"Enhancing Residential Water Conservation with Mobile Apps"

Using data to drive customer communication and engagement

Agenda

The Landscape

- What are utilities doing to engage with customers?
- How are digital services supporting both engagement and efficiency?

Observations

- Customer behavior and response
- Utility tools and strategies
- Preparing for the future

Q&A

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Customer engagement and water efficiency

Typical Communication

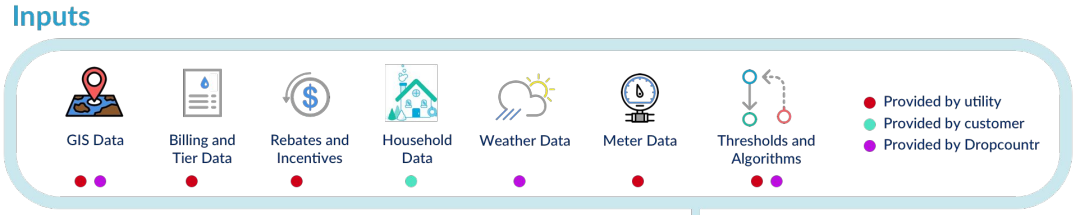
- Critical and non-critical announcements
- 1-way
- Broad distribution
- Expensive

Typical Conservation

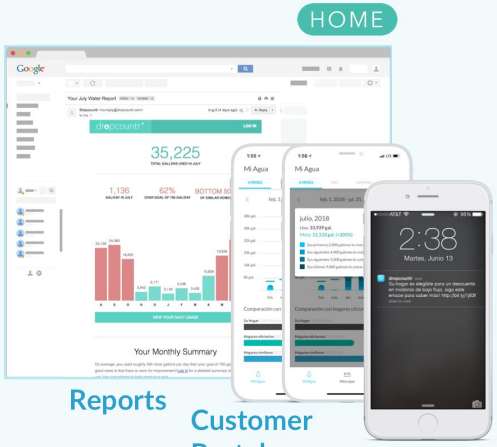
- Focused on fixtures, landscape and education
- Incentives/rebates
- Low/medium adoption
- Constrained by budgets

A digital approach

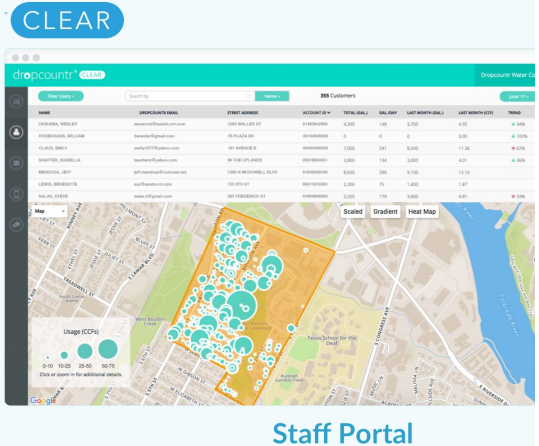
- *Complements* existing conservation plans
- Adds a data layer that leads to insights, strategy and targeted outreach
- Reduces traditional engagement costs



Outputs



Apps consistently talk to each other, update and adjust

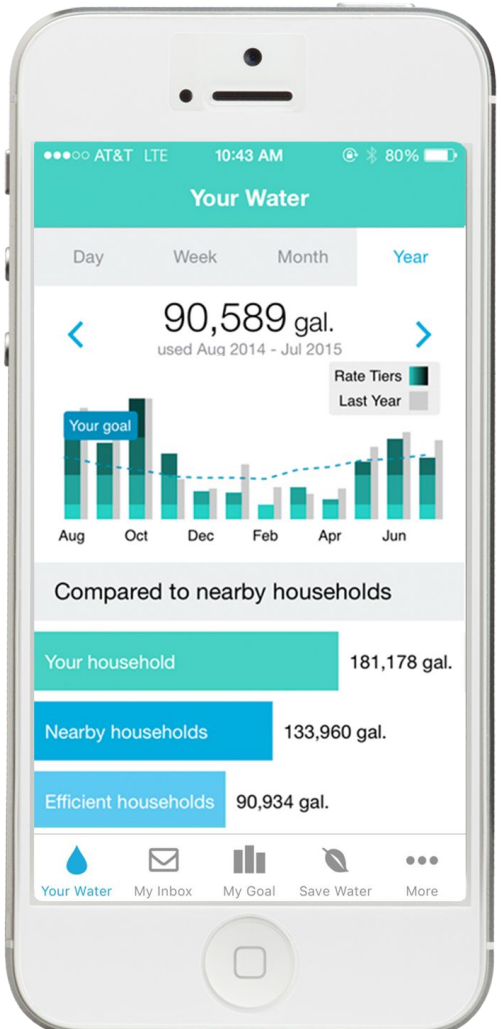


Know Your Customer

Household Details
- Occupancy
- Income and education
- Appliances
- Features (pool, lawn, etc.)
- History (delinquency, rebate participation)

Preferences
- Language
- Channel
- Frequency
- Types of alerts (leaks, bills, outages)

Dropcountr overview



DENVER WATER
Austin WATER
Green Mountain Water
CITY OF BOZEMAN WATER CONSERVATION
DEDHAM-WESTWOOD WATER DISTRICT
pompano beach
Florida's Warmest Welcome
SAWPA
CITY OF FOLSOM
LACSD
Lake Arrowhead Community Services District

Information drives change

Historically water utilities offer very little feedback for the consumers.

