Understanding the use of wood-burning stoves in the East Riding - a postnote

Background

Wood-burning is particularly common in the East Riding of Yorkshire. Wood-burning stoves are used by a higher percentage of households in the East Riding, compared to average use in England as a whole.

Wood burning can lead to poorer indoor air quality. Burning wood and other solid fuels results in the emission of significant amounts of particulate matter ('dust') (Box 1).

Particulate matter is known to cause and worsen cardiovascular and respiratory disease, and some cancers (Naeher et al., 2007; Po et al., 2011). Between 26,000 and 38,000 premature deaths in England are attributed to air pollution every year, including through asthma, bronchitis and heart conditions caused by particulate matter.

Box 1: Current Picture

- 15% of rural households, including parts of the East Riding, are off the gas grid.
- 15% of the households in the rural East Riding use wood-burning stoves, compared to 5% throughout England and Wales (SIA, 2013).
- Emissions from 1 hour use of 1 eco-certified wood stove = 1 hour use of 18 diesel cars = 1 hour use of 6 heavy goods vehicles. But the emissions from the stove are generated and remain indoors.

The choice to use wood-burning stoves can result from infrastructure within rural communities (local availability of wood and lack of access to the gas grid), as well as personal preferences and socio-economic status. Given 1) the common use of wood-burning stoves in the East Riding, 2) the significant emissions of particular matter by wood-burning stoves and 3) the established relationship between particulate matter and disease, it is important to better understand wood burning practices in the region (Box 2).

Box 2: Study aims

- To investigate the reasons and motivations behind the use of wood-burning stoves.
- To investigate the perceptions of benefits and drawbacks of using wood-burning stoves among the residents of East Riding.

Methods

Data collection: June-July 2024 through Smart-Survey.

Data storage and analysis: Data was anonymised and stored on University systems, in compliance with University and ERYC policies. Data cleaning and preparation for analysis was done as per Saunders et al., 2019.

Governance: This project was approved by the Hull York Medical School Ethics Committee (23-24.41), and performed within the context of the MSc Collaboration Agreement between the University and the ERYC.

Results

Participant numbers and locations

Representative sample across the region (Figure 1 and Box 3).

Primary source of heating: gas, followed by solid fuels (including wood) and oil (Figure 2).

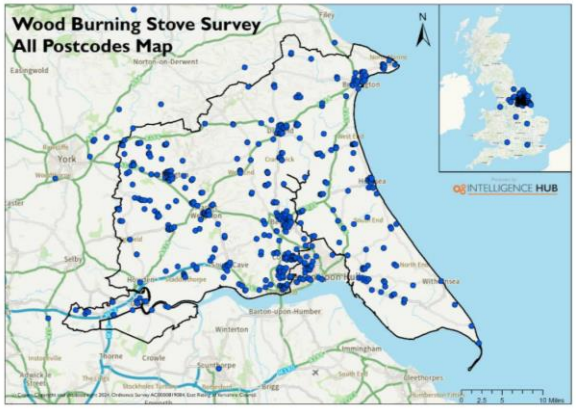

Figure 1: Maps including the postcodes from all survey respondents as blue dots.

Box 3: Participant demographics

- 615 residents above age 18.
- Most respondents lived in detached (42%) or semi-detached houses (28%).
- Gender distribution was 47.5% male, 46.3% female with the balance as other / prefer not to say.
- The majority of respondents identified as white (84%) and were between 25-74 years old (90%).
- 72% of respondents reported no disability, and 90% owned their property.
- 65% and 34% of participants were on-grid and off-grid, respectively.

WHY do respondents use wood-burning stoves?

Heating is the major reason why respondents use wood-burning stoves (Figure 3).

Perceived benefits of using wood-burning stoves include heat, costs and mental health (Figure 4). Some benefits are better perceived by specific groups (Boxes 4 and 5).

WHERE do respondents use wood-burning stoves?

Living rooms are the most common location of wood-burning stoves (Figure 5).

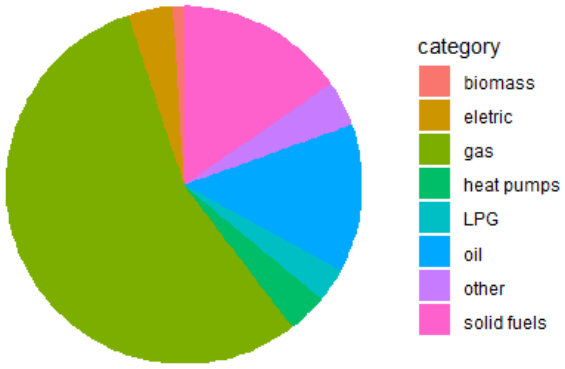

Figure 2: Primary source of heating: gas (55%), oil (13%), biomass (1%), LPG (3%), electric (4%), heat pumps (4%), solid fuels (15%), and other (4%).

