                                 | x                                | x                    | ✓                                  | x                     | x                  | ✓                                 | x                                  | x                     | ✓                                   |
| N                     | 2748                   | 2642               | <b>2642</b>                       | 1788                             | 1714                 | <b>1714</b>                        | 2744                  | 2638               | <b>2638</b>                       | 2751                               | 2637                  | <b>2637</b>                         |
| <b>Sample: Female</b> |                        |                    |                                   |                                  |                      |                                    |                       |                    |                                   |                                    |                       |                                     |
| Access to electricity | 0.111***<br>(0.0357)   | 0.047<br>(0.0406)  | <b>0.007</b><br><b>(0.0396)</b>   | -0.021**<br>(0.0091)             | -0.021**<br>(0.0093) | <b>-0.022**</b><br><b>(0.0093)</b> | -0.068***<br>(0.0176) | -0.009<br>(0.0198) | <b>0.007</b><br><b>(0.0192)</b>   | -0.038<br>(0.0240)                 | -0.074**<br>(0.0287)  | <b>-0.057**</b><br><b>(0.0287)</b>  |
| Controls              | x                      | ✓                  | ✓                                 | x                                | ✓                    | ✓                                  | x                     | ✓                  | ✓                                 | x                                  | ✓                     | ✓                                   |
| Year fixed effects    | x                      | x                  | ✓                                 | x                                | x                    | ✓                                  | x                     | x                  | ✓                                 | x                                  | x                     | ✓                                   |
| N                     | 4782                   | 4643               | <b>4643</b>                       | 2945                             | 2845                 | <b>2845</b>                        | 4775                  | 4636               | <b>4636</b>                       | 4779                               | 4632                  | <b>4632</b>                         |
| <b>Sample: Male</b>   |                        |                    |                                   |                                  |                      |                                    |                       |                    |                                   |                                    |                       |                                     |
| Access to electricity | 0.250***<br>(0.0348)   | 0.006<br>(0.0392)  | <b>-0.004</b><br><b>(0.0389)</b>  | -0.005<br>(0.0065)               | -0.000<br>(0.0078)   | <b>-0.000</b><br><b>(0.0078)</b>   | -0.131***<br>(0.0201) | -0.013<br>(0.0217) | <b>-0.007</b><br><b>(0.0216)</b>  | -0.048**<br>(0.0237)               | -0.090***<br>(0.0264) | <b>-0.092***</b><br><b>(0.0265)</b> |
| Controls              | x                      | ✓                  | ✓                                 | x                                | ✓                    | ✓                                  | x                     | ✓                  | ✓                                 | x                                  | ✓                     | ✓                                   |
| Year fixed effects    | x                      | x                  | ✓                                 | x                                | x                    | ✓                                  | x                     | x                  | ✓                                 | x                                  | x                     | ✓                                   |
| N                     | 4847                   | 4730               | <b>4730</b>                       | 2978                             | 2892                 | <b>2892</b>                        | 4842                  | 4725               | <b>4725</b>                       | 4848                               | 4726                  | <b>4726</b>                         |