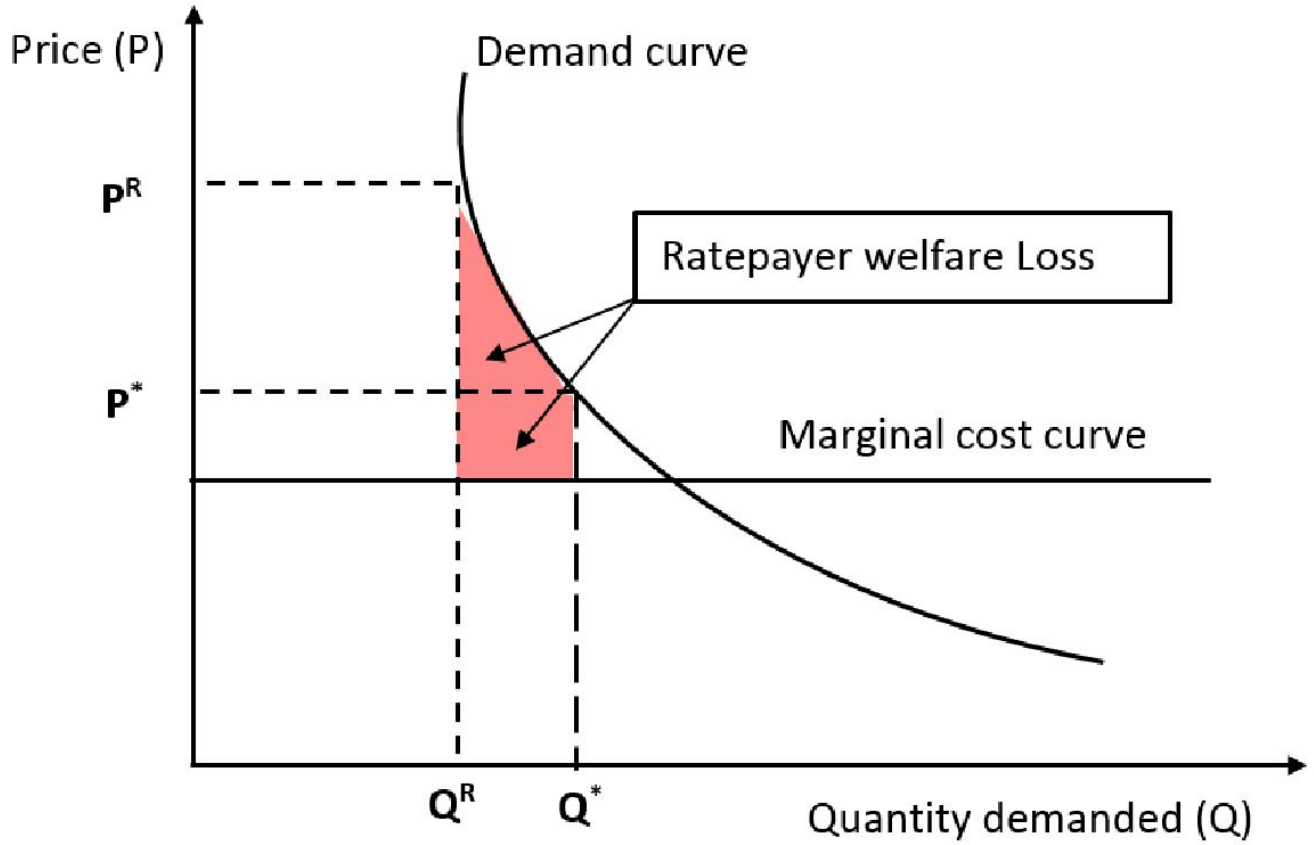
Information provision offers potential for efficiency gains.

Many places, like California, are continuously considering investment in water infrastructure.

Problem:

There is little knowledge of how residential water users respond to information

Information has the potential to reduce welfare losses when supply is restricted



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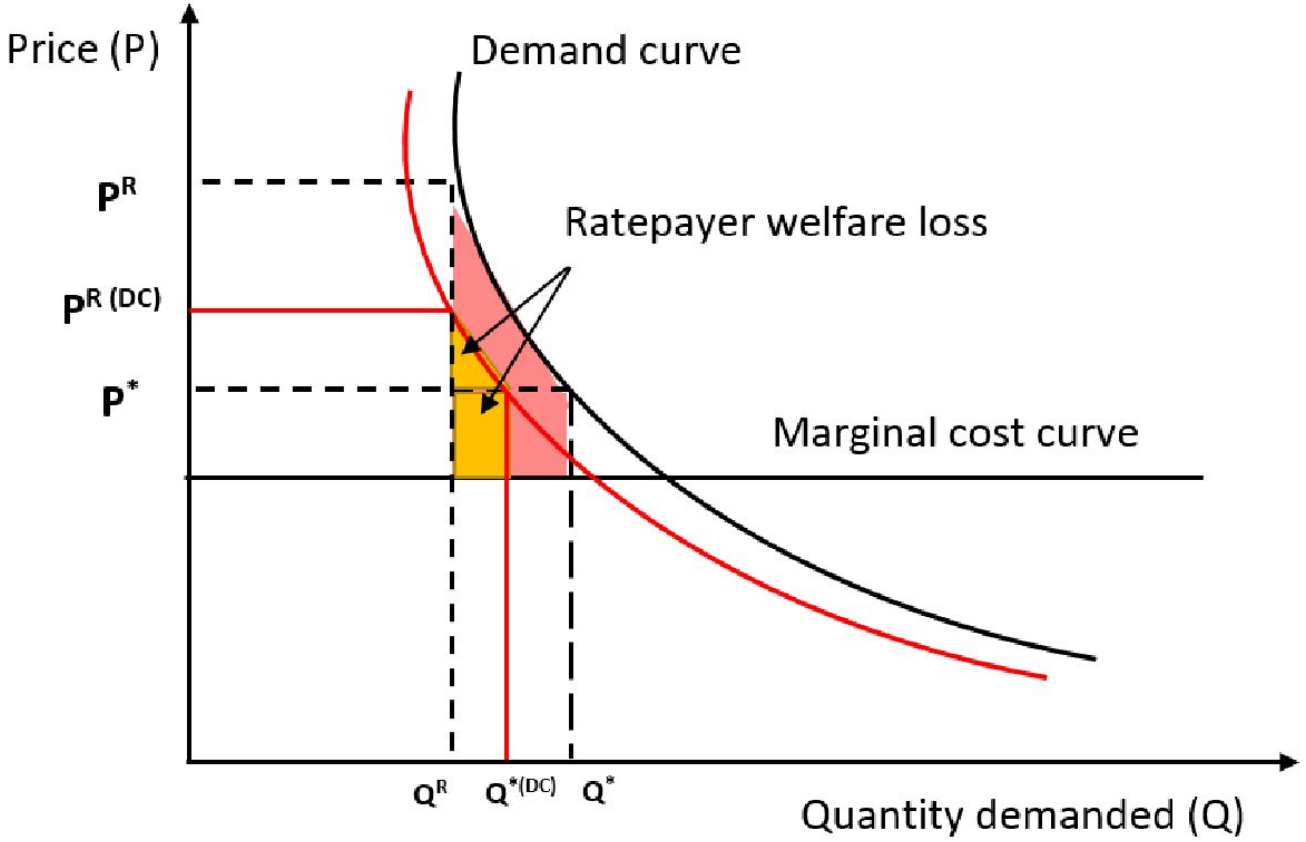
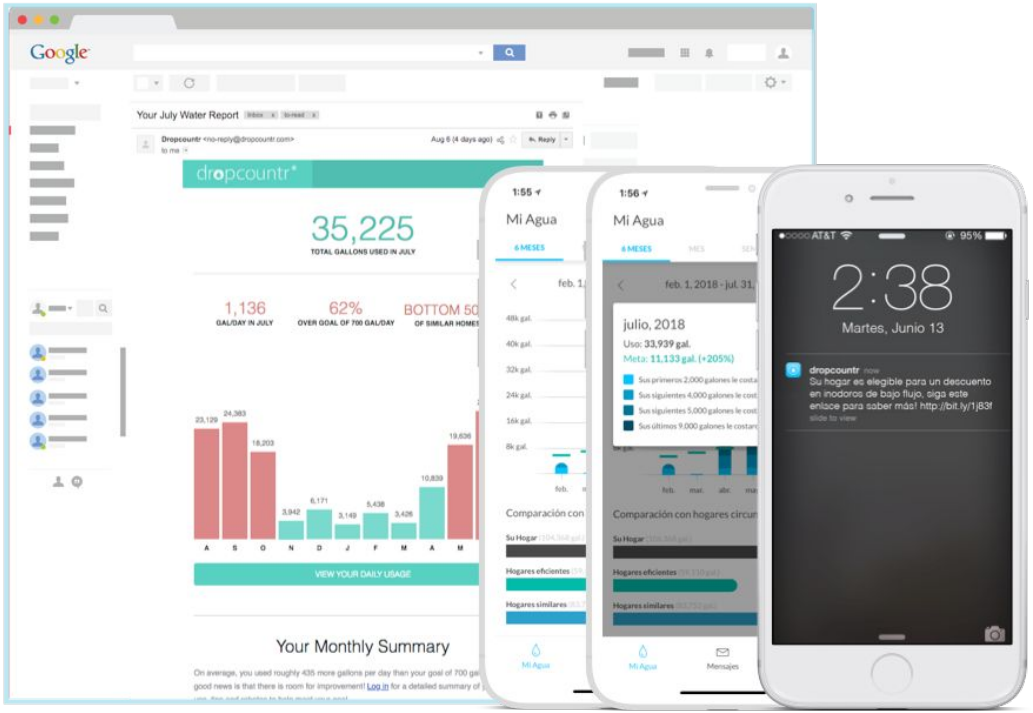


Case study: Northern California Utility (with AMI)

