Developing Evidence-Based Educational Programs to Improve Homeowner Behavior to Protect the Inland Bays

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Motivation

- Pollutants are contributed by both industrial and residential sources.
- Efforts to reduce such pollution have focused almost entirely on industrial and agricultural sources
- Little attention has been paid to encouraging residents to manage and reduce runoff from their homes.
  - There is significant EPA regulations on this topic – MS4 permits)
- Environmental education programs frequently to not scientifically measure their impacts on their target audience
  - We are bringing the scientific process to these outreach activities.

Objectives of our research

1) Do residents have positive willingness to pay (WTP) to adopt practices that would decrease the amount of nutrient runoff from their landscaping?

2) Do behavioral nudges such as default priming and framing influence WTP, and, if so, which are most effective in encouraging adoption of pollution control methods?

3) Does residents' WTP vary according to any demographic characteristics?

Applying Behavioral Insights

- **Nudges work.** Many of the things related to behavioral science are relatively small adjustments and are within the control of a program administrator.
  - Do not require additional funds or new legislation to be passed.
  - Works well with **voluntary programs.**

- **Nudges are non-political.** Goal is helping programs work better, better serve their customers, and being cost-effective with taxpayer money.

- **Testing is embedded** within the programs and market settings.
  - Strong external validity.
  - Research permit the telling of simple stories to external audiences.

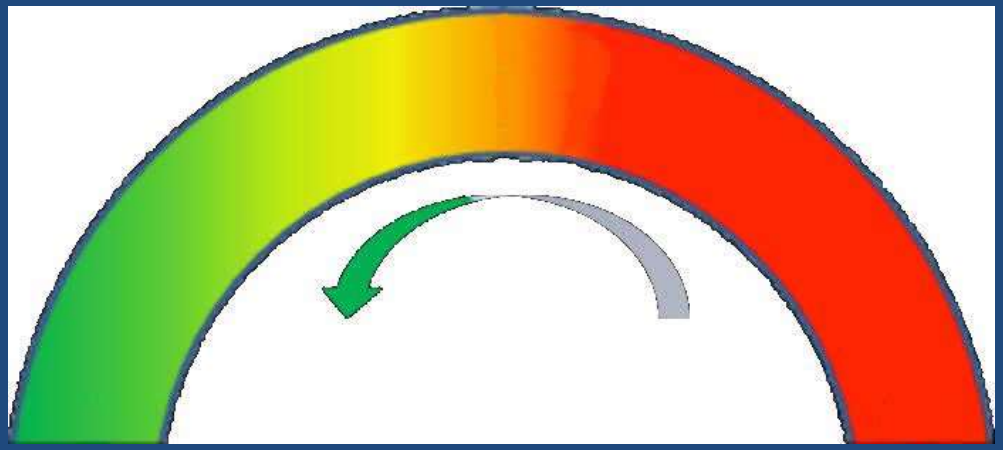
Experimental Design

- Confidential decisions.
- Participants recruited from Delaware River Watershed
- ~$25 payment for 15 minute study
- BDM: offer of residential water-runoff “BMP” items
- Studies have been conducted with over 1500 residents

Sample Product Description

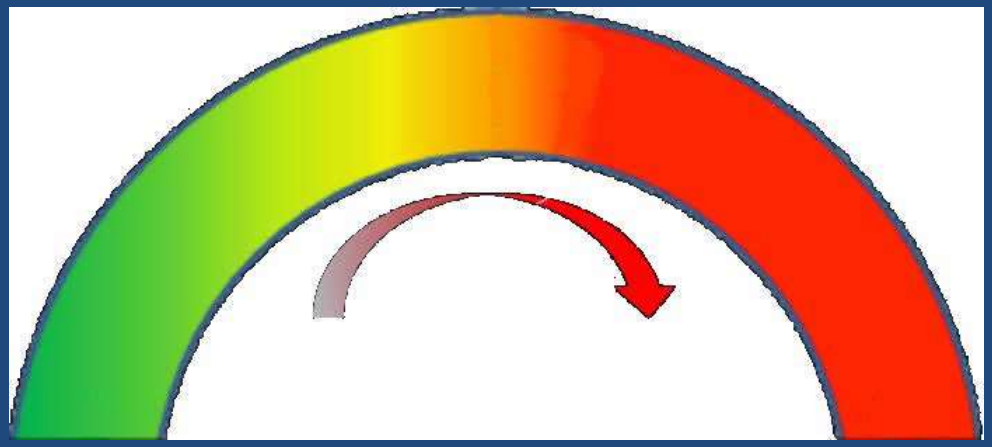
Biochar
Biochar is a soil amendment that can be mixed with the existing soil in a lawn. This material saves water by increasing soil's water retention. It provides soil aeration and structure. This material increases soil's nutrient holding abilities. Nutrients are also anchored to the soil where they will be available to plants, rather than being carried away into local waterways by storm water. Biochar promotes beneficial microbial life and immobilizes soil toxins. This product is produced by CoolTerra and contains 10 quarts of Biochar.