# Findings

|                       | Health is worse compared to peers |                    |                                  | Suffers long-term health problem |                    |                                  | Health in general    |                     |                                   | Good health          |                    |                                  |
|-----------------------|-----------------------------------|--------------------|----------------------------------|----------------------------------|--------------------|----------------------------------|----------------------|---------------------|-----------------------------------|----------------------|--------------------|----------------------------------|
|                       | (37)                              | (38)               | (39)                             | (40)                             | (41)               | (42)                             | (43)                 | (44)                | (45)                              | (46)                 | (47)               | (48)                             |
| Access to electricity | -0.050***<br>(0.0107)             | -0.008<br>(0.0123) | <b>-0.005</b><br><b>(0.0124)</b> | 0.073***<br>(0.0110)             | 0.004<br>(0.0136)  | <b>-0.003</b><br><b>(0.0135)</b> | -0.026<br>(0.0419)   | -0.078*<br>(0.0446) | <b>-0.068</b><br><b>(0.0445)</b>  | -0.020<br>(0.0324)   | -0.055<br>(0.0348) | <b>-0.051</b><br><b>(0.0348)</b> |
| Controls              | x                                 | ✓                  | ✓                                | x                                | ✓                  | ✓                                | x                    | ✓                   | ✓                                 | x                    | ✓                  | ✓                                |
| Year fixed effects    | x                                 | x                  | ✓                                | x                                | x                  | ✓                                | x                    | x                   | ✓                                 | x                    | x                  | ✓                                |
| N                     | 9627                              | 9358               | <b>9358</b>                      | 5843                             | 5699               | <b>5699</b>                      | 5649                 | 5487                | <b>5487</b>                       | 5649                 | 5487               | <b>5487</b>                      |
| <b>Sample: Urban</b>  |                                   |                    |                                  |                                  |                    |                                  |                      |                     |                                   |                      |                    |                                  |
| Access to electricity | -0.054***<br>(0.0182)             | -0.020<br>(0.0190) | <b>-0.014</b><br><b>(0.0188)</b> | 0.054***<br>(0.0176)             | -0.009<br>(0.0195) | <b>-0.022</b><br><b>(0.0192)</b> | -0.080<br>(0.0690)   | -0.092<br>(0.0722)  | <b>-0.095</b><br><b>(0.0713)</b>  | -0.080<br>(0.0582)   | -0.098<br>(0.0612) | <b>-0.099</b><br><b>(0.0607)</b> |
| Controls              | x                                 | ✓                  | ✓                                | x                                | ✓                  | ✓                                | x                    | ✓                   | ✓                                 | x                    | ✓                  | ✓                                |
| Year fixed effects    | x                                 | x                  | ✓                                | x                                | x                  | ✓                                | x                    | x                   | ✓                                 | x                    | x                  | ✓                                |
| N                     | 6876                              | 6721               | <b>6721</b>                      | 4130                             | 4045               | <b>4045</b>                      | 4130                 | 4038                | <b>4038</b>                       | 4130                 | 4038               | <b>4038</b>                      |
| <b>Sample: Rural</b>  |                                   |                    |                                  |                                  |                    |                                  |                      |                     |                                   |                      |                    |                                  |
| Access to electricity | -0.053***<br>(0.0151)             | 0.020<br>(0.0207)  | <b>0.018</b><br><b>(0.0212)</b>  | 0.080***<br>(0.0167)             | 0.031<br>(0.0230)  | <b>0.033</b><br><b>(0.0234)</b>  | -0.000<br>(0.0580)   | -0.046<br>(0.0661)  | <b>-0.044</b><br><b>(0.0679)</b>  | 0.019<br>(0.0414)    | 0.021<br>(0.0491)  | <b>0.018</b><br><b>(0.0504)</b>  |
| Controls              | x                                 | ✓                  | ✓                                | x                                | ✓                  | ✓                                | x                    | ✓                   | ✓                                 | x                    | ✓                  | ✓                                |
| Year fixed effects    | x                                 | x                  | ✓                                | x                                | x                  | ✓                                | x                    | x                   | ✓                                 | x                    | x                  | ✓                                |
| N                     | 2751                              | 2637               | <b>2637</b>                      | 1713                             | 1654               | <b>1654</b>                      | 1519                 | 1449                | <b>1449</b>                       | 1519                 | 1449               | <b>1449</b>                      |
| <b>Sample: Female</b> |                                   |                    |                                  |                                  |                    |                                  |                      |                     |                                   |                      |                    |                                  |
| Access to electricity | -0.049***<br>(0.0148)             | -0.014<br>(0.0166) | <b>-0.012</b><br><b>(0.0168)</b> | 0.087***<br>(0.0164)             | -0.003<br>(0.0203) | <b>-0.007</b><br><b>(0.0202)</b> | -0.124**<br>(0.0550) | -0.117*<br>(0.0601) | <b>-0.118*</b><br><b>(0.0602)</b> | -0.088**<br>(0.0431) | -0.073<br>(0.0472) | <b>-0.073</b><br><b>(0.0474)</b> |
| Controls              | x                                 | ✓                  | ✓                                | x                                | ✓                  | ✓                                | x                    | ✓                   | ✓                                 | x                    | ✓                  | ✓                                |
| Year fixed effects    | x                                 | x                  | ✓                                | x                                | x                  | ✓                                | x                    | x                   | ✓                                 | x                    | x                  | ✓                                |
| N                     | 4779                              | 4632               | <b>4632</b>                      | 2903                             | 2820               | <b>2820</b>                      | 2803                 | 2716                | <b>2716</b>                       | 2803                 | 2716               | <b>2716</b>                      |
| <b>Sample: Male</b>   |                                   |                    |                                  |                                  |                    |                                  |                      |                     |                                   |                      |                    |                                  |
| Access to electricity | -0.051***<br>(0.0155)             | -0.003<br>(0.0182) | <b>0.002</b><br><b>(0.0183)</b>  | 0.058***<br>(0.0145)             | 0.012<br>(0.0183)  | <b>0.002</b><br><b>(0.0180)</b>  | 0.086<br>(0.0629)    | -0.029<br>(0.0653)  | <b>-0.019</b><br><b>(0.0650)</b>  | 0.058<br>(0.0482)    | -0.031<br>(0.0513) | <b>-0.026</b><br><b>(0.0512)</b> |
| Controls              | x                                 | ✓                  | ✓                                | x                                | ✓                  | ✓                                | x                    | ✓                   | ✓                                 | x                    | ✓                  | ✓                                |
| Year fixed effects    | x                                 | x                  | ✓                                | x                                | x                  | ✓                                | x                    | x                   | ✓                                 | x                    | x                  | ✓                                |
| N                     | 4848                              | 4726               | <b>4726</b>                      | 2940                             | 2879               | <b>2879</b>                      | 2846                 | 2771                | <b>2771</b>                       | 2846                 | 2771               | <b>2771</b>                      |

