Beijing's coal-to-electricity program: impact on household welfare and energy choices

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Context

- In fall 2016, Beijing adopted a **"coal-to-electricity" policy** which bans coal heating in rural homes and subsidizes its replacement with electric heat pumps.
- The policy is expected to improve air quality, but is costly for rural households.
- We are interested in the policy's economic and health impacts at the rural household level, as well as its overall effectiveness.

Research questions

How do the coal ban and heat pump subsidy impact:

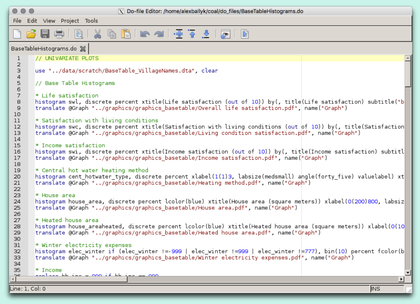
1. **Household energy choices**: How do the heating technology, and its duration of use, change?
2. **Household welfare**: How does the income shock from upfront investments and higher electricity costs affect measures of wellbeing?

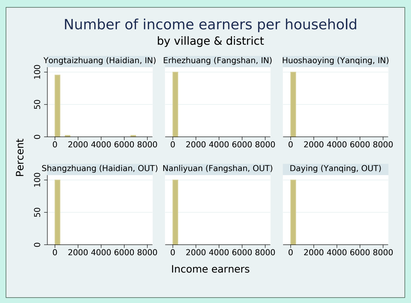
Method

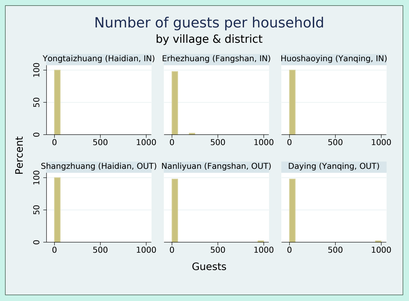
- **Analysis of survey data** from 3 rural districts with 2 villages each (one treated, one untreated)
- Data cleaning in Stata/MP®: vetting of survey responses via *descriptive statistics*
  - Recoding of aberrant observations
  - *T-tests* to determine level of difference between variables in treated and untreated villages
- Creation of key variables for household energy choices

Learning outcome #1: the data cleaning, vetting, recoding and plotting process

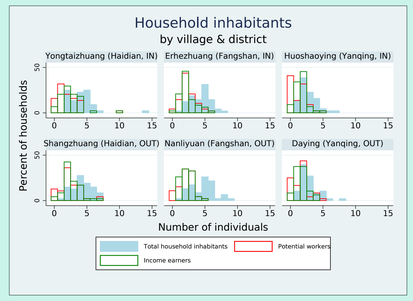
Example: Total household inhabitants, income earners and potential workers







Problems: it doesn't make sense for a household to have more than 1000 guests or income earners. Some also reported more income earners than total inhabitants.
Solutions: generate new variables with sensible maximum values, make note of this assumption.



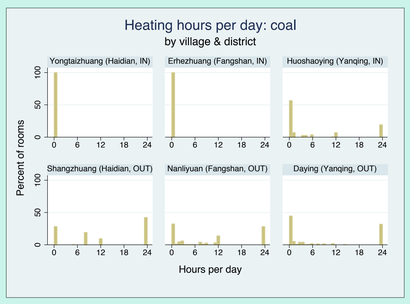
Step 1: write a code which plots histograms of the desired variables

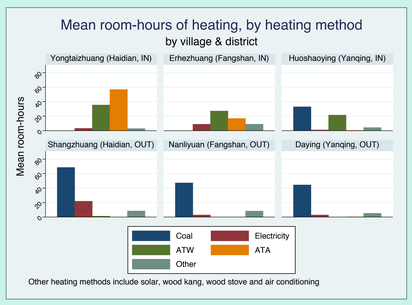
Step 2: note and investigate any odd results, recode the variables accordingly

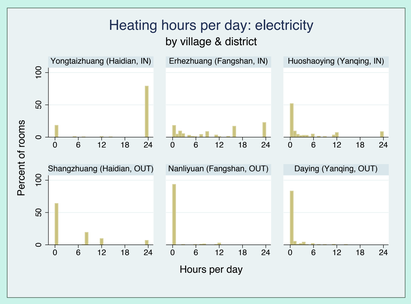
Step 3: plot recoded variables, colour-coded for clarity

Learning outcome #2: analysis of survey results

Via descriptive statistics and pairwise comparisons







Additionally…
In Fangshan, respondents in the treated village reported being significantly more satisfied with their living conditions. The opposite was true in Yanqing. No significant difference in self-reported wellbeing measures was observed in Haidian.

Treated villages in Haidian and Fangshan (more affluent districts) do not burn coal, whereas the treated village in Yanqing (the least affluent district) does.

Air-to-water and air-to-air heat pumps are the most prominent heat sources in Yongtaizhuang and Erhezhuang, yet coal heating is still quite prominent in Huoshaoying.

Electricity use in treated villages is far greater than in their untreated counterparts, yet Yongtaizhuang and Erhezhuang consume more electricity than Huoshaoying.

Conclusions & Next Steps

- Although coal heating in Yanqing is lower in the treated village, these villagers continue to burn coal. Thus, our findings suggest that **the policy only eliminates coal use entirely in relatively affluent districts.**
- We surmise that additional expenses related to electric heating are too costly for less affluent households.

Conclusions & Next Steps (cont.)

- Wellbeing measures reflect the latter conclusion: in Fangshan, respondents are happier under the program as opposed to out of it, while respondents in Yanqing are less happy under the program.
- **Next Steps:** Scale-up the survey, examine before-and-after effects in currently untreated villages.

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