Saving Water & Energy

Spillovers from Behavioral Interventions

WaterSmart Software partnered with Katrina Jessoe, Gabriel Lade, Frank Loge, and Edward Spange from the University of California, Davis on the Smart Water-Energy Savings (SWES) project funded by the California Department of Water Resources (DWR) to run a randomized controlled trial. The study used high-frequency data to test the effect of social norms messaging about residential water use on energy consumption.[1]

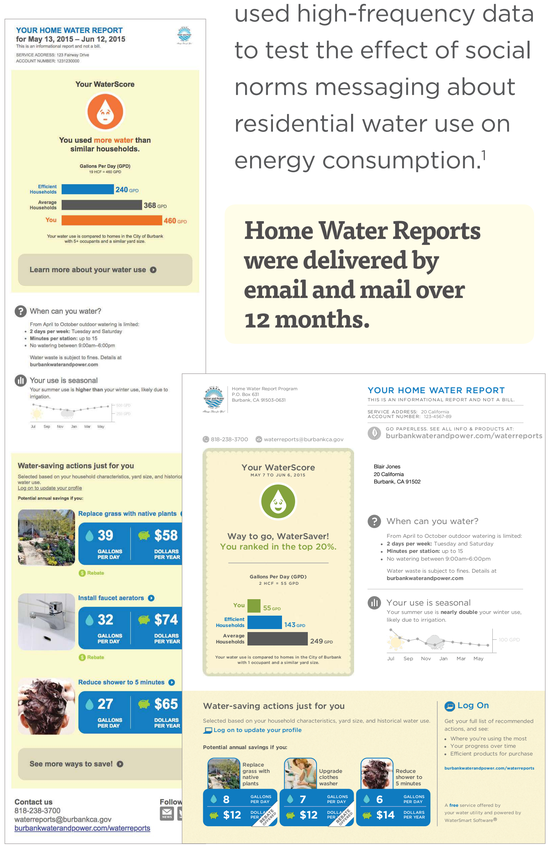

Figure 1

Home Water Reports were delivered by email and mail over 12 months.

This project was motivated by the nexus between water, energy, and greenhouse gas emissions. Almost 20% of California's electricity and 30% of its natural gas go toward moving, heating, and treating water.[2] Behavioral nudges have proven to be a cost-effective method to avoid generation and delivery costs for individual commodities. This study aimed to identify cross-sectoral impacts between water and gas, or water and electricity.

RESEARCH DESIGN

The WaterSmart Program was run March 2015 through May 2016 in the jurisdiction of Burbank Water and Power (BWP). BWP serves roughly 18,500 single family customers. 4,559 accounts were randomly selected to receive Home Water Reports (HWRs) on a bi-monthly basis. HWRs are personalized mailings that feature a social comparison, which compares the recipient's most recent bi-monthly water use with that of similar households—those with the same number of occupants and a similar irrigable area. The comparison is paired with an injunctive norm to convey the value of being "below average" (Figure 1).

HWRs also include information about the Utility and water savings recommendations specific to the household. The hypothesis was that potential energy savings would be mechanically related to water saved. For example, shorter showers or fewer loads of laundry would reduce use of hot water heaters and complementary appliances, such as clothes dryers.

Social norms messaging about residential water use saved 4.4 % water annually *and* 1.3 – 2.2% electricity in summer months.

Figure 2

For two additional treatment groups (called "Hot WaterSmart") the savings recommendations included potential gas savings (Figure 2). However, these groups and the associated effect on gas consumption are not included in the current analysis.

RESULTS

The electricity conservation effect was 1.3% to 2.2% in the summer months, and negligible in other months (Figure 3). The largest treatment effects occurred between 3pm and 7pm, a period that includes the hours of peak demand—when wholesale electricity prices are the highest.

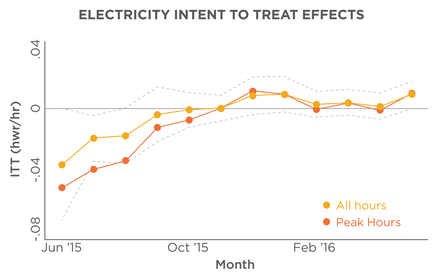

Figure 3

The total water conservation effect over the 12 months of the program was 4.4%. In the hotter summer months, water reductions were only 2.9%. This is notable in the context of electricity savings. The hours with most observed savings were 5am to 7am, and at 7pm, suggesting reduction of outdoor use.

These results challenged the hypothesis that energy savings would be mechanically related to water savings. To confirm this observation, the research team ran further analysis.

ANALYSIS

First, the timing of water and electricity savings were mismatched on both a seasonal and an hourly basis (Figure 4). Next, a follow-up survey indicated that HWRs correlate positively with self-reporting of electricity-conserving actions. For example, turning off the lights. Finally, an appliance-level engineering simulation implied that mechanical complementarities can explain only 26% of the estimated electricity savings.

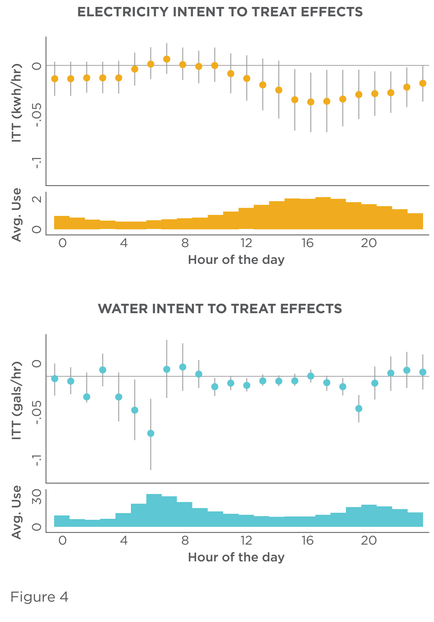

Figure 4

At least 74% of the electricity savings were due to behavior change, rather than from the mechanical influence of water conservation.

CONCLUSION

The study demonstrates that behavioral interventions can spill into unintended sectors. In this case, behavioral nudges targeted at water conservation produced an effect on both water and electricity use. The analysis suggests that the spillover effect is due to changes in electricity use choices. The HWRs may increase attention to utility bills in general, or perhaps increase the "moral utility" of water and energy use. Further research should investigate what other spillovers may exist, and under which conditions.

More Information

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1. Katrina Jessoe, Gabriel E. Lade, Frank Loge, and Edward Spang. *Spillovers from Behavioral Interventions: Experimental Evidence from Water and Energy Use*. December 2017.
2. California Energy Commission. *California's Water – Energy Relationship*. November 2005.