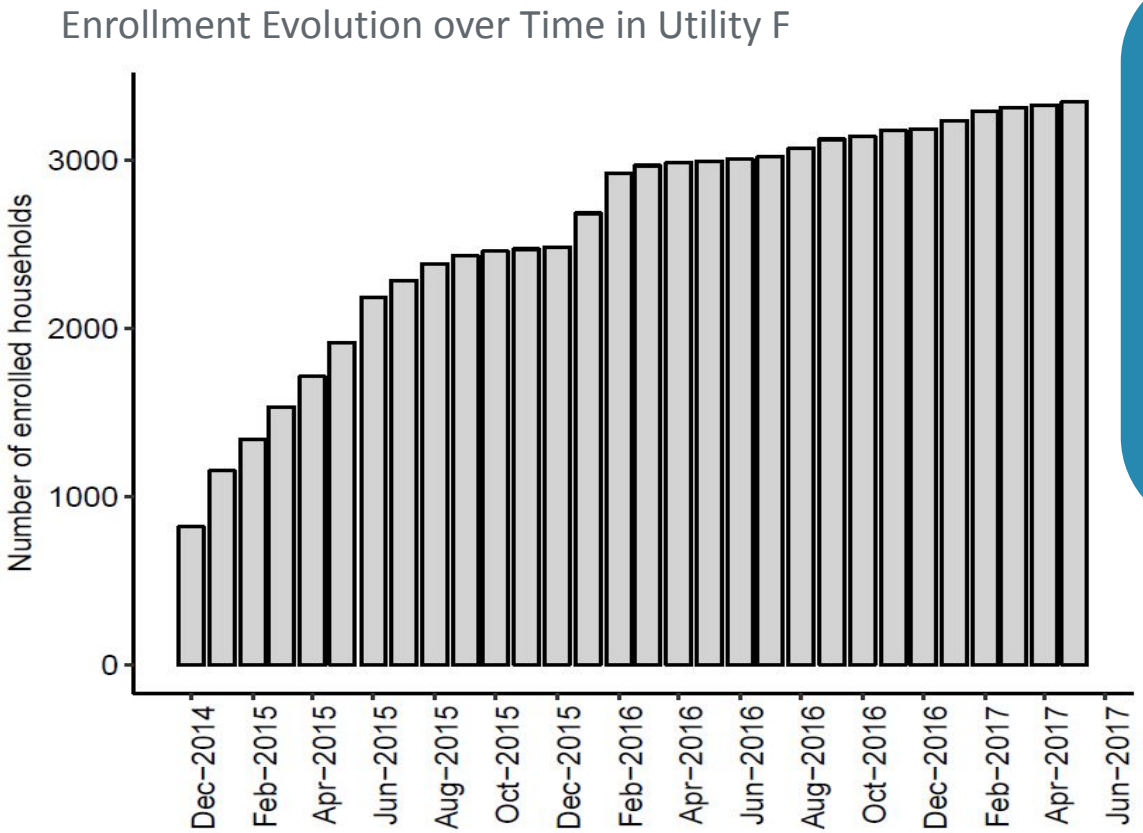


Reports Customer Portal Alerts

Pilot Details

- Started in mid-December of 2014.
- The utility contracted for a maximum of 5,000 accounts.
- Advertised first by paper, then by media, customer service, word-of-mouth, site-visits
- Available “for free” on a "first come, first served" basis.

Dropcountr enrollment in utility F



Difference-in-differences approach

- Voluntary sign-up without randomization.
- Dropcountr participants probably are systematically different than the average water customer.
- We are **not** estimating **ATE**
- We are estimating **ATOT**

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Summary statistics

Daily panel data from January-2013 to May-2017 from utility F.

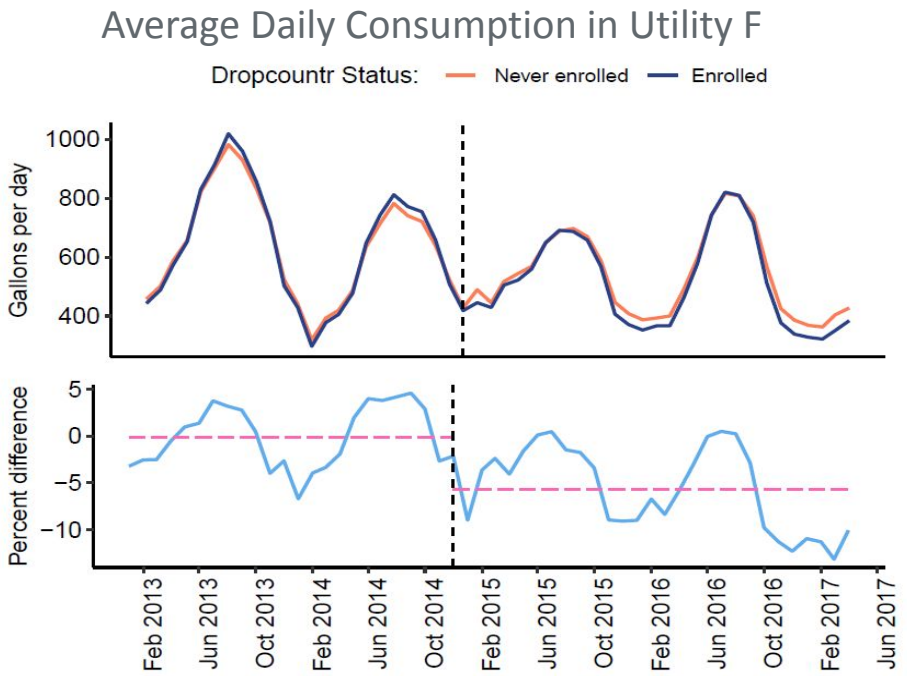
	All accounts	Never enrolled	Enrolled
Number of accounts	19,524	16,171	3,353
Pre-period observations	10,769,093	8,893,550	1,875,543
Treatment period observations	10,874,899	8,825,345	2,049,554
Baseline (gallons):			
Average	589.54	589.23	591.02
25th percentile	157.09	155.60	164.57
Baseline median	403.95	396.47	433.87
75th percentile	748.05	748.05	748.05

