

# **What Are U.S. Households Willing to Pay To Avoid the Harm to the Environment From the Deepwater Horizon Oil Spill?**

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\*Views expressed do not necessarily reflect those of the U.S. National Oceanic & Atmospheric Administration or the U.S. Department of Justice.

# Total Value Economic Damage Assessment Team



Left to Right: Norman Meade, Jason Murray, Ray Kopp, Rich Bishop, Kerry Smith, Richard Carson, Michael Hanemann, David Dain, Jeff Wooldridge, Katherine Pease, Barbara Kanninen, Nora Scherer, Mike Welsh, Roger Tourangeau, Matt Konopka, Kevin Boyle, Adam Domanski, Chip Paterson, Scott Cernich, Jon Krosnick (Not pictured: Matt DeBell, John List, Stanley Presser)





Miss.

Mobile

Jack

Louisiana

BP / Deepwater Horizon Spill

Florida

Total extent of oil spill, 68,000 sq miles. Adapted from Skytruth.org

Havana







# Natural Resource Damage Assessment

- Set of U.S. government procedures for assessing physical injuries and translating those in to economic harm from injuries to and lost use of the public's natural resources.
  - U.S. Oil Pollution Act, Superfund/CERLA/Clean Water Act and others
  - Designates Trustees for those resources who can be Federal Agencies that manage natural resources (e.g., Commerce/National Oceanic and Atmospheric Administration, Department of Interior, Agriculture/Forest Service), States (i.e., AL, FL, LA, MS, TX) and/or Tribes
- Goal is to “make public whole”
  - Conceptual measure is the public's ex ante minimum willingness to accept compensation for agreeing to allow the set of injuries to occur
  - Ohio v. U.S. DOI decision rules public should be compensated for lost “passive use” & that contingent valuation could be used to measure it
- Money received by government from a natural resources damage claim must be spent on primary or compensatory restoration
- Does not cover claims by private parties (e.g., fishermen)

# Outcome of Settlement Agreement Between BP and Federal/State Trustees

## **\$15 billion dollar** settlement

- Does not include criminal penalties; \$5b in Clean Water Act civil penalties; \$1b local government claims; and private claims
- \$8b for a natural resource restoration plan; \$5b divided between individual impacted states; and \$2 billion from criminal phase of trial for restoration
- Consent decree approved by federal judge April 2016

# A Bit of History

## Santa Barbara 1969



- Government agencies received less than \$14 million

# Contingent Valuation (CV)

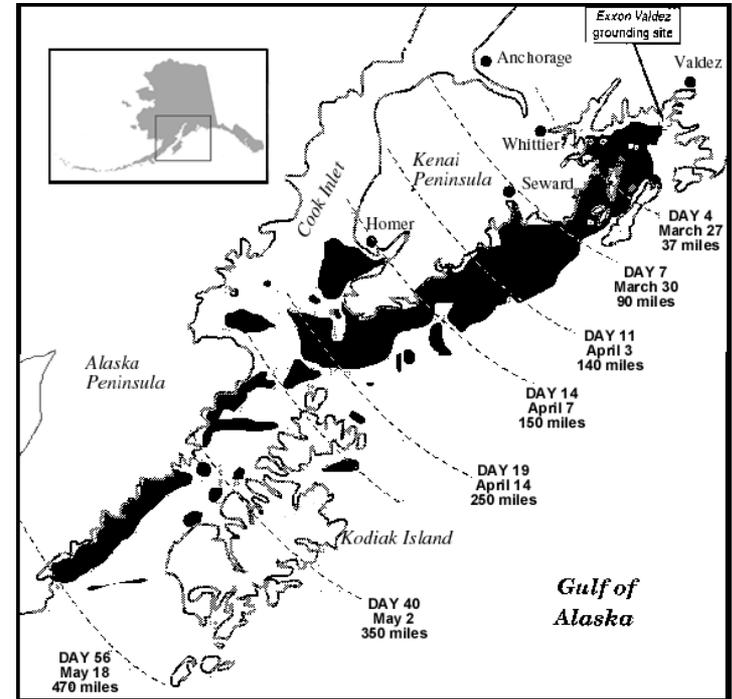
- One of the main methods to estimate the monetary value of change in environmental quality
  - Benefit assessment for renew of U.S. Clean Water Act
- Survey Method
  - Constructs the missing market for a nonmarketed good
  - Elicits stated preferences typically in form of choices
  - Choices plus experimental design allow derivation of willingness to pay (WTP) for non-marketed good
  - Can be seen as similar to a dose response function in biology with “tax cost” as the quantity of poison
  - Only approach (other than actual voting) that can be used to measure total economic value (WTP or WTA), including passive use (existence value/nonuse/option/stewardship)

