Pretest Summary

- EPA is conducting a stated preference survey to estimate benefits of improving water quality in the Chesapeake Bay and lakes in the Chesapeake Bay Watershed
- The stated preference survey will be mailed to randomly selected households using a choice experiment approach with the following environmental attributes
  - Water clarity in the Bay
  - Striped bass population
  - Blue crab population
  - Oyster population
  - Lakes with low algae levels
- Our original experimental design included two baseline scenarios in three geographic strata. In response to public comments we added a third baseline and another reference year for attribute improvements to the pretest design

Baseline Conditions	**Time Horizon**	**Geographic Strata**
- Improving*	- 2025	- Bay States
- Constant	- 2040*	- Watershed States
- Declining		- Other Eastern States

* Added in response to public comments

Pretest Administration Details

- The sample size for the pretest was based on the following:
  - 6 survey versions and 3 geographic strata result in 18 sampling cells
  - Target of 50 completes per sampling cell
  - Anticipated effective response rate of 28%
  - $(50/.28) \times 18 = 3,214$ households in the sample (rounding resulted in a sample of 3240)

- EPA received approval for the pretest on Sept 17, 2013

- Began printing materials as soon as the government shutdown ended on October 17th

- Pretest mailing schedule
  - Preview letter — November 13
  - First survey — November 19
  - Reminder postcard — November 26
  - Second survey — December 9
  - Final reminder — December 16
  - Non-response follow up — January 16

Response Rate Calculation

- Accounts for: completed surveys, refusals, deceased, physically or mentally incompetent, ineligible addresses, non-respondents

- Am. Assoc. for Public Opinion Research (AAPOR)
  - RR1: only removes ineligible addresses
  - RR3: removes ineligibles PLUS a *portion* of non-respondents based on an estimated eligibility rate (e)

	Bay States	Watershed States	Other Eastern States	Overall
RR1	31.7%	26.4%	22.7%	26.9%
RR3	38.1%	33.3%	29.7%	33.7%

Sample Summary Statistics

Typical of mail surveys, our sample includes smaller proportions of females and minorities and tends to be older than the sample frame.

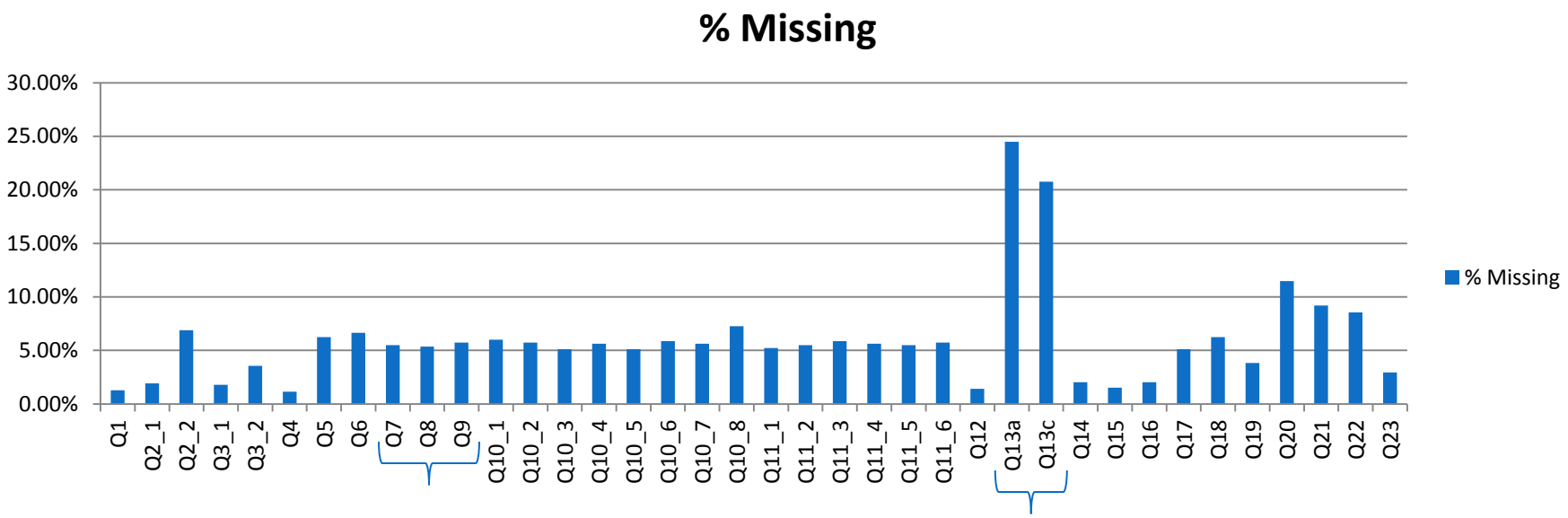
	Sample	Population[1]	H_0: Sample% = Population%
Male	55.2%	47.9%	4.09*
Age 20-29	2.82%	17.45%	-24.07***
Age 30-39	12.2%	16.5%	-3.24*
Age 40-49	16.7%	18.8%	-2.16*
Age 50-59	25.5%	17.9%	4.15*
Age 60-69	24.19%	15.76%	5.37***
Age 70 & over	22.7%	12.6%	6.77*
Black	11.2%	18.2%	-5.70*
Hispanic	4.2%	12.5%	-10.71*
College Degree	49.9%	48.1%	0.43
Average and median respondent's household income falls between $50,000 to $74,999. The "median" population income is $52,627.			