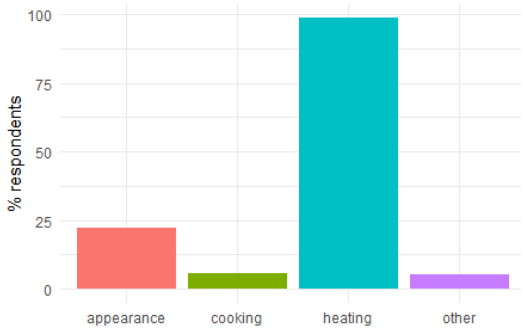

Figure 3: Most respondents use wood-burning stoves for heating

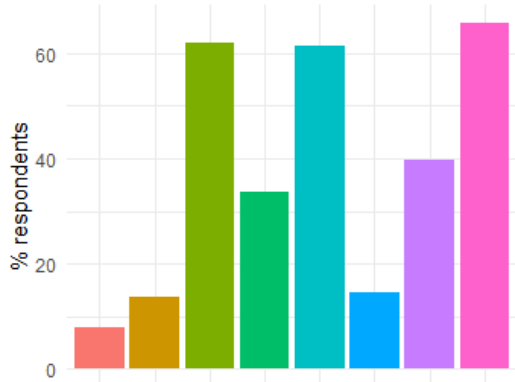

Figure 4: % respondents that cite benefits related to (from left to right): 1) better for air pollution, 2) better for climate change, 3) cost, 4) energy efficiency, 5) good for mental health, 6) good for physical health, 7) none/other/ prefer not to say, and 8) provides heat during power cuts

Box 4: Regression analysis. Our models show that:

- People off-grid may perceive more benefits than people on-grid
- Older age groups may be more likely to use wood-burning stoves

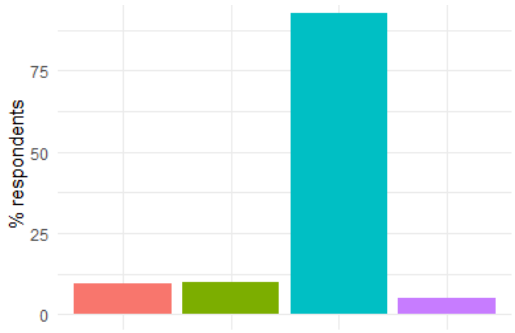

Figure 5: Location of stove (from left to right): 1) dinning room, 2) kitchen, 3) living room, and 4) other/ prefer not to say.

WHEN do respondents use wood-burning stoves?

In agreement with the view that one of the main aims of using wood-burning stoves is heating, use in December is much more common than in June (Figure 6).

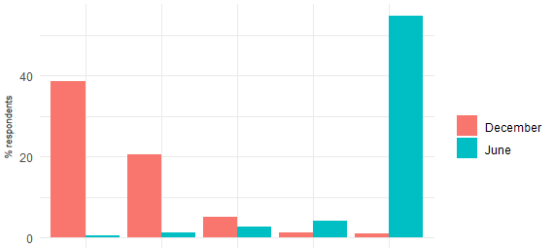

Figure 6: % respondents that use stoves, from left to right: 1) daily, 2) several times a week, 3) once a week, 4) once a month, and 5) less than once a month, in the indicated month.

WHAT wood do respondents use in wood-burning stoves?

Ash, birch and oak are some of the most commonly used wood sources, while 27% and 29% of respondents do not know, or use other sources (Figure 7).

WHICH drawbacks of using wood-burning stoves do respondents identify?

Air pollution is an acknowledged drawback of using wood-burning stoves (Figure 8).

Respondents identify a number of other drawbacks – and also benefits (Box 5).