Positive Framing



As shown by the arrow, residents that choose to install water conservation items on their lawn will **reduce the amount of pollution** they contribute to local watersheds. The nutrients in your lawn like Nitrogen and Phosphorus can cause algal blooms and kill fish once they enter local water bodies. **Once installing water conservation items in your lawn, your contribution of nutrients and sediments will decrease.** These items encourage healthy habitats and superior water quality in your local waterways.

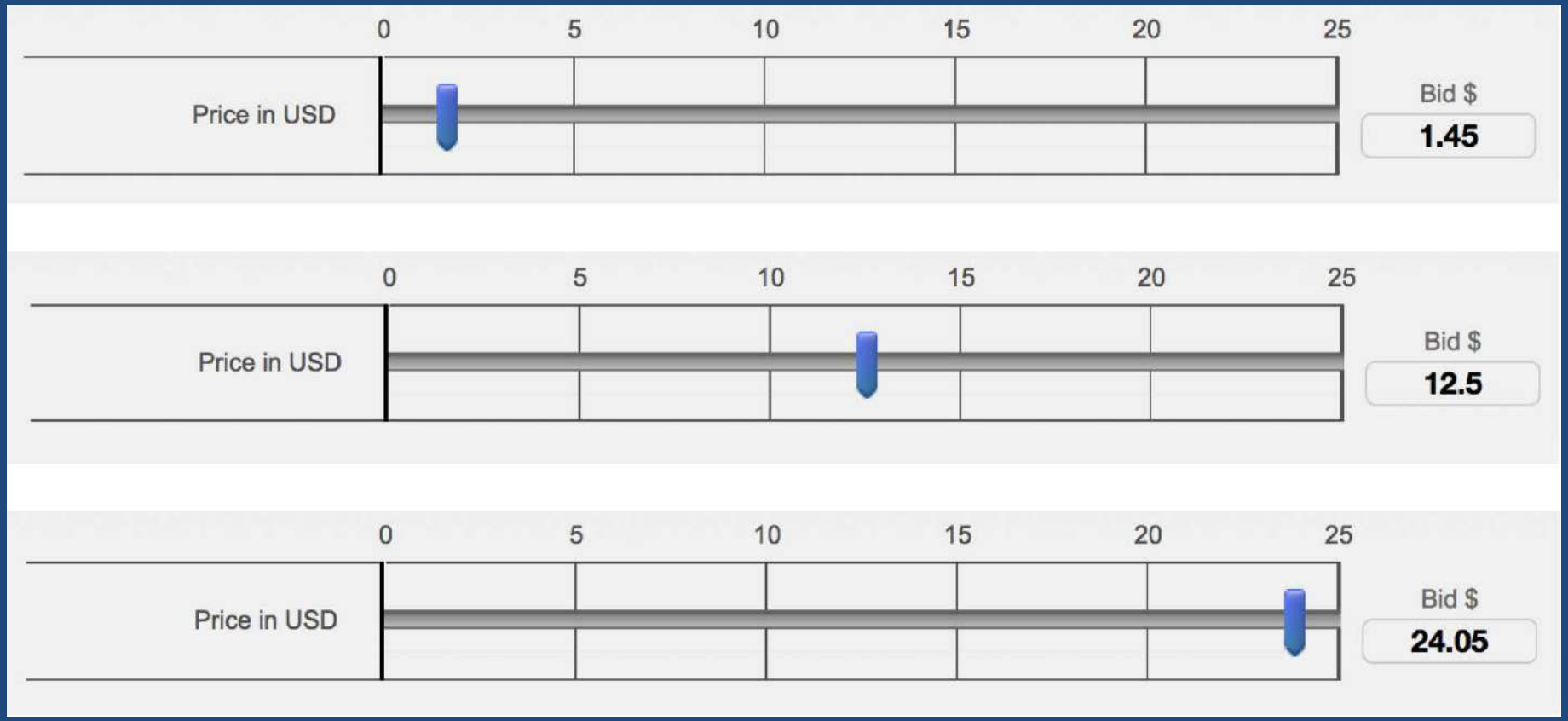
Negative Framing



Also a “No Framing” Treatment”