# Key Features of a CV Survey

- Define baseline level of service flows
- Define change in flow of services
- Describe credible plan to deliver that change
- Describe credible payment structure for plan
- A mechanism for eliciting preference information
- Obtain information on covariates that should help to characterizing differences in individual WTP

# Exxon Valdez Oil Spill

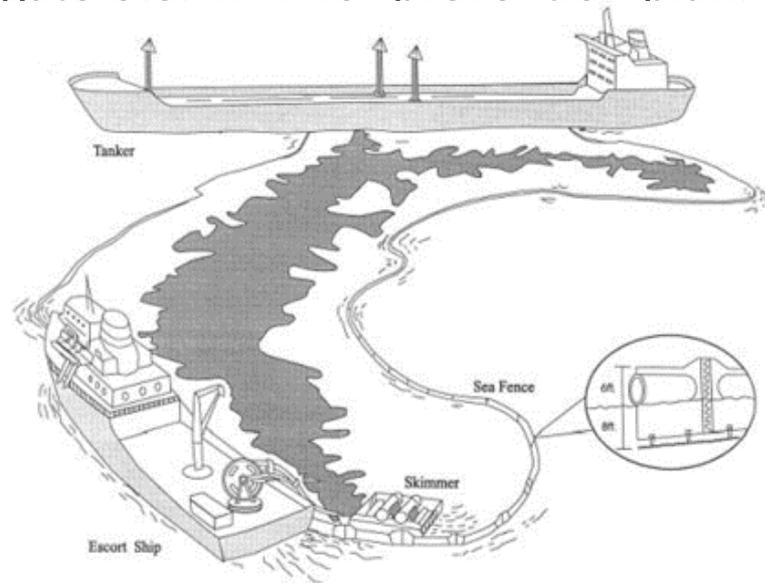
- 1989, Exxon Valdez runs aground spilling 11m gallons of oil



- Set in motion efforts by State of Alaska and Federal government to obtain a monetary estimate of damages consistent with how government was valuing benefits of environmental programs and law on natural resource damages as codified by Ohio v. US DOI

# Exxon Valdez CV Study (Carson, et al.)

- Large random sample of U.S. population asked if willing to pay (WTP) \$X in one time higher tax to setup & run program to prevent injuries from another Exxon Valdez oil type spill
  - Substitutes preventing a future set of similar injuries (time traveler)
  - Substitutes a WTP measure for a WTA measure
  - Detailed descriptions in words and pictures of injuries/prevention plan
  - Estimated aggregate U.S. WTP for prevention plan: \$3 billion dollars



# After the Exxon Valdez

- Exxon settles out of court with government for \$3 billion (\$2b for primary restoration & \$1 billion for compensatory restoration)
- Short term restoration activities now seen as counterproductive

