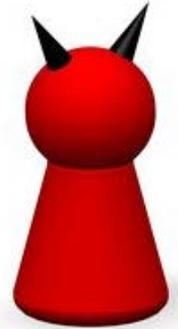

BECC 2011



Side effects of household water consumption feedback on electricity consumption



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The discussion on potential side effects of environmental behavior change is controversial.

- Most environmental campaigns
 - Target one single domain, e.g. water use
 - Evaluation: only targeted variable analyzed



■ Potential side effects are not considered.



Foot-in-the-door techniques



Small actions as a moral excuse

Not considered in cost-benefit analysis of smart meter installations and energy efficiency campaigns!

More recent literature indicates more support for moral licensing (negative spillover effects).

Positive spillover effect

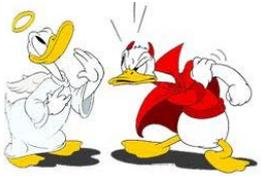
- Bem's self-perception theory (1972) : behavior as cue to internal dispositions
- Desire for **consistency** (Festinger 1957)
- Ex.: Recycling and buying organic food (Thøgersen 2003)



Moral licensing

- Previous behavior **decreases barrier** for socially undesirable/ morally questionable actions
- Moral **credits** model: accumulate credits for deviation (Miller&Efron 2010)
- Moral **credentials** model: behavior not as transgression

Previous studies found evidence for different types of moral licensing in a variety of domains.



Within behavioral domain

Racism, sexism, donations, food choice, consumer behavior,...



Across domains

Shopping for green products increasing likelihood of stealing/lying



Visibility to others not necessary



Mere anticipation of future behavior sufficient

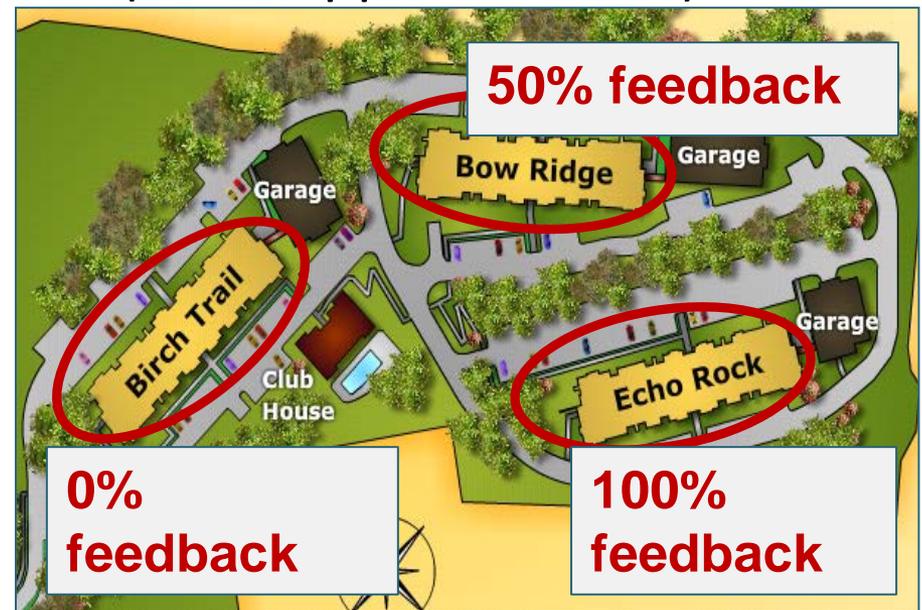
Problem: based on lab experiments & surveys!

Conditions favoring moral licensing are highly relevant for environmental behavior.

| Behavioral history | Environmental behavior |
|---|------------------------|
| 1. Domain unimportant to one's identity | |
| 2. Behavior framed as progress , not commitment to goal | |
| 3. Avoiding hypocrisy less important <ul style="list-style-type: none">• No claim about moral values• Not same domain• Not blatant transgression | |

