# Low Hanging Fruit: Why consumers respond to social norms messaging

(former title: Money vs. Morals: Why do Consumers Respond to Nudges?)

Presented by Kimberly Rollins
University of Nevada, Reno

Daniel Brent, Corey Lott, Michael Taylor, Joe Cook & Shawn Stoddard
LSU, UCSB, UNR, TMWA

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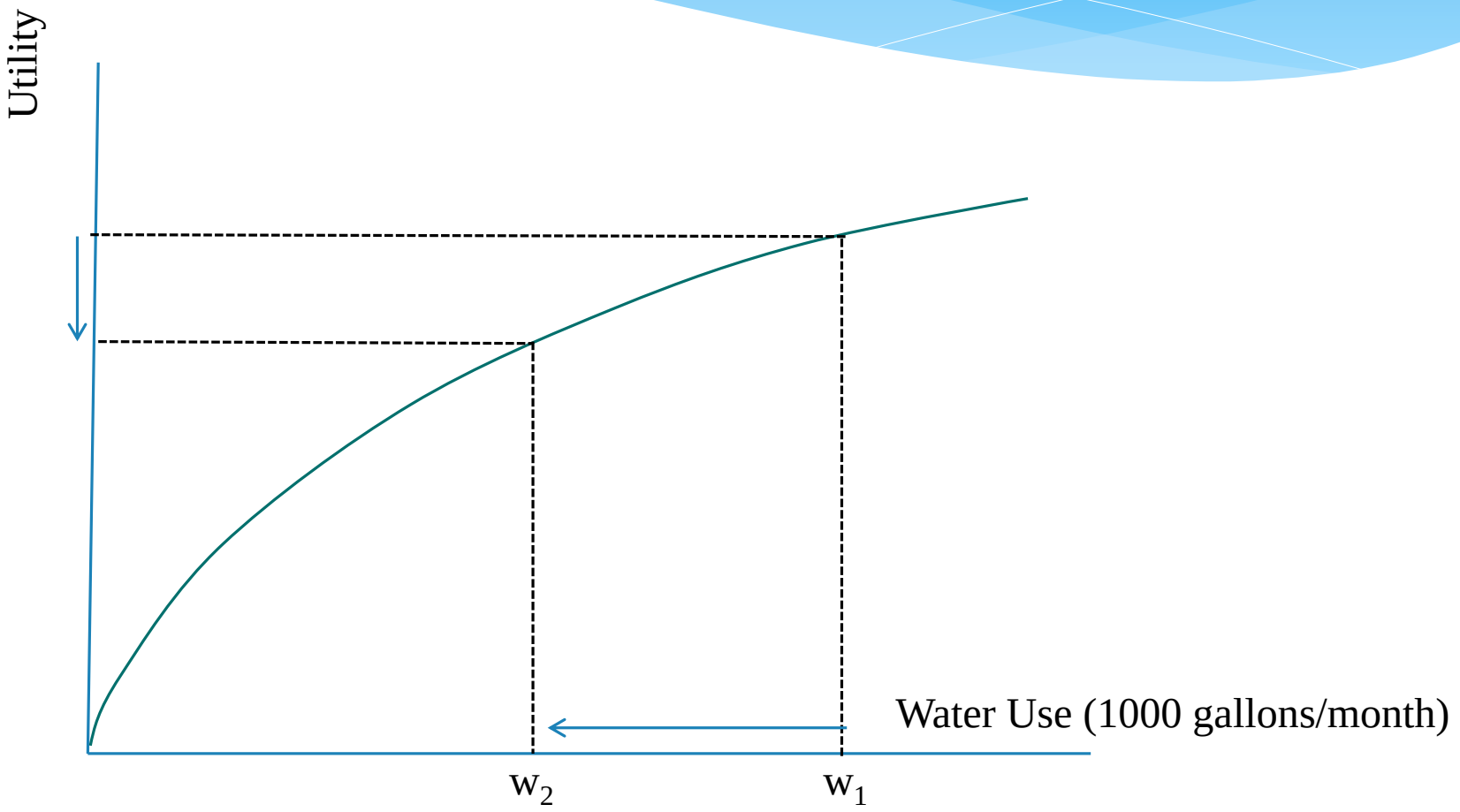
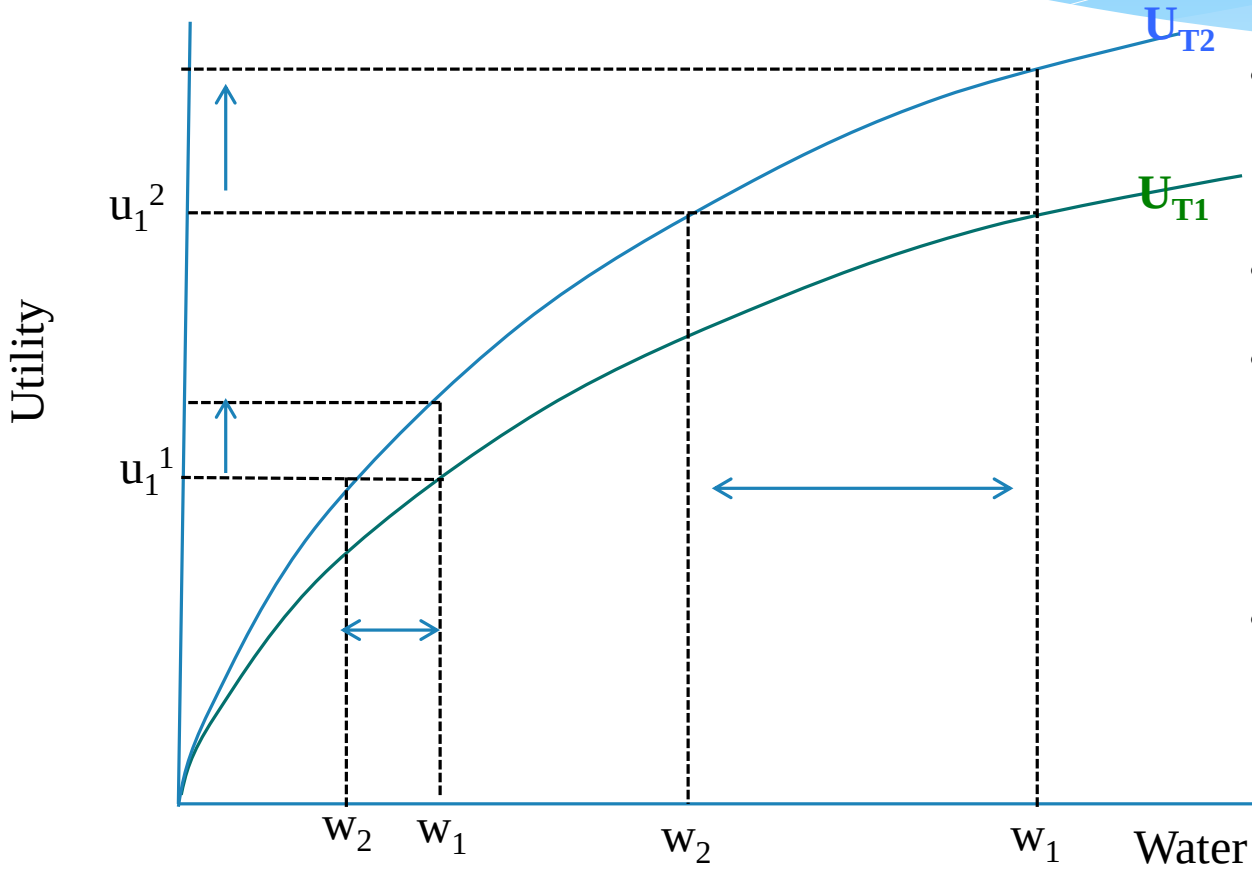
# Normative Appeals and Water / Energy Consumption