Box 5: Testimonials – benefits and drawbacks

- Cleaning and maintenance: '*Messy*'.
- Wood storage and handling: '*You have to cut logs*'
- Health and safety, including as a fire hazard: '*Horrendous for people with a lung condition*'; '*On a cold day I can smell the fumes and it gets to the back of my throat and chest*'; '*This form of heating affects people's right to fresh air and can cause breathing health issues*'
- Community and air pollution: '*Smoke from next door gets into my house*'; '*The smog from [my housing estate] in winter gathers and sits dense in the air*', '*people are not burning correct fuel thus bad for the environment*'.
- Efficiency and environmental impact: '*Only heats one room*' and there is no control once lit up. But: '*Per kwh it costs nearly nothing, I use an electric chainsaw powered by my solar panels and a log splitter powered by my solar panels, so my CO_2 footprint is [minimal]*'; and '*Greener than heat pumps and more effective*'.
- Tradition and culture: '*Wood has been the main fuel source for hundreds or thousands of years. Wood is a free resource for us [..] yet we must pay to heat our house by different means as a result of this scaremongering*'; '*They are relaxing watching the flames dancing*'; '*I love the ambience of a stove*'; '*I will always have one wherever I live no matter what laws are brought into play*'.

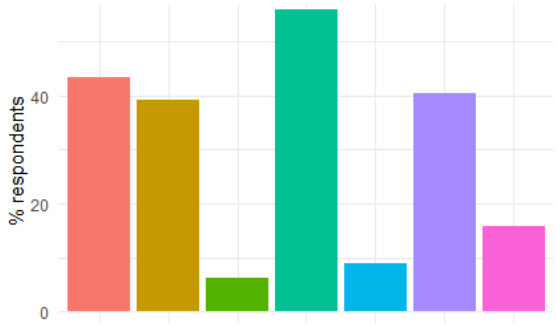

Figure 7: Type of wood used (from left to right): 1) ash, 2) birch, 3) cedar, 4) don't know/ other, 5) larch, 6) oak and 7) pine.

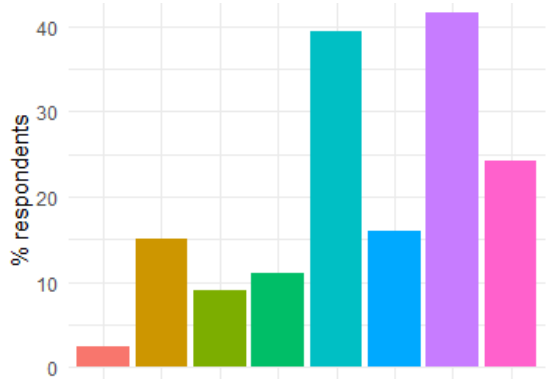

Figure 8: Drawbacks of using wood-burning stoves (from left to right): 1) detrimental to mental health, 2) detrimental to physical health, 3) less cost effective, 4) less energy efficient, 5) none, 6) other, 7) worse for air pollution and 8) worse for climate change.

Conclusions

- Air pollution is the single greatest environmental threat to health, and associated with illness, disease, loss of productivity and mortality.
- Air pollution is mainly caused by road transport and solid fuel burning.
- Wood burning is common practice in the East Riding of Yorkshire, mainly for heating and also for aesthetics and comfort. This is compounded by a large rural population, and groups without access to the gas grid.
- **There is a tension between perceived benefits and drawbacks** of wood-burning stoves and how they affect individuals and communities (Box 6).
- Further research can contribute to understanding the use of wood-burning stoves in the East Riding through increasing the granularity of data collection to include e.g., socioeconomic status.
- Conducting vulnerability and health impact evaluations would be valuable towards assessing the implications of domestic solid fuel burning on East Riding of Yorkshire residents.

Box 6: Main messages

- Clearly, users of wood-burning stoves reach compromises between drawbacks (e.g., 'messy') and benefits (e.g, 'relaxing', 'cheap to heat')
- This tension is likely to be dynamic e.g., the same people deciding to use / not to use stoves depending on personal or household circumstances
- **Empowering individuals, households and communities with the right support and information can help maximise the benefits of wood-burning stoves at the individual / household / community levels while minimising air pollution and associated disease**

References

Naeher, L.P., Brauer, M., Lipsett, M., et al. (2007). Woodsmoke health effects: A review. Inhalation Toxicology, 19(1), 67-106

Po, J.Y., J.M. FitzGerald, and C. Carlsten. 2011. Respiratory disease associated with solid biomass fuel exposure in rural women and children: Systematic review and meta-analysis. Thorax 66:232–239

Saunders, M.N.K., Philip, L., & Adrian, T. Research methods for business students. Harlow, England ; New York : Pearson, 2023.

SIA (2023). Woodburning stove sales remain strong - Stove Industry Association | SIA. [online] Stove Industry Association | SIA.