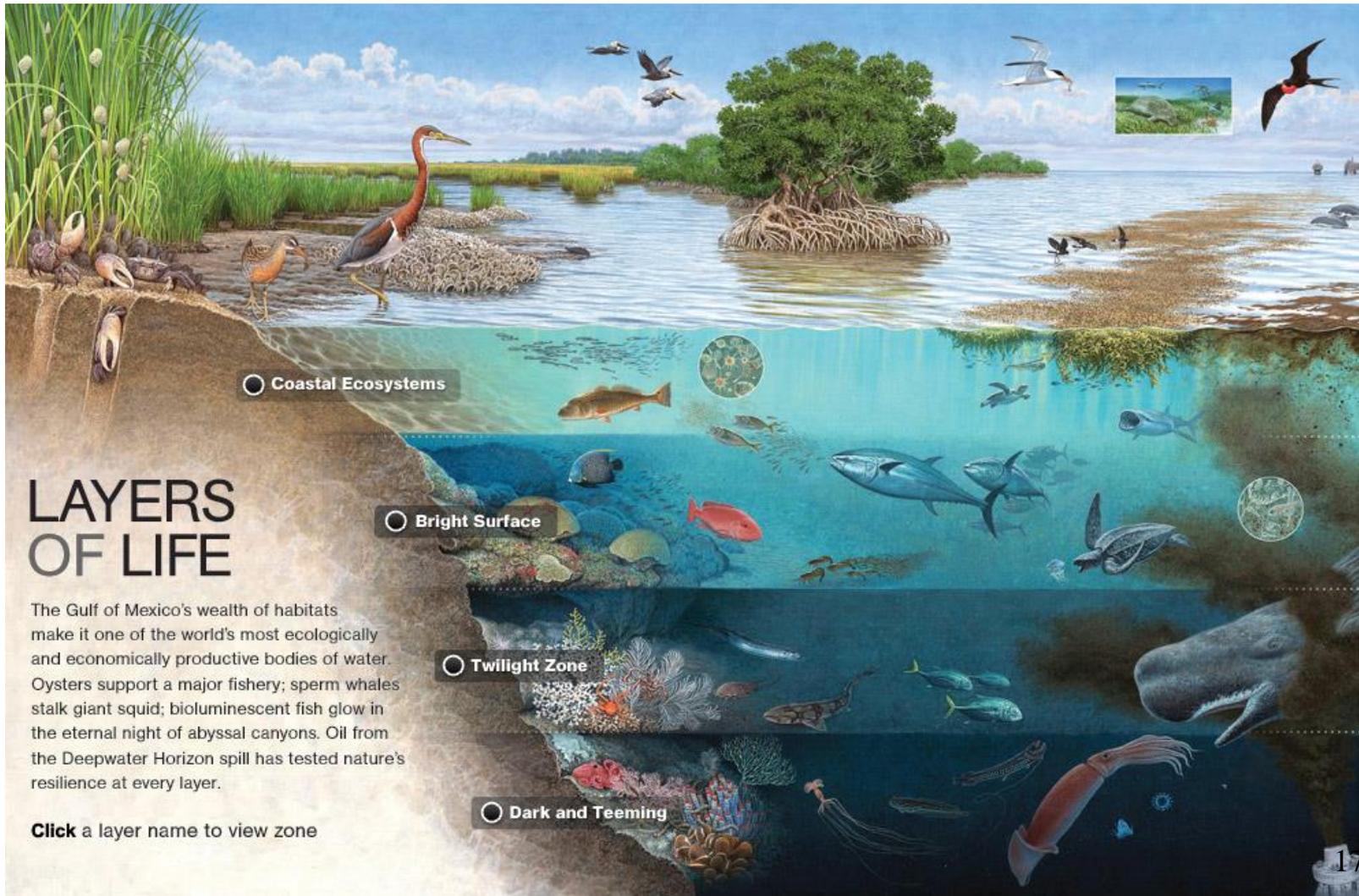


- Coast Guard implements variant of CV study's prevention plan
  - Subsequently prevents three Exxon Valdez type oil spills

# Subsequent Events

- NOAA Blue Ribbon Panel (Arrow et al., 1992)
  - Passive use should be included in damage assessment
  - Contingent valuation done in an appropriate way can be a reliable way to estimate damages for a judicial proceeding
  - Calls for conducting “scope” test of sensitivity to injury description
- Theoretical developments
  - WTA can be considerably larger than WTP for environmental goods
  - WTP for a good valued first in a sequence should be smaller than WTA for a good valued in any order
  - Income elasticity of WTP typically smaller than income elasticity of demand
- Comparison of stated (SP) & revealed (RP) preference estimates
  - SP estimates similar if not smaller than RP estimates & highly correlated
- Consequentiality and incentive compatibility
  - Responses to consequential questions represent “real” economic behavior
  - questions can be structured so truthful preference revelation is optimal<sup>6</sup>

# CV Survey on Preventing Injuries from a Deepwater Horizon Type Spill



# Goals of Questionnaire Design Process

- Describe the 2010 BP spill and associated injuries accurately
  - Moving target due to parallel science work
  - Injuries provided to the economic research team by government lawyers
  - Divided into two sets: (i) easily proven/known early & (ii) required studies
- Provide balanced presentation that did not signal voting one way was preferred
- Provide the information that people want when they want it
- Provide information so it is easily understood and interesting to respondents
- Do not present too much information to avoid inducing fatigue or disengagement
- Describe the 2010 spill, its effects, and the prevention plan in a way respondents will find plausible, and,
- Encourage respondents to base their votes on value to them of preventing the set of injuries described, plan cost and their financial situation

# Keeping Respondents Engaged

- Well-trained interviewers administer survey in person
- Respondents told to take their time and think carefully to answer as accurately as possible.
- Visual aids presented on a laptop controlled by an interviewer tablet
- Lots of photographs shown (e.g., beaches, boats, and oil drilling platforms) Diagrams also used to help respondents understand the drilling process and the prevention program
- Periodically, questions asked that closely matched the information the interviewer had presented
- Just before voting, respondents were asked to take a moment to think about the effects of the oil spill, the cost to them of the prevention program, and other factors that could influence their voting decisions.