* Evidence from several studies indicates normative appeals lead to significant and persistent reductions in residential energy (Allcott & Rogers 2014) and water use (Bolson, Ferraro and Miranda 2014).
* Previous studies have done little to shed light on underlying behavioral mechanisms (Ferraro and Price 2013).
* Moral motivation is the widely accepted behavioral argument: Social norm message raises the psychic cost of consumption (imposes a moral tax).
* We provide an alternative explanation that is consistent with economic theory.

# Reduced water use in response to the "moral tax" imposed by social norm message



# Normative messages provides information that raises awareness about wasteful and costs of reducing this




- $U_{T1}$ to $U_{T2}$ : utility, re-optimization of water use practices
- $u_1$ : pre-message utility.
- $w_1 - w_2$ : post message conservation potential with "low hanging fruit."
- Less potential if prior conservation effort

# Previous Findings

* High users **more responsive** to normative appeals (Allcott 2011; Ferraro & Price 2011, 2013; Ferraro & Miranda 2013; Brent et al. 2015)
* Two explanations:
  1. High users more likely to get a "strong" message which would impose a higher moral cost
  2. High users have more low-cost options for saving water

BUT: The difference from peer group (message strength) and pre-treatment level of consumption are highly correlated.

# Problem

* Correlation between pre-treatment use and strength of the message means
* Consumers with higher pretreatment use have a stronger response to normative messaging (Allcott 2011; Dolan and Metcalf 2013; and Ito, Ida, and Tanaka 2015; Ferraro and Miranda 2013; Brent, Cook, and Olsen 2015)
  * Higher moral tax
  * Higher users have more opportunities to improve their welfare by re-optimizing use habits and practices (i.e., have more “low-hanging fruit”).

# Our Contributions

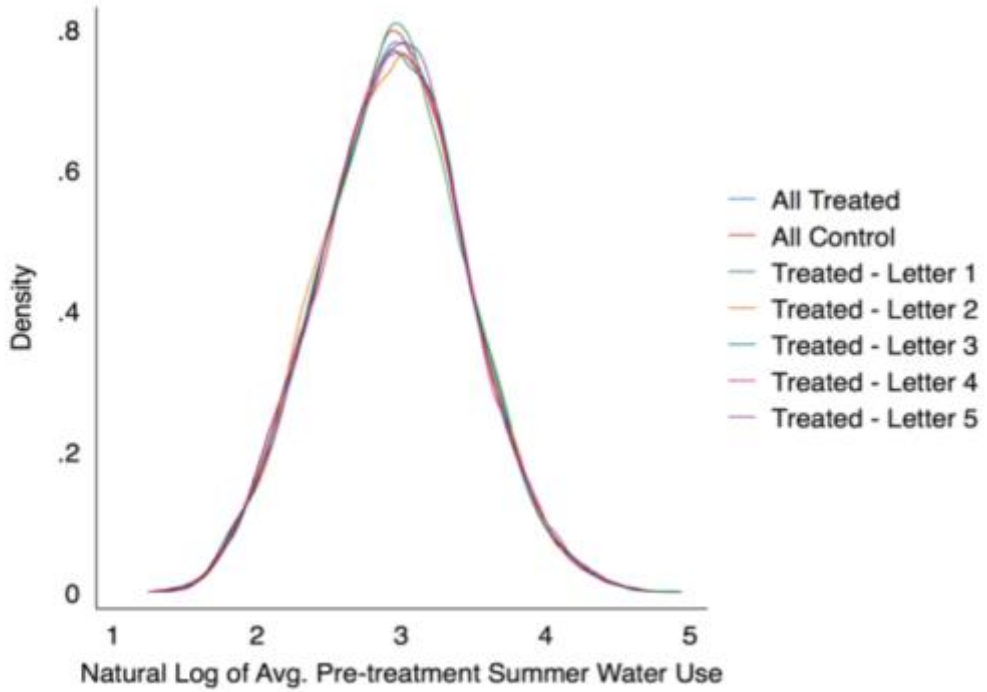
* New type of social norms message designed to decouple the strength of the normative message and the level of pre-treatment use.
* Improved understanding of whether conservation motivation is due to averting a moral tax (welfare decreasing) or due to providing information about the potential costs of re-optimizing (reduce waste with low cost changes).
* Our interpretation of social norms as policy tools implies they are more welfare enhancing than if one must account for welfare losses due to their imposing a moral tax.