Takeaway: *ATOT was substantial*

Nearly 1 out of 6 households were enrolled

Action: *ATOT maybe the object of interest.*

Information drives change



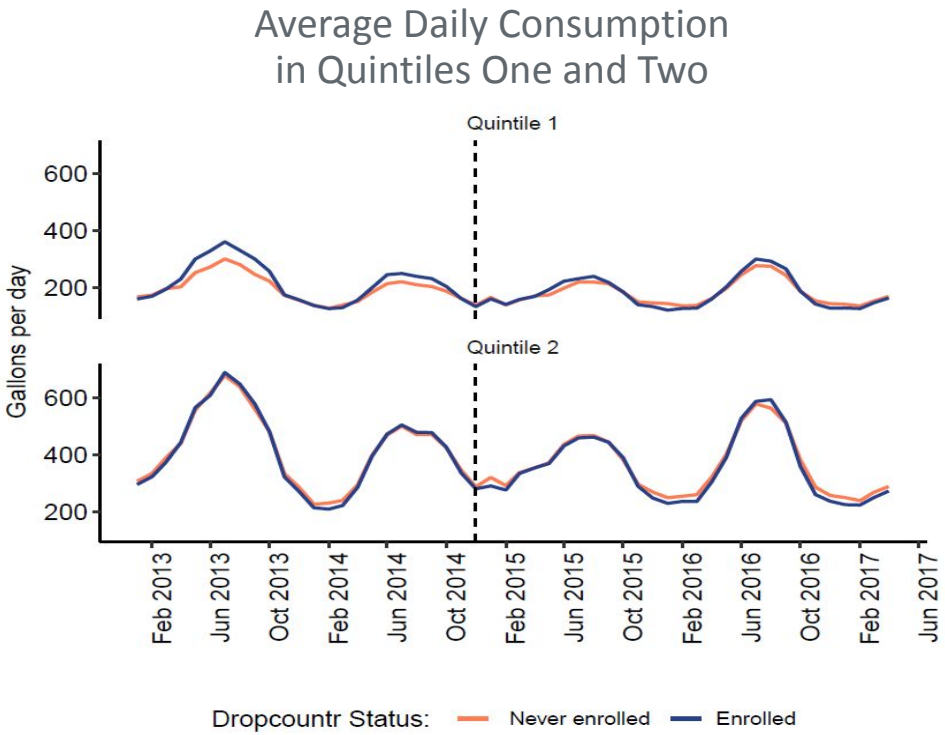
***Takeaway**: Information Drives Change*

Simple DID shows that enrolled customers on average reduced their water use by 6.65% (32 gallons/day)

Examples:

- *The average shower uses 16-40 gallons*
- *Clothes washing machines require 25-40 gallons per wash.*

Not all customers are the same



Takeaway: *Not all customers are the same*

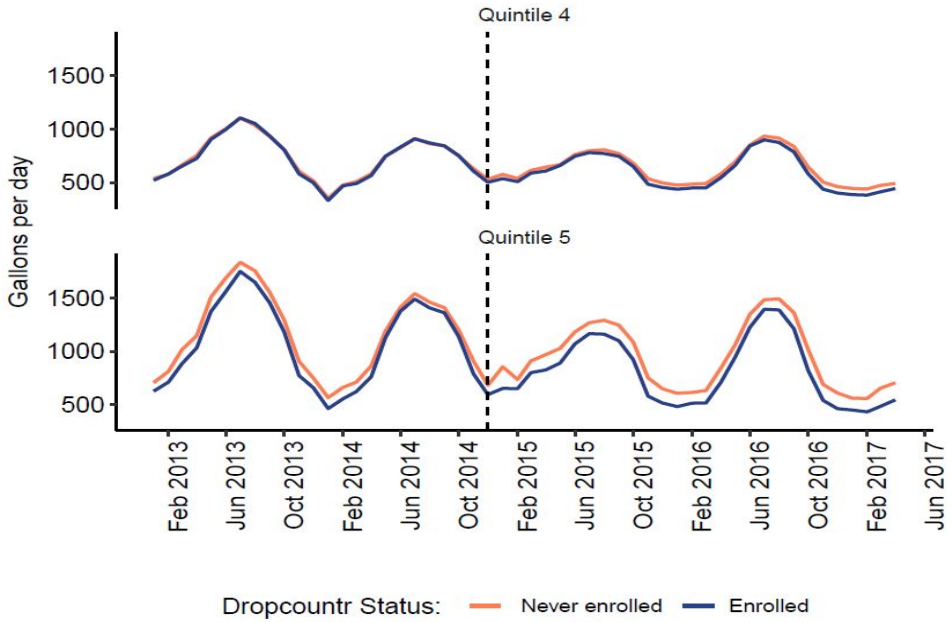
Customers aren't identical in consumption. Conservation among those in the "lowest 40%" most efficient was negligible.

Those customers are already using less than their peers, therefore energy and financial resources shouldn't be expended on them.

Action: *Focus on those customers with the greatest opportunity to conserve*

Not all customers are the same

Average Daily Consumption
in Quintiles Four and Five



Takeaway: *Not all customers are the same*

Those in the "top 40% reduced their usage significantly; those reductions represented a huge overall gross volume conserved.

