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INNOVATIONS

HOW WATERSMART HOME WATER REPORTS EMPOWER CUSTOMERS AND CHANGE PRICE ELASTICITY

Evaluation Results from the EBMUD Pilot Project

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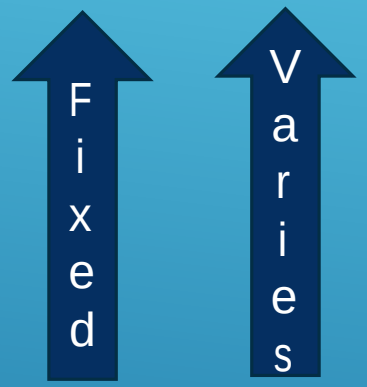
PRESENTATION OVERVIEW

- Informational Economics and Social Norms Marketing
- Applications to Energy and Water Efficiency
- EBMUD Pilot Design
- Pilot Evaluation
  - Goals & Methods
  - Findings
    - Water Savings
    - Program Channeling Effects
    - Water Use Awareness
    - Cost Effectiveness

INFORMATIONAL ECONOMICS AND SOCIAL NORMS MARKETING

Version 1 – Law of Demand, Higher price ➔ less demand (Textbook)

Customer Use = Mean + Elasticity * Price



Elasticity is a scalar and textbook fixed

Water Price can be changed in theory

Version 2 – Information matters, Customer responsiveness can also be changed (Reality Matters)

Customer Use = Mean + Elasticity * Price

Elasticity is informationally malleable

Water Price is empirically/politically rigid

INFORMATIONAL ECONOMICS

WHAT IS SOCIAL NORMS MARKETING?

- **Basic Premise**: Much of people's behavior is influenced by their perceptions of what is "normal" or "typical"
- Inform them their behavior is outside the norm and they change it to revert to the norm
- Show them their assessment of the norm is inaccurate and they update their assessment and behavior accordingly
- Social norms marketing has been used in a variety of contexts: student drinking/drug use, voting behavior, retirement planning, environmental awareness, charitable giving
- Opower pioneered its use in Energy Conservation
- WaterSmart now is pioneering its use in Water Conservation

WHERE IS IT BEING DONE?

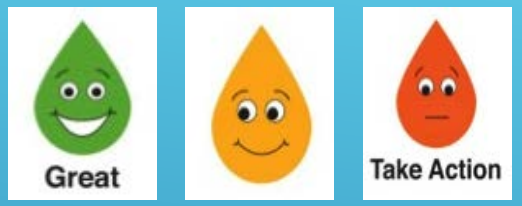
- Energy Efficiency
  - Opower runs programs for more than 90 energy utilities, including 8 of the 10 largest U.S. utilities. Its programs reach more than 22 million homes worldwide
- Water Efficiency
  - WaterSmart runs programs for a growing number of utilities, including EBMUD, City of Sacramento, Irvine Ranch, City of Newport Beach, City of Davis

- Normative Comparisons of Use Against Comparable Customers
- Application of Injunctive Norms
- Targeted Messaging
- Actionable Information and Enticements
- Impactful Visual Displays of Information

HOW IS SOCIAL NORMS MARKETING IMPLEMENTED?

Normative Comparison

Injunctive Norm Emoticons



Home Water Report

This report is not a bill. We are providing this information to help you save water and money.

Service Address: **123 Main Street**
Account Number: **12345678**
Report Period: **12/21/12-02/20/13**

See More: **www.ebmud.com/mywater**
Registration Code: XXX234

Your WaterScore

Hi, Salvador! Thanks for learning more about your water and ways to use it wisely.

Your household uses **181 gallons** of water per day.

Take Action

Salvador Bloom
123 Main Street
Everytown, USA

You	181 gpd
Average Households	127 gpd
Efficient Households	84 gpd

Approximate gallons of water per day (gpd) used in the last 2 months

You used 3,370 more gallons than the average 2-person home, on a similar-sized property, in EBMUD's service area.