# Survey Development Work

- Focus groups
  - Examined public's perceptions and language used
- Cognitive interviews using concurrent verbal protocols
  - Look very detailed level of how people understood survey
- Group interviews
  - Experiments with cost amounts & survey features
- Pilot surveys
  - Experiments with cost amounts & survey features
  - Temporal stability

# Sample Design & Survey Administration

- Nationally representative sample of the adult (18+) household population in 48 contiguous states and DC
  - Some exclusions: American Indian reservations, military bases, prisons and households where no adults spoke English well enough to do the interview (N=112,647,215 eligible households).
- Four-stage design
  - Census primary sampling units stratified by Census Division
  - Census blocks
  - Specific addresses within a census block
  - Randomly chosen individual within household
- Abt-SRBI collected the data
  - Extensive interviewer training and certification
  - In-person interviews (45 minutes to 2 hours in length)
  - 3,656 completed interviews (~50% response rate)
- Third party verification (Westat) that interviews took place

# Initial Contact Letter



UNITED STATES DEPARTMENT OF COMMERCE  
Washington, D.C. 20230

[DOC LETTERHEAD]

[DATE]

[INSERT ADDRESS HERE]  
[CITY, STATE ZIP]

To the Residents of [ADDRESS].

I am writing to invite you to take part in an important study being done for the U.S. Department of Commerce. The study is about people's opinions on issues facing the country. Your answers will help the government decide what to do on these issues.

In the next few weeks, an interviewer from Abt SRBI will visit your home. Abt SRBI is a research company working for us.

Your participation is voluntary and is critical for the success of the study. Most people find the study very interesting and informative. We think you will, too.

When the interviewer visits, we hope you will do the interview then. But if that is not convenient, the interviewer would be happy to come back at another time. Or you can set a time for your interview by calling toll free [REDACTED]. Please mention ID Number [ID].

If you have questions about this study, which is called the Study of National Issues (SONI), please e-mail us at [SONI@srbi.com](mailto:SONI@srbi.com). You can also learn more about Abt SRBI by visiting [www.abtsrbi.com](http://www.abtsrbi.com).

Thank you very much. I appreciate your help.

Sincerely,

Norman Meade  
Senior Economist  
Department of Commerce  
1-877-251-3433



# Baseline Information

- Animals and ecosystem in Gulf of Mexico
- Human activities
  - Recreation of various types
  - Businesses
  - Catching fish
  - Shipping
  - Drilling for oil
- Past effects of pollution on the ecosystem



- Major design challenge was overcoming many respondents' beliefs about the injuries that the spill had cause
  - Driven largely by early TV images and reporting
- Three pronged solution
  - Respondents list everything they thought was harmed by the spill
  - Display a series of newspaper headlines showing scientific understanding of what had happened during the spills changed over time
  - Tell respondents that what they are now going to be told/shown is what scientists now believe happened after years of study

- The 2010 Spill
  - What do you remember about it?
  - How serious were the effects?
- News coverage
  - At first
  - Later
  - Example headlines
- Extensive work by natural scientists studying effects
  - Damage was less than at first thought
  - Description of injuries
- Businesses lost money, but they were paid back
- Explanation of normal drilling for oil
- Explanation of why the accident occurred
- Leaks like this are usually stopped with a second pipe, and that was done for BP spill

- Another spill will happen during next 15 years, same effects
- Companies can't be forced to prevent it
- Government program to prevent it
  - Drill second pipes
- What the program won't do