Action: *Focus on those customers wit*
the greatest opportunity to conserve

Empirical model

$$log(q_{hd}) = \alpha_1 \cdot Dropcountr_{hd} + \gamma_{hm} + \mu_{my} + \delta_{dow} + \epsilon_{hd} \qquad (1)$$

- q_{hd} is the water consumption in the household h at day d.
- $Dropcountr_{hd}$ denotes whether a household observation is in the enrolled group during the post period in which Dropcountr was active.
- γ_{hm} is household-calendar month(m) fixed effects.
- μ_{my} is calendar-month year(y) fixed effects.
- δ_{dow} is day-of-the-week fixed effects.
- ϵ_{hd} captures all unobservable factors.

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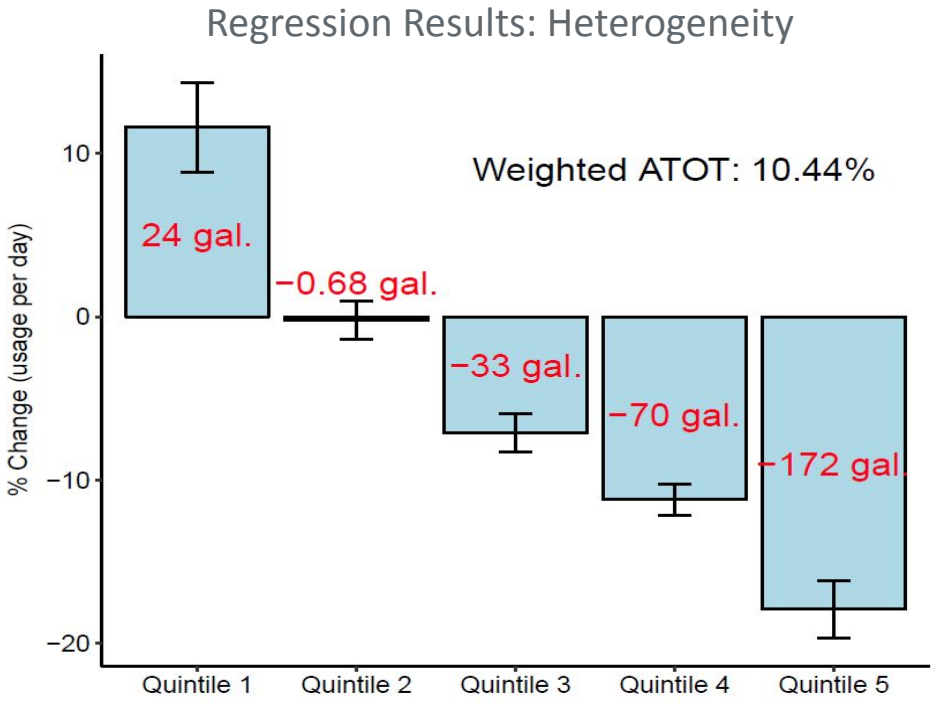
Regression results

	(1)	(2)	(3)	(4)
Dropcountr (Post X Treatment)	-0.110***	-0.101***	-0.081***	-0.078***
	(0.001)	(0.008)	(0.008)	(0.003)
Post-Dropcountr	-0.157***	-0.164***		
	(0.002)	(0.003)		
Enrolled household	0.078***			
	(0.003)			
Household FE	No	Yes	Yes	No
Month X year FE	No	No	Yes	Yes
Household X month FE	No	No	No	Yes
Day-of-the-week FE	No	No	No	Yes
Obs.	21,643,992	21,643,992	21,643,992	21,643,992

Notes: * p<0.1; ** p<0.05; *** p<0.01. Standard errors are reported in parentheses and are clustered at the level of the households.

Sometimes there are unintended consequences



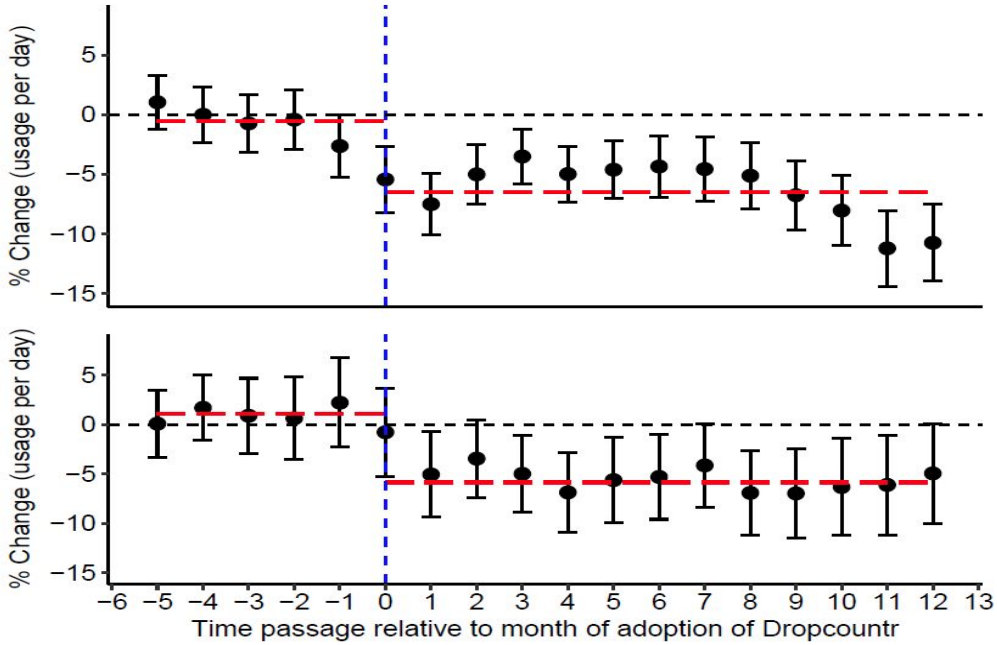
Takeaway: *Unintended consequences*

Utility F saw a "rubber band effect" whereby customers (lowest 20%) who were already efficient in their usage actually used *more* than their baseline usage.