Want to change the number of occupants we estimated for your household? Go online or give us a call.

It's Easy to Control Your Water Use

Go online and explore ways you can take

Visit **www.ebmud.com/mywater**
Registration Code: GAC77B

3 Suggestions For You

Stop a Leaking Toilet

Did you know a silent toilet leak could waste up to **7,000 gallons** of water per month?

To check for leaks, put food coloring in the tank. Do not flush. Check the toilet bowl ten minutes later. If you see color in the bowl, the tank has a leak - most likely from a worn flapper valve.

Check today. It's quick, easy, and can save you a bundle.

Seasonal Irrigation Tune-up

Check for:

- Sprinklers that aren't popping up
- Shrubs blocking your pop-up nozzles
- Broken or clogged nozzles
- Sprinklers that are spraying sidewalks
- Punctured hoses or leaky valves.

Leaks can waste **thousands of gallons** each month.

Don't wait. Check today!

Choose Plants Wisely

When you're choosing new plants, choose ones that require a low amount of water.

Low water-use plants are adapted to local conditions and generally require less maintenance and less water, fertilizers and pesticides. In addition, water-wise plants are more drought-tolerant.

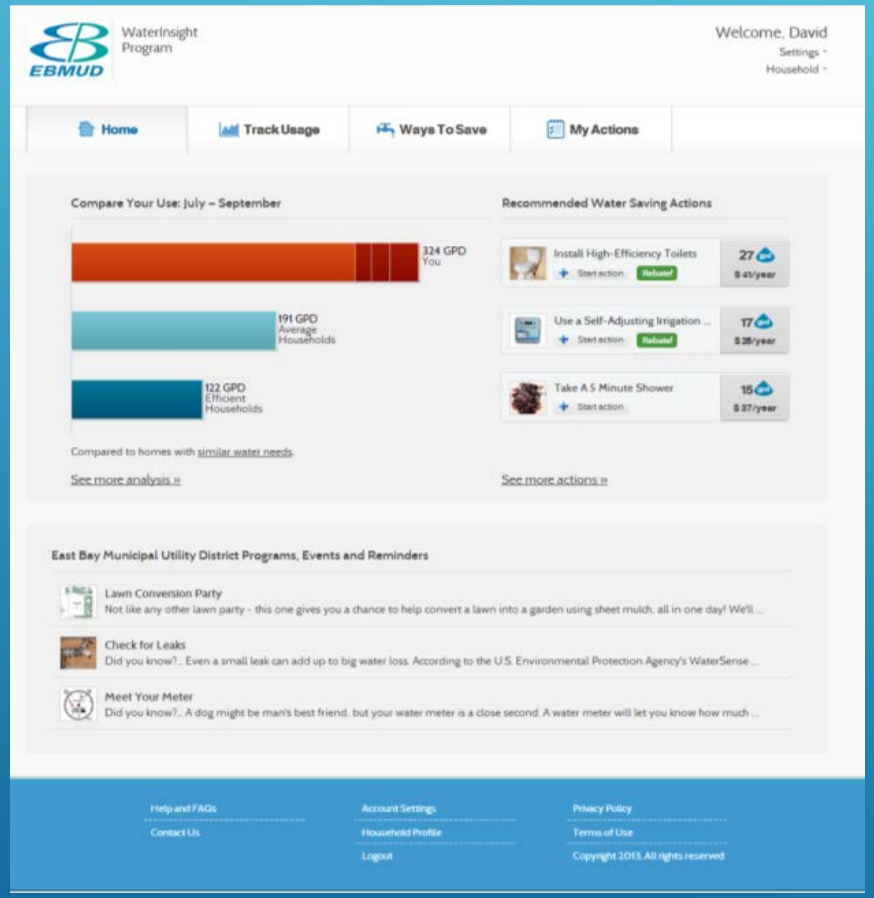
With your 8,200 sq. ft. yard, you can save about **11,000** gallons per year.