# Part of larger experiment deployed in Reno NV with the Truckee Meadows Water Authority (TMWA)

**Control vs. Treated Customers by Letter**

| Treatment Type | Control | Total |
|---|---|---|
| T1: Tips Sheet Only | | 4,232 |
| T2: Tips + Water Use History | | 4,237 |
| T3: Tips + History + Rate Information | | 4,234 |
| T4: Tips + History + Social Norms (Gallons) | | 4,231 |
| T5: Tips + History + Social Norms (Percent) | | 4,217 |
| Total | 21,552 | 21,151 |

# Balance on Baseline Water Use



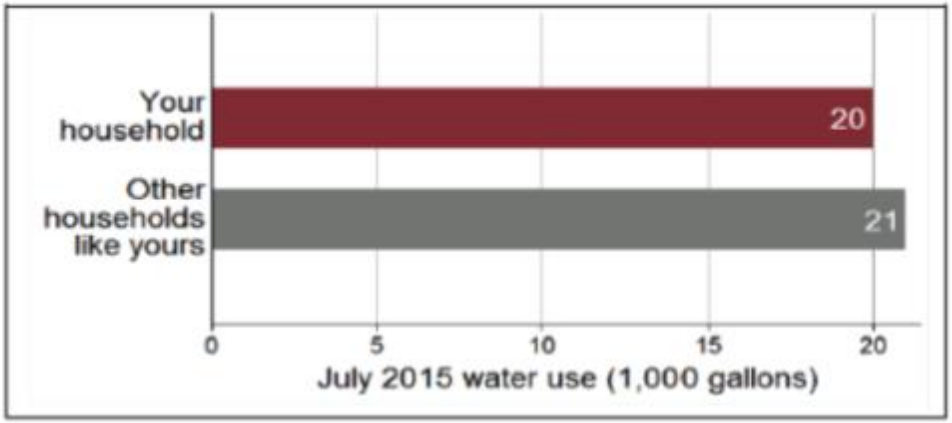
# Social Norm Comparison in Gallons of Water Used

**How does your water use compare?**

The graph on the right shows your water use from your July bill compared to similar properties in your area. You used **1,000 gallons less** than your neighbors with similar properties.

You saved 35% on your July bill compared to 2013.