Respondents' familiarity with the Chesapeake Bay and Watershed lakes

	Sample
Heard of the Chesapeake Bay before receiving the survey	90.6%
Has recreated at the Bay in the last 5 years	34.9%
Has recreated at a Watershed lake in the last 5 years	32.4%

1. U.S. Fact Finder census data for entire sample frame

Item non-response



- Choice question non-response about 5.5%
  - 19 (2%) respondents skipped all three choice questions
  - 716 (91%) respondents answered all three choice questions
- Open ended questions asking where recreation trips to the Chesapeake Bay were taken

Debriefing Questions

- Fourteen Likert scale questions following the choice experiments grouped into Q10 and Q11
  - Evaluate quality of responses to choice questions
  - Probe motivation for WTP
- Respondents still answering questions thoughtfully late in the survey
  - Only 0.003% and 2.3% of participants responded the same for all Likert scale questions in Q10 and Q11, respectively
  - 2.8% and 4.3% said "don't know"
  - 4.7% and 5.0% skipped all of Q10 and Q11, respectively
- Comparison with Banzhaf et al. (2006) Adirondacks SP study

	Chesapeake Pretest	Adirondacks
Did not vote as if household would face costs	7%	N/A
Did not believe improvements would be achieved	7%	37%
Costs should not be a factor	36%	25%
Against taxes/govt. spending	30%	21%
My household should not have to pay	36%	19%
Considering factors other than attributes in choice questions	32% - 46%	10% - 59%

Probing for Scenario Rejection and Protest Responses

- Respondents generally accepted scenarios and responded to choice questions as if the scenarios posed were real and consequential
- Some indication of protest responses
  - Contradicted by answers to choice questions
  - Could be improved by rewording some prompts

Question Prompt	Strongly Disagree				Strongly Agree		
	1	2	3	4	5	Don't Know	Missing
I voted as if my household would actually face the costs shown in the questions.	5%	2%	9%	**17%**	**55%**	5%	6%
I voted as if the programs would actually achieve the results shown by [YEAR]	4%	2%	12%	**21%**	**48%**	8%	6%
I am against any more regulations and government spending.[1]	21%	13%	25%	10%	21%	7%	6%
My household should not have to pay any amount to improve Bay Waters and Watershed Lakes.[2]	17%	17%	21%	9%	25%	5%	6%
It is important to improve waters in the Chesapeake Bay Watershed, no matter how high the costs.[3]	15%	11%	27%	17%	19%	7%	5%

1. Since our payment vehicle did not include government spending we will change the phrasing for the full survey
2. 114 respondents agreed w/ statement, but voted for policy option at least once
3. 67 of respondents agreed w/ statement but still chose status quo at least once

Motivation for WTP

- How much is WTP motivated by bequest and option value?
- To what extent did factors other than those presented in the choice questions influence respondents' votes?