For help, visit our online gardening resources.

Contact us: **1-866-40-EBMUD** or **wtrcserv@ebmud.com** or **www.ebmud.com/mywater**

Actionable Information & Tips

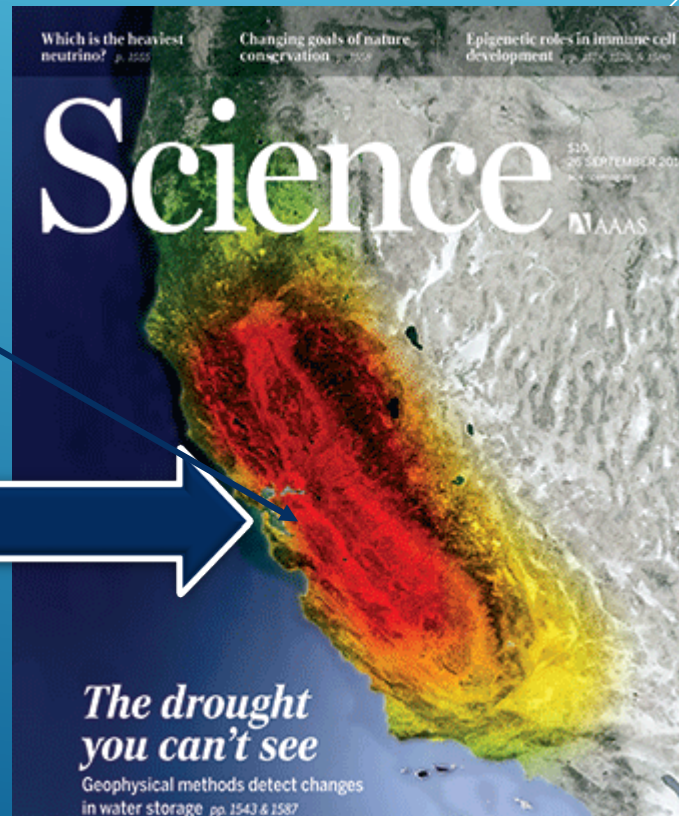
Impactful Visual Displays of Information



EBMUD PILOT

East Bay Municipal Utility District, California USA

You are here



INDEPENDENT EVALUATION OF PILOT

- Evaluation conducted by David Mitchell, M.Cubed, and Tom Chesnutt, A&N Technical Services
- Evaluation funded by California Water Foundation and EBMUD
- Research team operated with complete independence of California Water Foundation, EBMUD, and WaterSmart

THE PRIMARY QUESTIONS

Do home water reports…

1. **Result in measurable reductions in household water use?**
2. **Increase rates of participation in other conservation programs?**
3. **Improve household knowledge and awareness of water use?**

THE SECONDARY QUESTIONS

1. Are water savings primarily due to changes in outdoor or indoor use, or a combination? Do they vary seasonally?
2. Are households above (below) the norm more (less) likely to save water?
3. Do paper reports yield more savings than email reports?
4. Which other programs get the biggest boost in participation from home water reports? Are households above (below) the norm more (less) likely to participate in other programs?
5. Are home water reports cost effective?

EXPERIMENTAL DESIGN

- Treatment Period
  June 2012 – June 2013
- Two Experiments
  - Castro Valley Group Experiment
    - 24,000 households
  - Random Group Experiment
    - 3,300 randomly selected households throughout EBMUD service area evenly split between control and treatment groups
- Pre and Post Pilot Customer Surveys

	Treatment	Control	Total
Castro Valley Group			
No. Households	10,529	13,765	24,294
No. Meter Reads	362,198	473,204	835,402
Random Group			
No. Households	1,710	1,576	3,286
No. Meter Reads	58,824	54,214	113,038

WHY TWO EXPERIMENTS?