- **Action:** *Encourage those already conserving with positive messaging to avoid "rubber band effect"*

Slow and steady wins the day

Regression Results: Persistence



***Takeaway**: Slow and steady wins the day*

Enrolled users received/had 40+ months of consistent access to consumption details, supporting long-term behavior change.

This modal is different than "flash-in-the-pan" alerts or engagement that drive short-term behavior change.

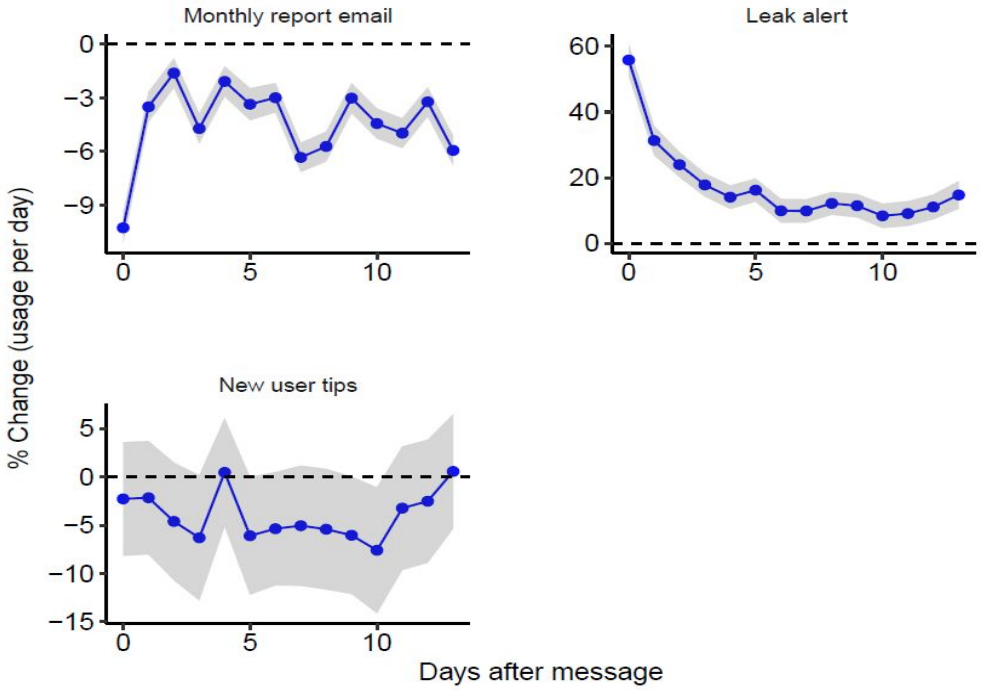
Action: *Keep a long view of customer behavioral change. Meaningful change will not happen overnight.*

Dropcountr or conservation minded?

Does Dropcountr indicator measure an omitted variable such as being conservation minded?

- **Problem:** *We can't test this directly. One indirect test*

Regression results: Which tool is causing the effect?



Takeaway: *Different channels, different result*

Even if conservation minded type households are enrolling in DC, these results suggest that without DC there would not be water conservation achieved.

Understanding this response is critical to improving a utility's messaging strategy.

Action: *Diversify your messaging, recipients, and channels. Analyze your customers' response and repeat.*

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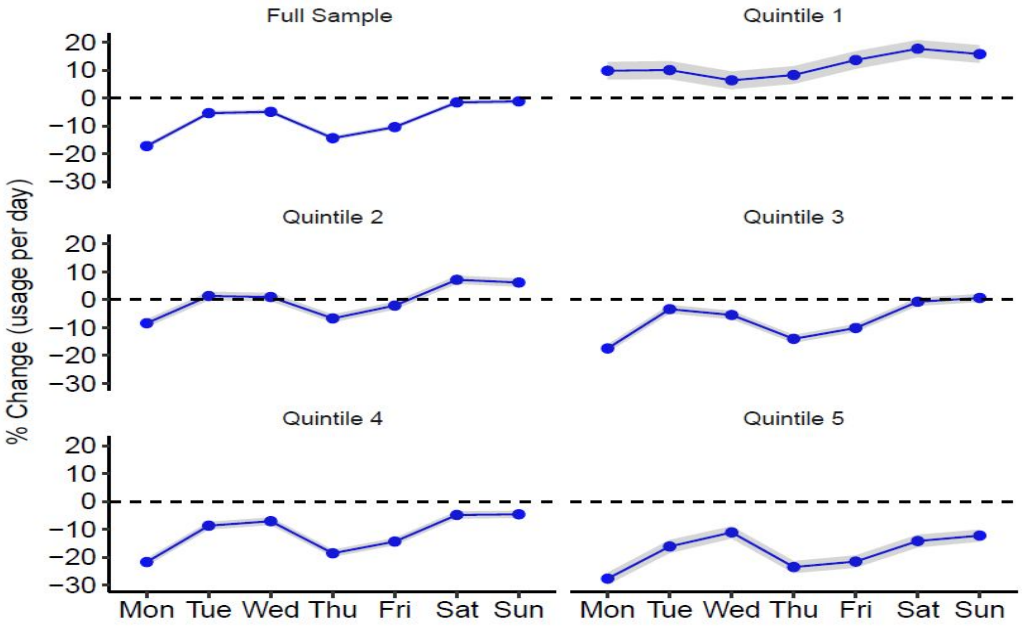
Does Dropcountr act through efficiency channel?