Question Prompt: Did the following affect your vote?	Strongly Disagree				Strongly Agree		
	1	2	3	4	5	Don't Know	Missing
Changes in the quality and price of seafood	19%	12%	24%	17%	15%	8%	5%
Impacts on the economy and jobs	10%	9%	22%	24%	22%	7%	6%
Improving the environment for others	5%	4%	14%	26%	38%	7%	6%
Water quality improvements to lakes outside the watershed	11%	9%	20%	21%	24%	9%	6%
Preserving the environment for future generations	5%	3%	11%	22%	48%	5%	6%
Trips I may take to the Chesapeake Bay or Watershed lakes in the future	19%	11%	19%	15%	18%	12%	6%

Screening responses for analysis

- Identify protest responses, hypothetical bias, etc. based on both responses to choice scenarios and debriefing questions

- Protest responses
  - Against government regulation and spending
  - Household should not have to pay for improvements
  - Chose status quo in all choice scenarios

- Hypothetical bias
  - Did not vote as if household would actually face costs
  - Chose highest cost option in every choice scenario

- Warm Glow
  - Improvements important no matter how high costs
  - Chose highest cost option in every choice scenario

Full sample	Protest Responses	Hypothetical Responses	Warm Glow Responses	Protest, Warm Glow, or Hypothetical Bias
784	97	4	29	127
100%	12.4%	0.5%	3.7%	16.2%

Comparing Results Across Baseline Versions

	Chi-sq Tests of Differences in Marginal WTP		
	H_0:(1)=(2)	H_0:(3)=(2)	H_0:(1)=(3)
clar	1.19	0.49	3.39*
lake	2.2	0.01	0.26

% respondents exhibiting:	Decreasing (1)	Constant (2)	Increasing (3)	(1)=(2)	(2)=(3)	(1)=(3)
Protest	9.12%	13.18%	15.95%	t=1.51	t=-0.69	t=-2.20**
Hypothetical Bias	0.70%	0.39%	0.41%	t=-0.49	t=-0.05	t=0.43
Warm Glow	5.26%	3.10%	2.49%	t=-1.25	t=0.41	t=1.62

Choice Questions and Econometric Model

Random utility model (RUM)

$$(v(\boldsymbol{X}_i, \boldsymbol{D}, Y\text{-}F_i) + \varepsilon_i) \geq (v(\boldsymbol{X}_j, \boldsymbol{D}, Y\text{-}F_j) + \varepsilon_j)$$

$v(.)$=utility
ε_i = stochastic component of utility
Y = income
$\boldsymbol{D}$ = household characteristics

- Estimated several conditional logit regressions using pretest data

7. Please vote for one of the three options below. *(Mark one box at the bottom to indicate which option you would prefer.)*

	Conditions in 2025 (% change compared to today)		
Environmental Outcomes	**Option A**	**Option B**	**Option C**
Bay Water Clarity Average visibility	**4 feet** (33% increase)	**5 feet** (67% increase)	**6 feet** (100% increase)
Striped Bass Adult Population	**26** million fish (8% increase)	**30** million fish (25% increase)	**30** million fish (25% increase)
Blue Crab Adult Population	**260** million crabs (4% increase)	**312** million crabs (25% increase)	**340** million crabs (36% increase)
Oysters Population	**4,300** tons (30% increase)	**4,300** tons (30% increase)	**6,500** tons (97% increase)
Watershed Lakes Lakes with low algae levels	**3,100** lakes (7% increase)	**3,350** lakes (16% increase)	**3,850** lakes (33% increase)
Your Cost of Living Permanent cost increase for your household starting next year	**$0 every year**	**$60 every year** or $5 every month	**$500 every year** or $41.67 every month
Your Vote Please mark one of the boxes to the right	Option A ☐	Option B ☐	Option C ☐

Validity Checks: Scope Tests

Pooled Model: all geographic strata, baselines, and reference years

- <u>Scope</u> – signs and statistical significance of coefficient estimates are often as expected

- We are able to improve the precision of our estimates using the screening criteria

Validity Checks: External Scope Tests

External scope

- Estimate each choice question separately
- Estimates based only on cross-sectional variation
- Coefficient signs are often as expected, suggesting that respondents are not just being internally consistent

Validity Checks: Theoretical Validity

- Positive coefficient on high income-cost interaction indicates wealthier people are more likely to choose higher cost options

- Monotonically decreasing coefficients on cost level dummies reflects decreasing marginal utility of income

Validity Checks: Theoretical Validity (2)

- Positive coefficient on user-attribute interactions shows that users of the Bay are generally willing to pay more to improve Bay attributes

Validity Checks: Alternative Specific Constants

- Alternative specific constants
  - ✓ – No evidence of status quo bias (i.e., warm glow or cold feet)
  - – Tendency for respondents to choose Option B and the cheapest alternative
  - – May be due to the lack of a full orthogonal design in the pretest
  - ➢ Main survey will have full orthogonal design
  - ➢ If these confounding influences still exist, they can be controlled for by inclusion of these dummy variables