**Keep up the good work!**

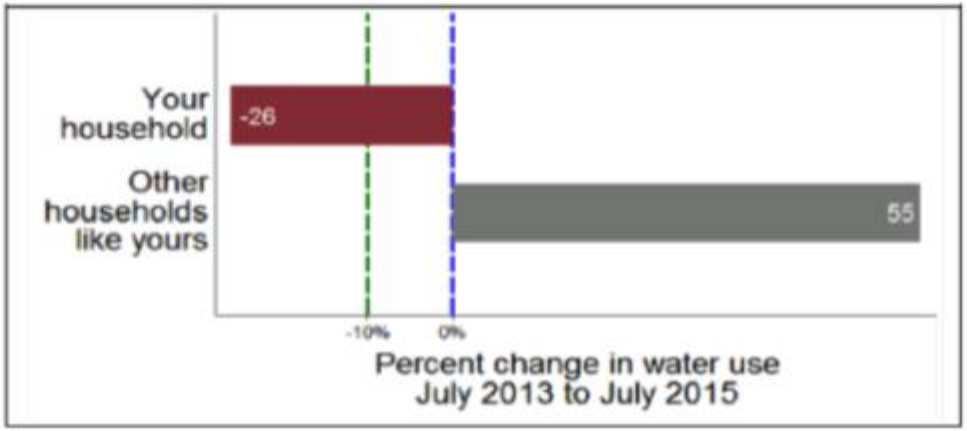


# Social Norm Comparison in % Reduction toward drought goal

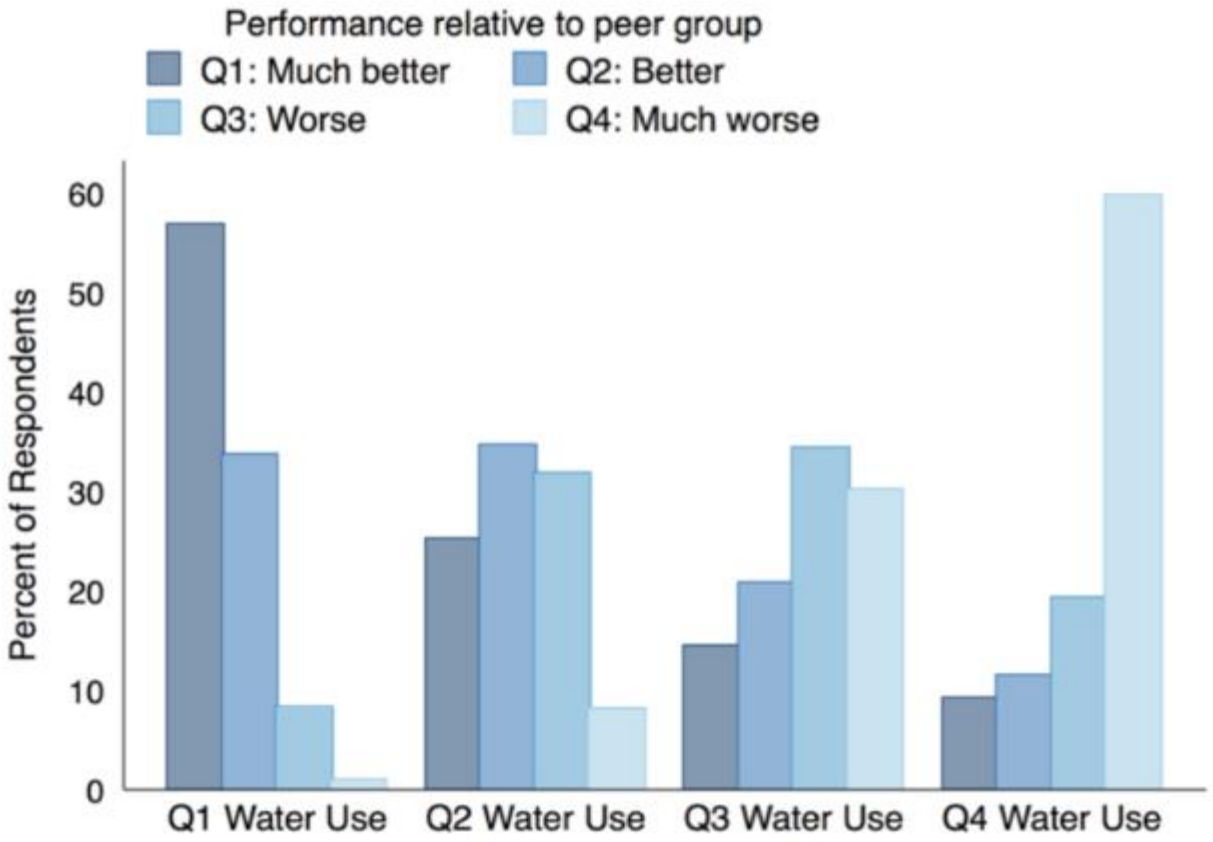
**Are you doing your part?** The graph on the right shows your change in water use from July 2013 to July 2015 compared to similar properties in your neighborhood. Your neighbors used 55% more water last month compared to 2013.

You saved 26% on your July water bill compared to 2013.