# Endogeneity problems

- For *reverse causality* issues: Lagged/lead regression → Effect of access to electricity in the previous round/year on current outcomes
- *Omitted variable/selection* bias issues: Work in progress! we are trying to find an instrument to be able to carry out Two-Stage Least Squares (2SLS)...

# Access to electricity in the previous round/year on current outcomes

|                       | Height-for-age z-score |                      |                                    | Underweight (low weight for age) |                   |                                  | Stunting              |                     | Health is better compared to peers |                   |                    |                                  |
|-----------------------|------------------------|----------------------|------------------------------------|----------------------------------|-------------------|----------------------------------|-----------------------|---------------------|------------------------------------|-------------------|--------------------|----------------------------------|
|                       | (25)                   | (26)                 | (27)                               | (28)                             | (29)              | (30)                             | (31)                  | (32)                | (33)                               | (34)              | (35)               | (36)                             |
| Access to electricity | 0.274***<br>(0.0211)   | 0.075***<br>(0.0234) | <b>0.069***</b><br><b>(0.0226)</b> | 0.006<br>(0.0084)                | 0.008<br>(0.0093) | <b>0.008</b><br><b>(0.0093)</b>  | -0.121***<br>(0.0145) | -0.031*<br>(0.0161) | <b>-0.033**</b><br><b>(0.0160)</b> | 0.025<br>(0.0200) | -0.016<br>(0.0233) | <b>-0.023</b><br><b>(0.0233)</b> |
| Controls              | x                      | ✓                    | ✓                                  | x                                | ✓                 | ✓                                | x                     | ✓                   | ✓                                  | x                 | ✓                  | ✓                                |
| Year fixed effects    | x                      | x                    | ✓                                  | x                                | x                 | ✓                                | x                     | x                   | ✓                                  | x                 | x                  | ✓                                |
| N                     | 7533                   | 7355                 | <b>7355</b>                        | 3864                             | 3800              | <b>3800</b>                      | 7526                  | 7348                | <b>7348</b>                        | 7537              | 7358               | <b>7358</b>                      |
| <b>Sample: Urban</b>  |                        |                      |                                    |                                  |                   |                                  |                       |                     |                                    |                   |                    |                                  |
| Access to electricity | 0.177***<br>(0.0357)   | 0.057<br>(0.0362)    | <b>0.011</b><br><b>(0.0346)</b>    | 0.000<br>(0.0131)                | 0.001<br>(0.0134) | <b>-0.000</b><br><b>(0.0132)</b> | -0.033<br>(0.0222)    | 0.009<br>(0.0229)   | <b>0.015</b><br><b>(0.0226)</b>    | 0.044<br>(0.0335) | 0.005<br>(0.0361)  | <b>-0.017</b><br><b>(0.0355)</b> |
| Controls              | x                      | ✓                    | ✓                                  | x                                | ✓                 | ✓                                | x                     | ✓                   | ✓                                  | x                 | ✓                  | ✓                                |
| Year fixed effects    | x                      | x                    | ✓                                  | x                                | x                 | ✓                                | x                     | x                   | ✓                                  | x                 | x                  | ✓                                |
| N                     | 5321                   | 5230                 | <b>5230</b>                        | 2656                             | 2625              | <b>2625</b>                      | 5318                  | 5227                | <b>5227</b>                        | 5320              | 5228               | <b>5228</b>                      |
| <b>Sample: Rural</b>  |                        |                      |                                    |                                  |                   |                                  |                       |                     |                                    |                   |                    |                                  |