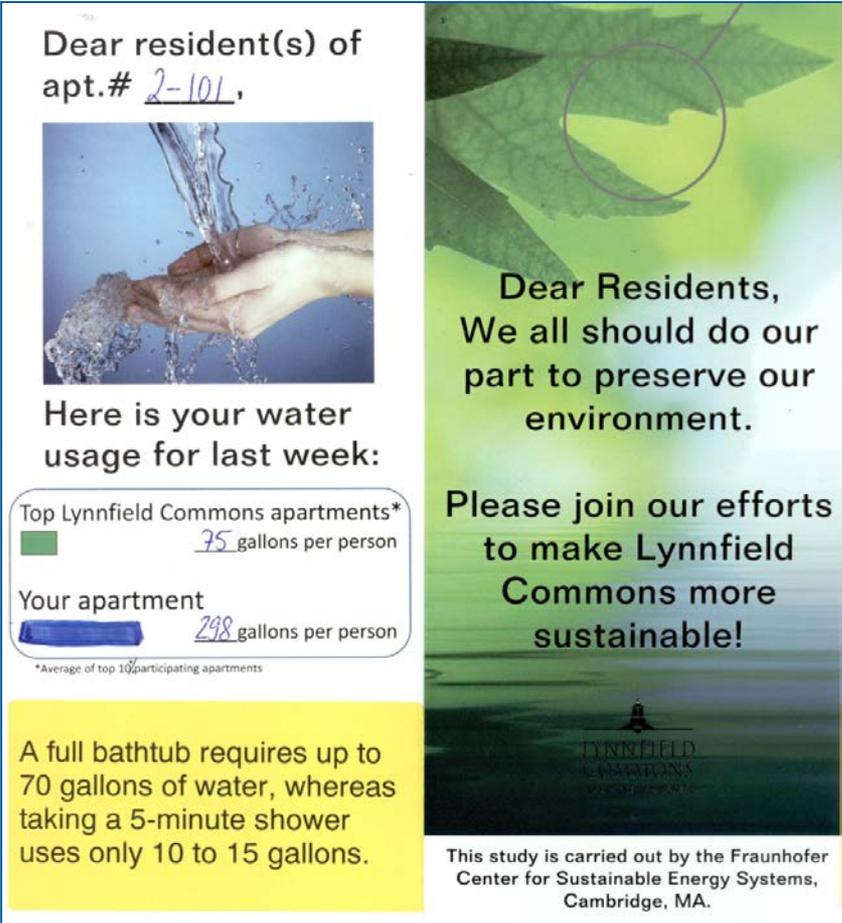
This field study quantifies the impact of a water consumption feedback campaign on electricity usage.

- 200 apartments in one property, 11 weeks
- Apartments submetered for water, electricity and gas
- Similar apartment characteristics (same appliances etc.)
- Opt-out study
- Residents informed in advance
- More representative sample
- “Random” group assignment



Actual field data are used to quantify the impact of the water feedback campaign (on water and electricity).

- Utility consumption data
 - Water (daily readings)
 - Electricity (weekly)
- Weekly feedback on per capita water usage
 - Control (77 units): no feedback
 - Treatment (77 apartments):
 - Prosocial message
 - Water conservation tip
 - Comparison with 10% most efficient apartments



Dear resident(s) of apt.# 2-101.



Here is your water usage for last week:

| Category | Usage (gallons per person) |
|-----------------------------------|----------------------------|
| Top Lynnfield Commons apartments* | <u>75</u> |
| Your apartment | <u>298</u> |

*Average of top 10 participating apartments

A full bathtub requires up to 70 gallons of water, whereas taking a 5-minute shower uses only 10 to 15 gallons.

Dear Residents,
We all should do our part to preserve our environment.

Please join our efforts to make Lynnfield Commons more sustainable!

LYNNFIELD COMMONS

This study is carried out by the Fraunhofer Center for Sustainable Energy Systems, Cambridge, MA.

Utility consumption data are subject to noise: example water

- Median usage per apartment:

74gal/day

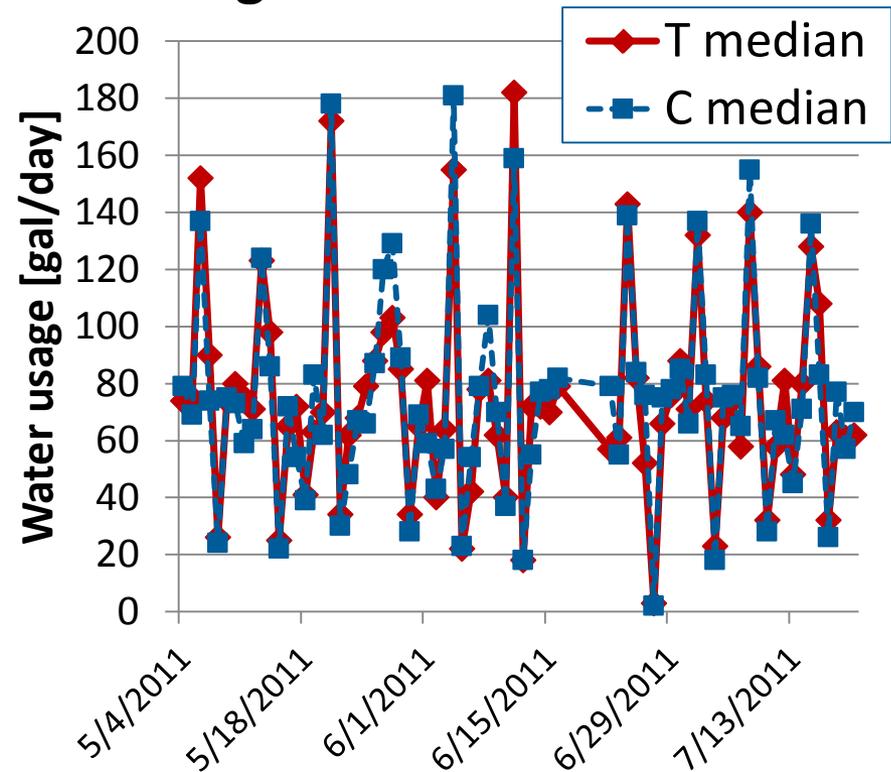
- Average standard deviation:

77gal/day

- → Controlled for

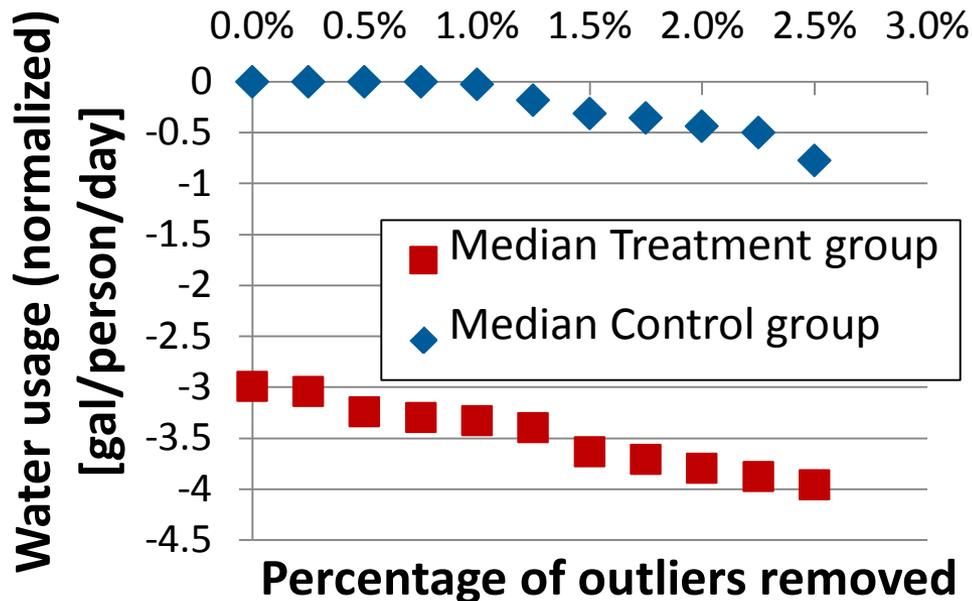
- # of occupants
- Weekdays
- Absence days

Water usage: medians of raw values

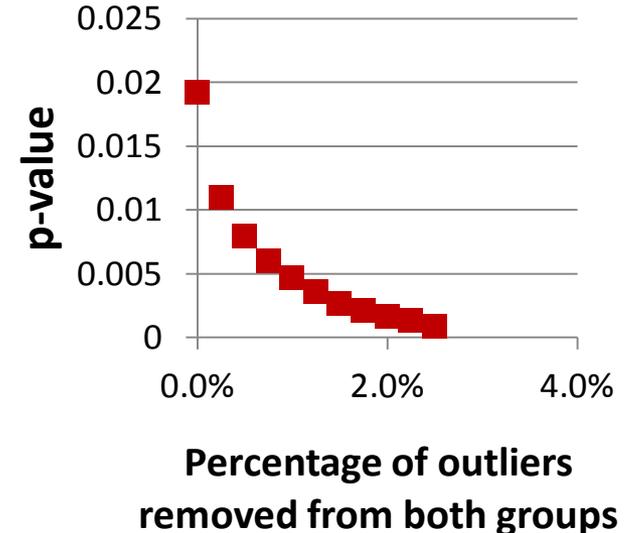


During the feedback period, the treatment group used 7.4% less water (before: no difference).