As shown by the arrow, residents that choose **not** to install water conservation items on their lawn **are continuing to pollute local watersheds**. The nutrients in your lawn like Nitrogen and Phosphorus can cause algal blooms and kill fish once they enter local water bodies. **If you choose not to install water conservation items in your lawn, your contribution of nutrients and sediments will continue.** Without installing these items, your local habitats and the water quality in your local waterways will continue to be damaged.

Experimental Design



Priming Treatments: Starting values of sliders

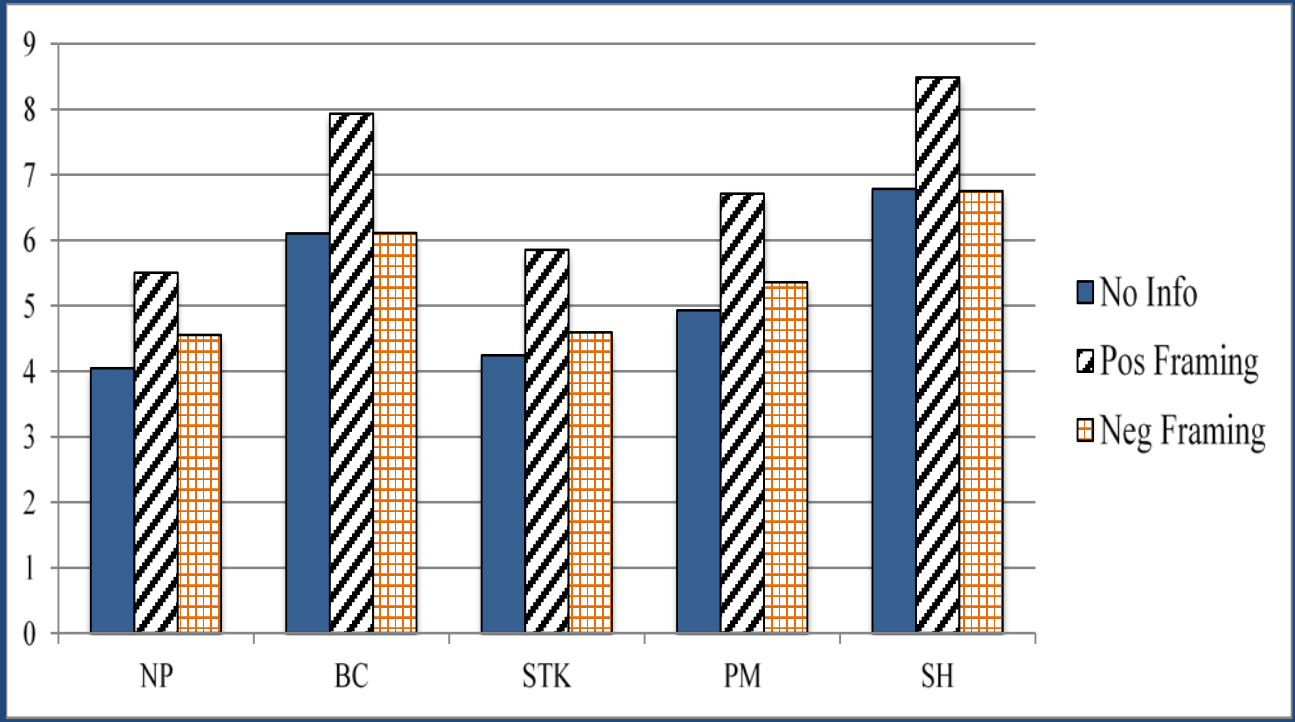
(pre-determined randomly)

Data

Summary statistics for demographic variables			
Number of respondents	336		
Average age (years)	32		
Female	62. 6%		
Children under 18 present in household	27.6%		
Own Residence	62.9%		
In State	72.7%		
Environmental	35.0%		
Rural	13.1%		
Concerned about drinking water		**Concerned about watershed**	
Not at all	1.2%	Not at all	0.6%
Only a little	14.1%	Only a little	6.9%
A fair amount	40.7%	A fair amount	37.1%
A great deal	44.0%	A great deal	55.4%

Results

Average Bids for each Water Runoff Management Practice by Framing



Note: NP is abbreviation for native plant; BC for Biochar; STK for soil test kit; PM for peat moss; SH for soaker hose; Vertical axis measures average bids in USD.