| Access to electricity | 0.303***<br>(0.0284)   | -0.051<br>(0.0355)   | <b>-0.023</b><br><b>(0.0334)</b>   | 0.023*<br>(0.0132)               | 0.026<br>(0.0164) | <b>0.027</b><br><b>(0.0171)</b>  | -0.158***<br>(0.0216) | 0.032<br>(0.0268)   | <b>0.018</b><br><b>(0.0264)</b>    | 0.007<br>(0.0288) | -0.011<br>(0.0368) | <b>-0.018</b><br><b>(0.0371)</b> |
| Controls              | x                      | ✓                    | ✓                                  | x                                | ✓                 | ✓                                | x                     | ✓                   | ✓                                  | x                 | ✓                  | ✓                                |
| Year fixed effects    | x                      | x                    | ✓                                  | x                                | x                 | ✓                                | x                     | x                   | ✓                                  | x                 | x                  | ✓                                |
| N                     | 2212                   | 2125                 | <b>2125</b>                        | 1208                             | 1175              | <b>1175</b>                      | 2208                  | 2121                | <b>2121</b>                        | 2217              | 2130               | <b>2130</b>                      |
| <b>Sample: Female</b> |                        |                      |                                    |                                  |                   |                                  |                       |                     |                                    |                   |                    |                                  |
| Access to electricity | 0.248***<br>(0.0276)   | 0.093***<br>(0.0343) | <b>0.100***</b><br><b>(0.0326)</b> | 0.000<br>(0.0084)                | 0.002<br>(0.0091) | <b>0.002</b><br><b>(0.0094)</b>  | -0.123***<br>(0.0199) | -0.038*<br>(0.0230) | <b>-0.044*</b><br><b>(0.0228)</b>  | 0.045<br>(0.0285) | -0.002<br>(0.0330) | <b>-0.010</b><br><b>(0.0333)</b> |
| Controls              | x                      | ✓                    | ✓                                  | x                                | ✓                 | ✓                                | x                     | ✓                   | ✓                                  | x                 | ✓                  | ✓                                |
| Year fixed effects    | x                      | x                    | ✓                                  | x                                | x                 | ✓                                | x                     | x                   | ✓                                  | x                 | x                  | ✓                                |
| N                     | 3737                   | 3644                 | <b>3644</b>                        | 1917                             | 1883              | <b>1883</b>                      | 3732                  | 3639                | <b>3639</b>                        | 3738              | 3644               | <b>3644</b>                      |
| <b>Sample: Male</b>   |                        |                      |                                    |                                  |                   |                                  |                       |                     |                                    |                   |                    |                                  |
| Access to electricity | 0.302***<br>(0.0320)   | 0.060*<br>(0.0323)   | <b>0.047</b><br><b>(0.0316)</b>    | 0.012<br>(0.0146)                | 0.014<br>(0.0160) | <b>0.012</b><br><b>(0.0158)</b>  | -0.120***<br>(0.0210) | -0.026<br>(0.0224)  | <b>-0.026</b><br><b>(0.0223)</b>   | 0.003<br>(0.0281) | -0.030<br>(0.0329) | <b>-0.038</b><br><b>(0.0326)</b> |
| Controls              | x                      | ✓                    | ✓                                  | x                                | ✓                 | ✓                                | x                     | ✓                   | ✓                                  | x                 | ✓                  | ✓                                |
| Year fixed effects    | x                      | x                    | ✓                                  | x                                | x                 | ✓                                | x                     | x                   | ✓                                  | x                 | x                  | ✓                                |
| N                     | 3796                   | 3711                 | <b>3711</b>                        | 1947                             | 1917              | <b>1917</b>                      | 3794                  | 3709                | <b>3709</b>                        | 3799              | 3714               | <b>3714</b>                      |