**Keep up the good work!**

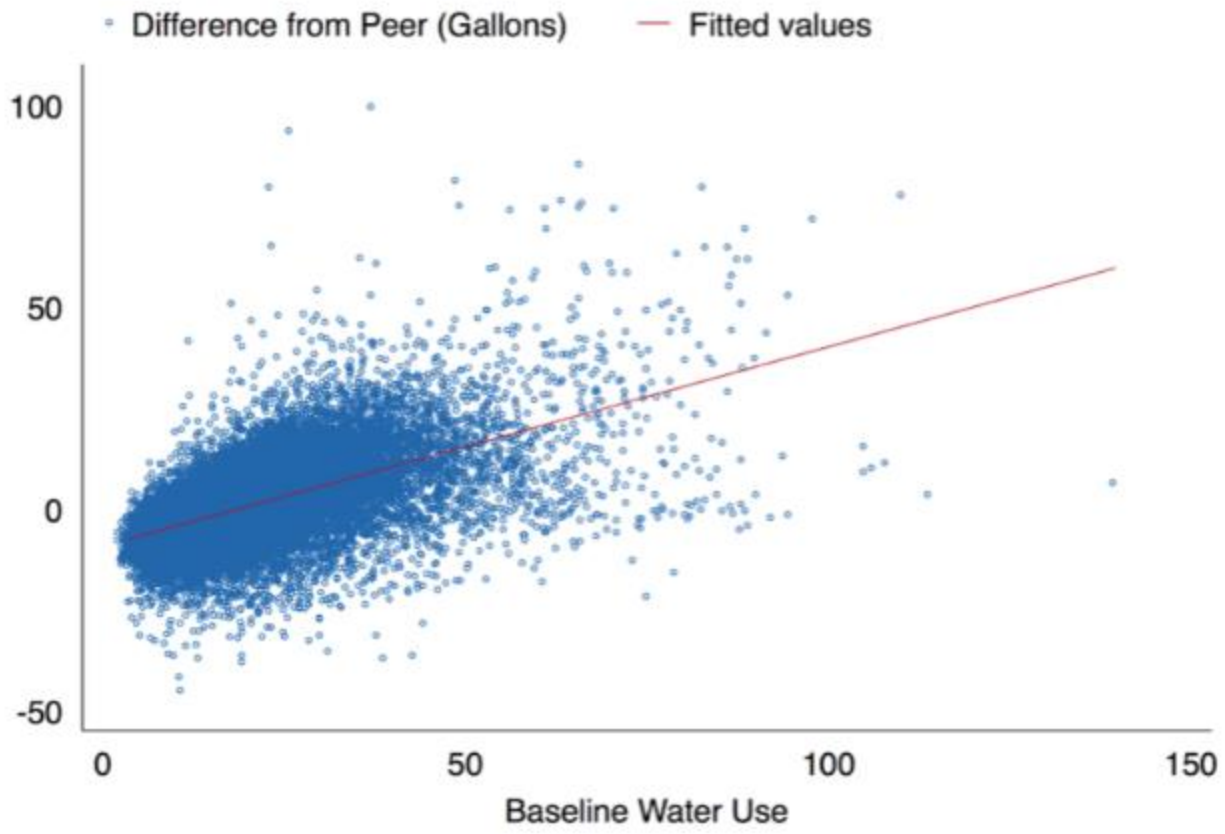


# Message in 1000's of Gallons

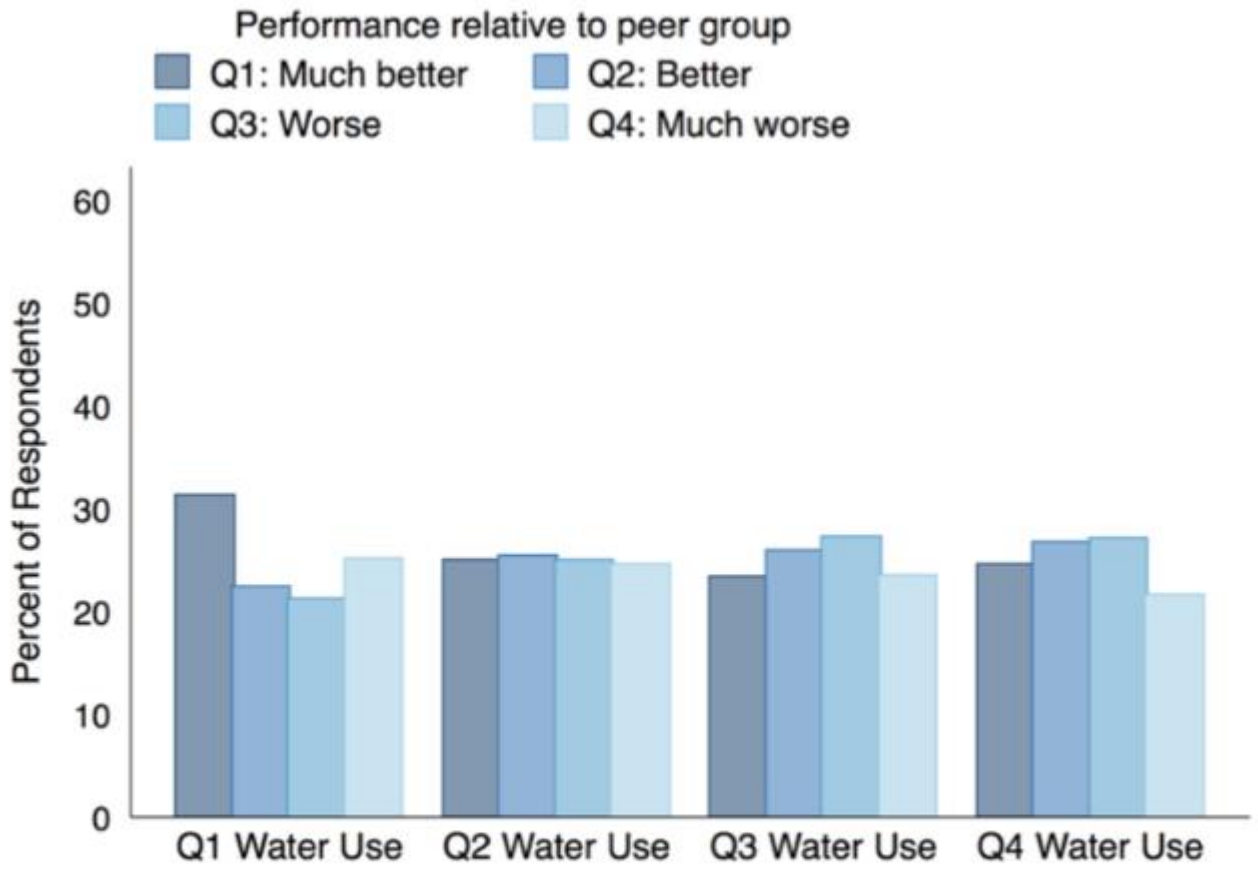



- x-axis: quartiles of baseline water use, y-axis: percentage of respondents receiving a given norm
- Norms quartiles: Difference between household's water use, or % reduction, and its peer group