Comparing Reference Year Versions (2025 v. 2040)

Annual Household WTP for a 10% improvement in Bay Water Clarity

- Comparison of preliminary WTP estimates across 2025 and 2040 show that respondents are discounting benefits that occur farther in the future
- Estimates from 2040 version of the survey are less precise

Annual Household WTP for a 10% increase in Low Algae Lakes - Watershed States Only

- WTP for Low Algae Lakes is not statistically different from zero for either reference year

Evaluating the 2040 Time Horizon

- Public comment: Some improvements from the TMDL will not be fully realized until after 2025.

- In focus groups and cognitive interviews long time horizons increased the incidence of scenario rejection.

- From our response to public comments: "We will include debriefing questions on all surveys to test for scenario rejection of the type we encountered in focus groups. If the pretest results show that a disproportionate number of respondents reacted negatively to either reference year we will reconsider the split sample design for the full survey."

- Debriefing Question: "I voted as if the improvements would actually be achieved by 2025/2040"

  7.5% of respondents to the 2040 version of the survey disagreed, compared with **4.7%** of respondents to the 2025 version (two-sample t-test p-value = 0.108)

Evaluating the 2040 Time Horizon (2)

- Preliminary WTP estimates for improvements in Bay Water Clarity
  - More precise estimates in the 2025 sample
  - Results indicate people are discounting at reasonable rates; implied discount rate is about 3%
- Standard practice to choose a shorter timeframe and discount benefits accordingly (e.g. Alberini et al. 2004, Banzhaf et al. 2006, Cameron and DeShazo 2013)
- Our preference is to collect data that will provide the "cleanest" estimate of WTP and discount future benefits appropriately.
- Dropping the 2040 time horizon from our experimental design would reduce the cost of conducting the main survey and the burden placed on respondents by half.

Non-response Survey Administration

- Sent to 900 households who did not respond to pre-test
  - Randomly selected by strata
  - Included $2 incentive payment and “Please Respond Within 2 Weeks” stamp on envelope
  - Brief questionnaire (4 pages total)

- 144 responses (16.2% response rate)
  - 38 received from Bay States
  - 49 received from Watershed States
  - 57 received from Other States

Non-response Survey Results

	Survey	Non-response
Heard of the Chesapeake Bay	91%	85%
Seen the Chesapeake Bay/Lakes	58%/49%	45%/43%
Recreated at the Chesapeake Bay/Lakes	35%/32%	23%/19%
Against more regulations and spending	31%	36%
Should not have to pay to improve Bay or Lakes	34%	43%
Important to improve Bay no matter the cost	36%	39%
Income ("median" based on mid-point of range)	$62,500	$62,500
Male	56%	51%
Black	11%	6%
Hispanic	4%	8%
College Degree	49%	45%

Proposed Changes for Full Sample

- Survey Edits
  - Minor changes to phrasing of some debriefing prompts
  - Minor text changes to description of Lakes attribute + changing question 5 to reinforce that information

- Experimental Design
  - Drop the 2040 time horizon
  - Scale back improving baseline version of the survey to Bay States stratum only

Changes to survey text

Page 4

"Pollution reduction programs already in place to limit nutrients and sediment flowing into the Chesapeake Bay also help ~~limit algae growth~~ keep algae levels low in Watershed Lakes."

Old Question 5. How do the predicted conditions for the Chesapeake Bay and the Watershed Lakes in [year] compare with what you expected?

- ❑ I had expected conditions in [year] to be *better* than what is predicted
- ❑ I had expected conditions in [year] to be *worse* than what is predicted
- ❑ I had expected conditions in [year] to be *about the same* as what is predicted
- ❑ Don't know

New Question 5. If you were taking a recreational trip to a lake, which would you prefer?

- ❑ I would prefer a lake with low algae levels and clearer water
- ❑ I would prefer a lake with high algae levels and greener water
- ❑ I don't have a preference, either type of lake would be fine
- ❑ I don't know

Full Survey Schedule

- Goal is to have the survey in the field before summer vacation…

	Dates
Printing and preparation	March/April 2014
Mail Preview Letter	April 28, 2014
Mail Final Reminder	May 26, 2014
Conduct Non-response bias study	June 9, 2014
Begin data analysis	July 2014