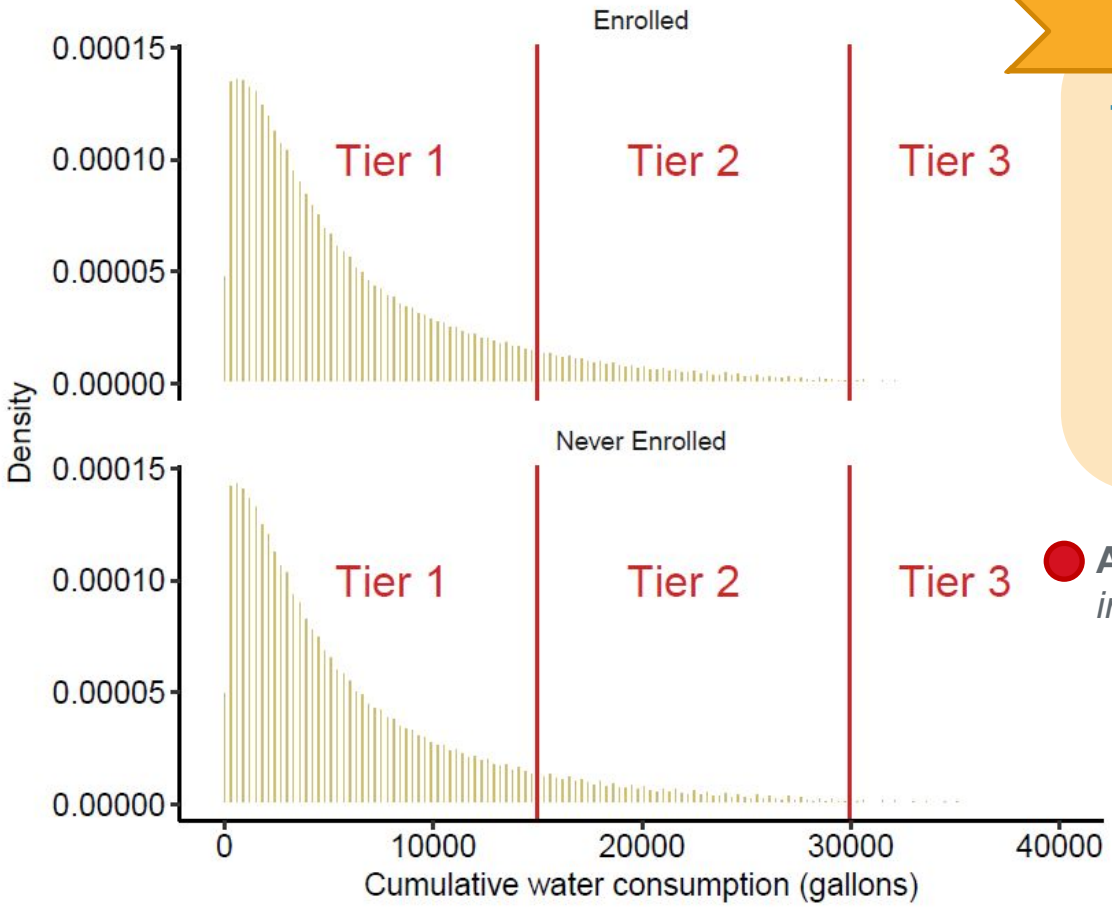
Takeaway: *Not all days are the same*

Similarly, *when* a message is received can demonstrably change how a customer responds to the message.

Understanding when engagement is best received will yield significant conservation results.

Action: *Schedule your messaging for different times and days of the week.*

Are Dropcountr participants are more responsive to tier pricing?



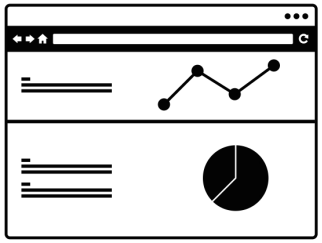
***Takeaway**: No effect from DC on price responsiveness*

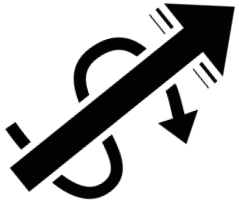
The distribution is as smooth as the distribution in never enrolled households, and there is no bunching around the kink points.

We also find no bunching for any year of the data.

Action: *Further studies required to investigate this question in greater detail.*

Concluding remarks



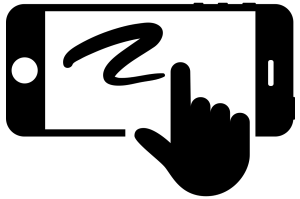


Providing your customers with information is a low-cost, non-price method of reducing residential water consumption.

To achieve a **7.8% reduction in consumption**, we estimate that it would take a **34% price increase**.

Information effects are heterogeneous; largest impacts likely on households with highest water use.

What is important for the future?



Which channel(s) do customer portals act upon? (e.g., consumption feedback, social comparison, household budget, etc.)?

What is the effect of information on the effectiveness of non-linear pricing?

Can the program's effect be magnified when coupled with other conservation programs?