# Access to electricity in the previous round/year on current outcomes

|                       | Health is worse compared to peers |                     |                                   | Suffers long-term health problem |                    |                                  | Health in general  |                    |                                  | Good health        |                    |                                  |
|-----------------------|-----------------------------------|---------------------|-----------------------------------|----------------------------------|--------------------|----------------------------------|--------------------|--------------------|----------------------------------|--------------------|--------------------|----------------------------------|
|                       | (37)                              | (38)                | (39)                              | (40)                             | (41)               | (42)                             | (43)               | (44)               | (45)                             | (46)               | (47)               | (48)                             |
| Access to electricity | -0.026***<br>(0.0100)             | -0.011<br>(0.0113)  | <b>-0.011</b><br><b>(0.0115)</b>  | 0.029*<br>(0.0161)               | 0.007<br>(0.0201)  | <b>0.004</b><br><b>(0.0202)</b>  | 0.018<br>(0.0339)  | -0.023<br>(0.0369) | <b>-0.021</b><br><b>(0.0374)</b> | 0.014<br>(0.0266)  | -0.018<br>(0.0294) | <b>-0.014</b><br><b>(0.0299)</b> |
| Controls              | x                                 | ✓                   | ✓                                 | x                                | ✓                  | ✓                                | x                  | ✓                  | ✓                                | x                  | ✓                  | ✓                                |
| Year fixed effects    | x                                 | x                   | ✓                                 | x                                | x                  | ✓                                | x                  | x                  | ✓                                | x                  | x                  | ✓                                |
| N                     | 7537                              | 7358                | <b>7358</b>                       | 3775                             | 3695               | <b>3695</b>                      | 5585               | 5444               | <b>5444</b>                      | 5585               | 5444               | <b>5444</b>                      |
| <b>Sample: Urban</b>  |                                   |                     |                                   |                                  |                    |                                  |                    |                    |                                  |                    |                    |                                  |
| Access to electricity | -0.020<br>(0.0154)                | -0.004<br>(0.0161)  | <b>-0.003</b><br><b>(0.0162)</b>  | 0.000<br>(0.0290)                | -0.019<br>(0.0321) | <b>-0.021</b><br><b>(0.0322)</b> | 0.032<br>(0.0586)  | 0.002<br>(0.0599)  | <b>0.013</b><br><b>(0.0601)</b>  | 0.035<br>(0.0465)  | 0.007<br>(0.0479)  | <b>0.013</b><br><b>(0.0479)</b>  |
| Controls              | x                                 | ✓                   | ✓                                 | x                                | ✓                  | ✓                                | x                  | ✓                  | ✓                                | x                  | ✓                  | ✓                                |
| Year fixed effects    | x                                 | x                   | ✓                                 | x                                | x                  | ✓                                | x                  | x                  | ✓                                | x                  | x                  | ✓                                |
| N                     | 5320                              | 5228                | <b>5228</b>                       | 2668                             | 2631               | <b>2631</b>                      | 3985               | 3913               | <b>3913</b>                      | 3985               | 3913               | <b>3913</b>                      |
| <b>Sample: Rural</b>  |                                   |                     |                                   |                                  |                    |                                  |                    |                    |                                  |                    |                    |                                  |
| Access to electricity | -0.028*<br>(0.0146)               | -0.007<br>(0.0206)  | <b>-0.008</b><br><b>(0.0207)</b>  | 0.042*<br>(0.0232)               | 0.013<br>(0.0336)  | <b>0.017</b><br><b>(0.0339)</b>  | 0.050<br>(0.0456)  | 0.003<br>(0.0568)  | <b>-0.002</b><br><b>(0.0570)</b> | 0.033<br>(0.0362)  | 0.016<br>(0.0455)  | <b>0.017</b><br><b>(0.0456)</b>  |