Water: Treatment and control group medians (normalized to median control)



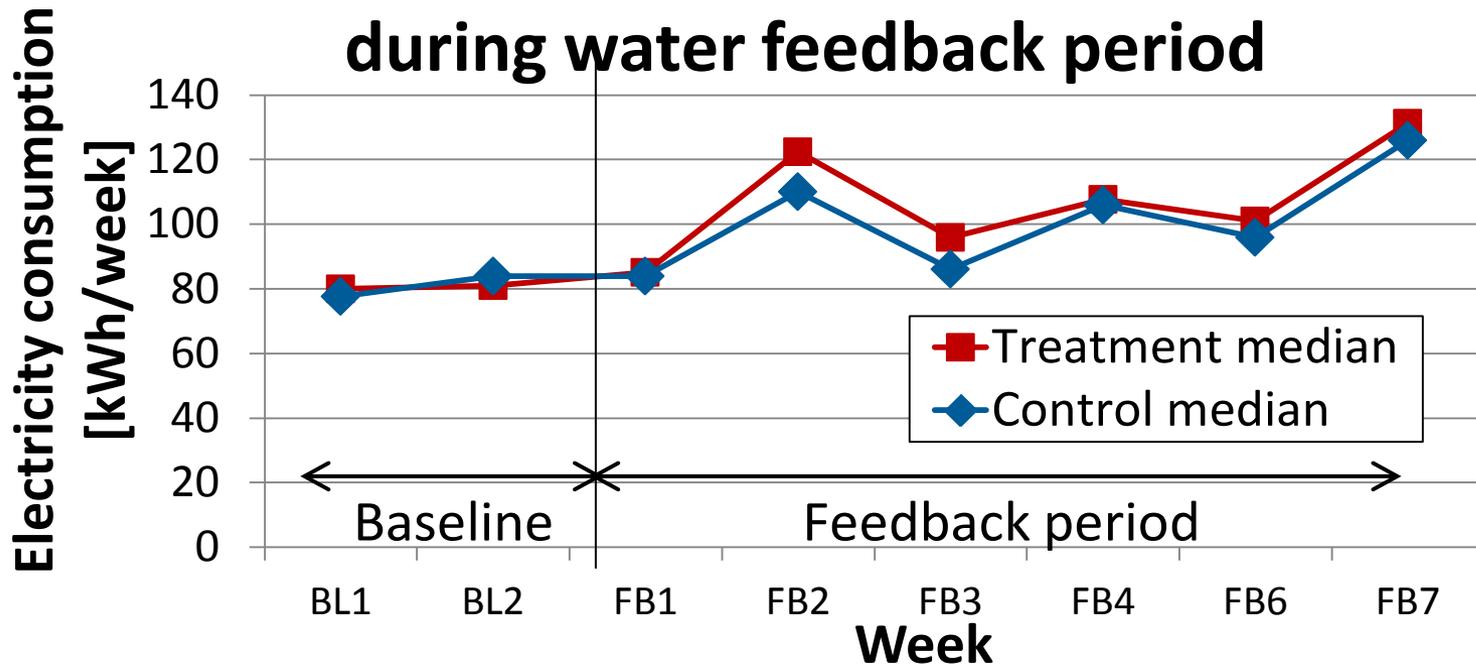
p-values (feedback period)



The effect is significant, robust and not due to outliers!

Data show support for moral licensing: The treatment group used more 5.7% more electricity!

Electricity usage medians before and during water feedback period



The effect is significant, robust and not due to outliers!

Summary (1): Despite evidence from many domains, licensing is overlooked in environmental behavior.

- Evidence for licensing effect found in many domains
- Environmental behavior prone to moral licensing by its nature
- Lack of actual field data



- This study:
 - Actual consumption data
 - Water feedback campaign
 - Electricity data confirm licensing



Summary (2): Understanding the licensing effect allows mitigating its risks and leverage opportunities.

- Are we “fighting fire with fire”?
- Need to investigate risks and opportunities
 - Risk: Danger to CO₂ reduction goals
 - Opportunity: e.g. climate compensation programs



- Key issue: Balancing messages



“Your behavior has an impact”



“Don’t overestimate the positive impact of your efforts”



Thanks for listening! Questions?



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