# Message in 1000's of Gallons (as in previous studies)

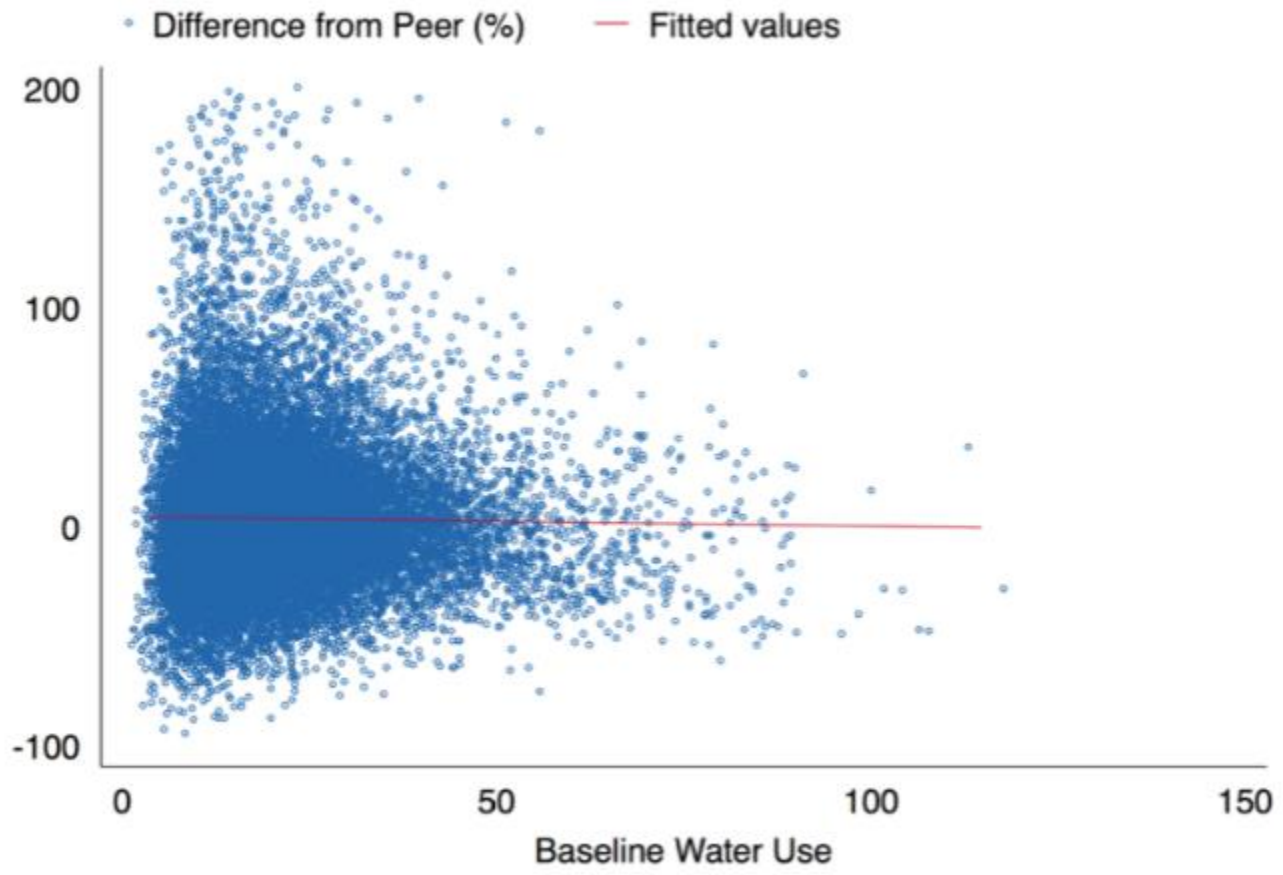


# Message as a % Reduction




- x-axis: quartiles of baseline water use, y-axis: percentage of respondents receiving a given norm
- Norms quartiles: Difference between household's water use, or % reduction, and its peer group

# Message as a % Reduction (new, normalized message)



# Baseline Regression Model

$$y_{it} = \alpha + \gamma_l T_{i,l} + \beta \mathbf{x_{it}} + \epsilon_{it}$$

* • $y_{it}$ is normalized 1,000 gallons per day (Allcott 2014)
* • $T_{i,l}$ is a dummy variable for the pooled treatment and each of the treatment letters/messages ($l$ = Pooled, 1, 2, ..., 5)
* • $x_{it}$ is a vector of control variables

# Baseline Results

| | Pooled | All Letters |
|---|---|---|
| All Treatments | -1.200*** | |
| | (0.260) | |
| Tips | | -0.381 |
| | | (0.455) |
| Tips+History | | -0.977** |
| | | (0.453) |
| Tips+History+Rate | | -1.601*** |
| | | (0.466) |
| Tips+History+Comparison (kgal) | | -1.452*** |
| | | (0.446) |
| Tips+History+Comparison (%) | | -1.587*** |
| | | (0.473) |
| Weather Controls | Yes | Yes |
| Bill Cycle FEs | Yes | Yes |
| Month FEs | Yes | Yes |
| Baseline Water | Yes | Yes |
| Households | 42,357 | 42,357 |
| Observations | 119,025 | 119,025 |

- Dependent variable normalized average daily water use
- Std Errors clustered at the household level

# Conditional Average Treatment Effects (CATE) Regression Model

$$y_{it} = \alpha + \sum_{c=1}^{k} \gamma_{l,c} T_{i,l,c} + \sum_{c=1}^{k} \theta_c C_{i,c} + \beta \mathbf{x_{it}} + \epsilon_{it}$$

- $\gamma_{l,c}$ is the CATE for message *l* in pre-treatment subgroup *c*
- $C_{i,c}$ is dummy for each level of the subgroup (account for the sample-wide differences in water use for subgroup *c*)