| Controls              | x                                 | ✓                   | ✓                                 | x                                | ✓                  | ✓                                | x                  | ✓                  | ✓                                | x                  | ✓                  | ✓                                |
| Year fixed effects    | x                                 | x                   | ✓                                 | x                                | x                  | ✓                                | x                  | x                  | ✓                                | x                  | x                  | ✓                                |
| N                     | 2217                              | 2130                | <b>2130</b>                       | 1107                             | 1064               | <b>1064</b>                      | 1600               | 1531               | <b>1531</b>                      | 1600               | 1531               | <b>1531</b>                      |
| <b>Sample: Female</b> |                                   |                     |                                   |                                  |                    |                                  |                    |                    |                                  |                    |                    |                                  |
| Access to electricity | -0.032**<br>(0.0148)              | -0.029*<br>(0.0165) | <b>-0.030*</b><br><b>(0.0166)</b> | 0.043*<br>(0.0224)               | -0.011<br>(0.0290) | <b>-0.013</b><br><b>(0.0290)</b> | -0.006<br>(0.0465) | 0.006<br>(0.0500)  | <b>0.007</b><br><b>(0.0504)</b>  | -0.024<br>(0.0361) | -0.019<br>(0.0403) | <b>-0.014</b><br><b>(0.0411)</b> |
| Controls              | x                                 | ✓                   | ✓                                 | x                                | ✓                  | ✓                                | x                  | ✓                  | ✓                                | x                  | ✓                  | ✓                                |
| Year fixed effects    | x                                 | x                   | ✓                                 | x                                | x                  | ✓                                | x                  | x                  | ✓                                | x                  | x                  | ✓                                |
| N                     | 3738                              | 3644                | <b>3644</b>                       | 1870                             | 1829               | <b>1829</b>                      | 2773               | 2699               | <b>2699</b>                      | 2773               | 2699               | <b>2699</b>                      |
| <b>Sample: Male</b>   |                                   |                     |                                   |                                  |                    |                                  |                    |                    |                                  |                    |                    |                                  |
| Access to electricity | -0.019<br>(0.0133)                | 0.008<br>(0.0155)   | <b>0.008</b><br><b>(0.0156)</b>   | 0.014<br>(0.0233)                | 0.019<br>(0.0280)  | <b>0.015</b><br><b>(0.0280)</b>  | 0.044<br>(0.0495)  | -0.044<br>(0.0540) | <b>-0.035</b><br><b>(0.0550)</b> | 0.056<br>(0.0392)  | -0.009<br>(0.0426) | <b>-0.005</b><br><b>(0.0434)</b> |
| Controls              | x                                 | ✓                   | ✓                                 | x                                | ✓                  | ✓                                | x                  | ✓                  | ✓                                | x                  | ✓                  | ✓                                |
| Year fixed effects    | x                                 | x                   | ✓                                 | x                                | x                  | ✓                                | x                  | x                  | ✓                                | x                  | x                  | ✓                                |
| N                     | 3799                              | 3714                | <b>3714</b>                       | 1905                             | 1866               | <b>1866</b>                      | 2812               | 2745               | <b>2745</b>                      | 2812               | 2745               | <b>2745</b>                      |

# Discussion

- With these results, **can we say access to electricity improves health?**
- For most outcomes... it doesn't, why could this be?
  
- **Effects of electrification are uneven**
- Potential Mechanisms?
- Therefore, important to ensure equitable levels of improvement across groups