Highest average WTP was for soaker hoses ($7.34).

Lowest average WTP was for native plants ($4.55). and most willing to pay for

Compared to baseline of no information, Positive framing had higher WTP.

Positive Framing

As shown by the arrow, residents that choose to install water conservation items on their lawn will **reduce the amount of pollution** they contribute to local watersheds. The nutrients in your lawn like Nitrogen and Phosphorus can cause algal blooms and kill fish once they enter local water bodies. **Once installing water conservation items in your lawn, your contribution of nutrients and sediments will decrease.** These items encourage healthy habitats and superior water quality in your local waterways.

Random Effects Hurdle Regression Results

Variables	Coefficients	Standard Error
Default Priming	0.19***	0.06
Positive Framing	3.10***	0.85
Negative Framing	0.04	1.06
Native Plant	-7.84***	1.29
Biochar	-2.05	1.35
Soil Test Kit	-7.24***	1.61
Peat Moss	-5.04***	1.18
Soaker Hose (Baseline)	-	-
Female	2.78***	0.56
Age	0.09***	0.02
Own Residence	2.08**	0.86
Children	1.13	0.72
In State	-0.65	0.96
Environmental	-0.92	0.57
Rural	-3.50***	1.12
Concern Drinking Water	0.37	0.64
Concern Watershed	0.65	0.90
Risk Preferences	0.65***	0.16
Constant	-8.99	1.95
Selection -- Lower Limit		
Default Priming	-0.00	0.00
Positive Framing	0.20***	0.07
Negative Framing	0.09	0.10

Note: *10% significance level, **5% significance level, ***1% significance level.

N = 1665; Wald Chi^2 = 164.28; Prob > Chi^2 = 0.00.

Research Question

How does different framing of the water security problem impact homeowner WTP?

Scientific Information

Water Run Off from our Lawns and Gardens Causes Problems Downstream

The Delaware River watershed, where you are sitting right now, provides drinking water to 17 million people—roughly 6% of the population of the United States.

Scientists have designated over 8,000 miles of streams in the watershed as "impaired." Their water quality is so poor you cannot safely drink from them, fish or swim in them, or even use them for agriculture or industrial uses. A substantial part of this damage is caused by water running off our lawns, gardens and streets.

The runoff carries with it nutrients, like nitrogen and phosphorous. While these nutrients can help plants grow in our yards, nutrient-rich runoff can make drinking water unsafe and causes enormous algae growth in our lakes, streams and bays. These algae block the light for aquatic plants, which then die and literally remove oxygen from the water. Without oxygen, fish, crabs, oysters, and other aquatic animals die.