# Decoupling High Water Use and Strength of Message

| | (1) Norm in Gallons (T4) | (2) Norm in % (T5) |
|---|---|---|
| Treat:Below Peer | -0.566 | -1.354** |
| | (0.512) | (0.592) |
| Treat:Above Peer | -2.248*** | -1.558** |
| | (0.703) | (0.655) |
| Below Peer | -14.34*** | -21.35*** |
| | (0.374) | (0.281) |
| Observations | 47,999 | 47,972 |

- CATEs estimated based on the distance (above/below) of household consumption relative to its peer group

# Effects of Prior Conservation (2014) Less "Low Hanging Fruit"

| | (1) Base | (2) Any Conservation 2014 |
|---|---|---|
| All Treatments | -1.178*** | -2.140*** |
| | (0.260) | (0.525) |
| Treat (All)*Conserve 2014 | | 1.368** |
| | | (0.602) |
| Conserve 2014 | | -5.457*** |
| | | (0.408) |
| Households | 42,357 | 42,357 |
| Observations | 119,025 | 119,025 |

- Conserve 2014 is a dummy variable equal to one if the household reduced water use in 2014 relative to 2013
- 70% of households reduced water use in 2014

# Conclusions

* Our standard approach of social messaging supports previous studies conclusions that the strength of the messages matter, not surprising, but,
* Our approach to decouple strength of the message (difference between individual water use and that of peer group) from the level of pretreatment water use to reduce the influence of this correlation on treatment results:
  * the CATEs are equal for households with weak and strong messages; this holds for both high and low water users
  * stronger normative messages do not generate more conservation – the strength of the message does not matter.
* Cannot infer that the social message imposes a moral tax as the motivation for water conservation - the potential for low cost means to reduce waste may just as likely be a motivation.