- Castro Valley Group Experiment: Provide insight into effectiveness of home water reports directed at targeted group of homes
- Random Group Experiment: Provide insight into average effectiveness if program expanded to entire service area

EVALUATION METHODS

STATISTICAL MODELING

- Water Use
  - Panel data fixed effects regression models
    - Control for time-variant seasonal and weather effects on consumption
    - Control for time-invariant differences in household characteristics
    - Implement robust regression techniques to control for data anomalies
- Participation in Other EBMUD Programs
  - Logistic dichotomous choice regression models
    - Implement difference-in-differences specification in Puhani (2008)
    - Estimates probability of participation pre and post treatment for treatment and control households

STATISTICAL IMPACT EVALUATION

- ~948,000 meter read consumption values
- 2 Participant Groups (Random and Targeted) matched control groups
- 2006 to 2013 Data
- Time Series Cross Section Method
  - Meter-specific Intercept,
  - Season, (S),
  - Weather (W), and
  - Effect of HWR (E)
- Fixed Effects with Variance reflecting clustering
- Estimation Method: Maximum Likelihood

$$Use = \mathbf{f}\left(\mathbf{S}_t, \mathbf{W}_t, E_t\right) + \varepsilon$$

$$\ln Use_{i,t} = \mu_i + S_t + W_t + E_{i,t}$$

$$E_{i,t} \equiv I_{HWR} \cdot \beta_{HWR}$$

$$\varepsilon_{it} = \mu_i + \xi_{it}$$

$$where$$

$$\mu_i \sim N(0, \sigma_\mu^2)$$

$$\xi_{it} \sim N(0, \sigma_\xi^2)$$

$$\sigma_\varepsilon^2 = T \cdot \sigma_\mu^2 + \sigma_\xi^2$$

FINDINGS

WATER USE

- Mean Treatment Effect
  - Castro Valley Group Experiment: 6.6% reduction in water use
  - Random Group Experiment: 4.6% reduction in water use
  - Null hypothesis of No Treatment Effect rejected with better than 99% statistical confidence

SAVINGS SCALE WITH USAGE

- Treatment Effect Scales with Household Use
  - Top quartile of users saved, on average, 1% more
  - Bottom quartile of users saved, on average, 3% less
- Also with Water Score (based on Castro experiment)
  - Score = 3 (Take Action!): 7.1%
  - Score = 2 (Doing Okay): 5.2%
  - Score = 1 (Doing Great!): 1.6%

PAPER REPORTS MORE EFFECTIVE

- Paper Reports More Effective Than Email
  - Households receiving paper reports saved, on average, 1% more than those receiving email reports

PROGRAM CHANNELING

- Home Water Reports strongly influenced participation in other programs
  - Households receiving home water reports 2.3 times more likely to participate in an audit or rebate program
  - Biggest impact on audit programs: home water report households were 6.2 times more likely to participate
  - Statistically significant but smaller effect on rebate programs: home water report households were 1.7 times more likely to participate
- Water Score Matters
  - Homes with water score of 3 (Take Action!) significantly more likely to do just that

COST EFFECTIVENESS

- Home Water Reports Yielded Cost-Effective Water Savings
  - Email Reports: $250 - $590 per AF; midpoint cost: $380/AF
  - Paper Reports: $290 - $570 per AF; midpoint cost: $400/AF

HOUSEHOLD WATER USE KNOWLEDGE

- Households receiving home water reports continue to underestimate actual water use; no improvement relative to control households
- But, strong evidence households view home water reports as providing useful and actionable information for managing water use:
  - Treatment group 52 to 80% more likely to score EBMUD as “Excellent” in terms of:
    - Showing ways to save money on water bills by conserving water
    - Giving useful tips and tools needed to use water efficiently
    - Offering programs to help household save water

FUTURE RESEARCH

STILL TO BE ANSWERED

- Is mean treatment effect generalizable to other utilities or parts of the state?
- Savings Persistence: Are savings sustainable or will they fade?
- How important is outdoor water use to overall effectiveness?
- Does report frequency matter? Would providing reports more (less) frequently have much impact on water savings?

Q & A