Identifiable Victim

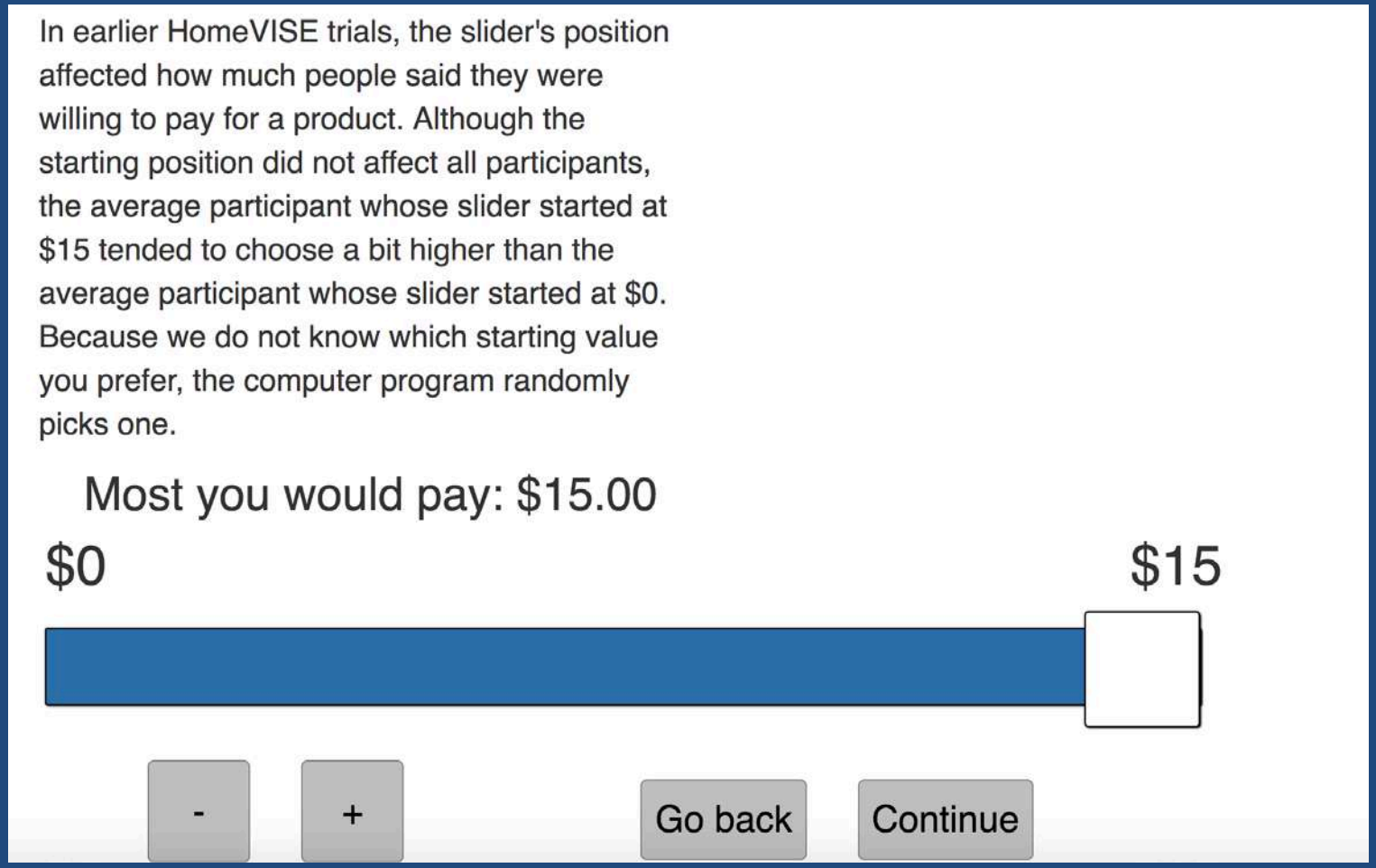
Water Run Off from our Lawns and Gardens Causes Problems Downstream

Jerome Rodio was a Navy and police officer, as well as a business owner and chamber of commerce president. In his spare time, Jerome helped the homeless and the Oxford SILO (Serving Inspiring Loving Others) project. Many expected Jerome to become the Mayor of Oxford, PA, just 13 miles from Delaware.

But Jerome died last summer from the flesh-eating Vibrio bacteria, which he received after being scratched by a crab trap and washing it out with bay water. According to the Chesapeake Bay Foundation, Vibrio grows from a "combination of warmer waters, nutrient pollution, and other factors". Nutrient pollution comes from water running off of our lawns, gardens and streets.

USA Today reports that the survival rate for an infection from *Vibrio* is only about 50%. Despite Jerome's treatment at a Veterans Affairs clinic, local hospital and the University of Maryland Medical Center, he died just three days after getting his original scratch.

Nudge Awareness Treatment



	OLS, In Dollars
High default and aware	0.861**
	(0.304)
Low default and aware	-0.537
	(0.285)
High default and unaware	0.228
	(0.297)
Age	0.0230**
	(0.00819)
Victim	0.576**
	(0.216)
Male	-0.580**
	(0.221)
Biochar	0.142
	(0.0932)
Soil test kit	-0.945***
	(0.0973)
Soaker hose	1.781***
	(0.103)
Constant	3.727***
	(1.087)
Observations	4956

Standard errors in parentheses
Session and State controls included.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

1. Average WTP for different items.
   - Soaker hose: $9
   - Slow-release fertilizer: $7
   - Biochar: $7
   - Soil test kit: $6

2. Older people and women had a higher willingness to pay.

3. The identifiable victim treatment led to higher willingness to pay.

4. In the awareness treatments, those with the higher defaults bid even higher.

Thank you

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