Laughing gull



Brown pelican

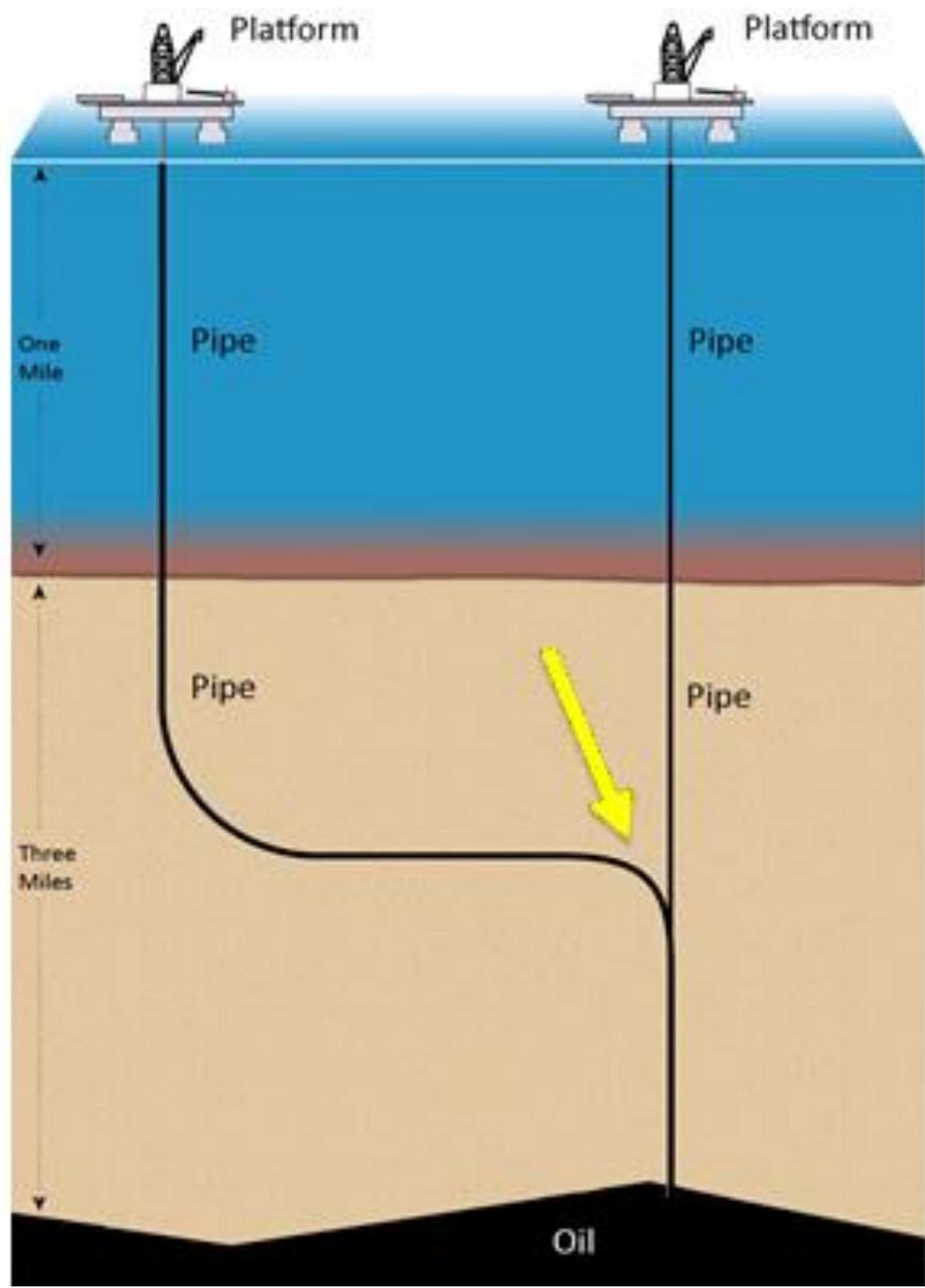


Royal tern



Northern gannet





- Payment: One-time extra federal tax
- Report income
- Price for the respondent
- List some reasons to vote for and against
- Vote
  - Respondents who voted in favor given two opportunities to change their vote

- Reasons for voting
- Scenario rejection
- Predispositions
- Demographics
- Final vote

# Two Injury Scenarios

## [A] Version Injuries in Bold & [B] All Listed Injuries

### Animals

			<u>Back to Normal</u>
1.	<b>Birds</b>	<b>50,000 died</b>	<b>5 years</b>
2.	Snails and worms	1/3 near well died	10 years
3.	Young fish	80 million died	1 year
4.	Young sea turtles	8,000 died	20 years
5.	Bottlenose dolphins	120 died	20 years
6.	Deep water corals	Parts of 120 died	300 years

### Plants

7.	<b>Marshes</b>	<b>Oil on 185 miles</b>	<b>3 years</b>
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### Recreation

8.	<b>Going to the beach</b>	<b>10 million fewer times</b>	<b>1 year</b>
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# Two Testable Predictions From Economic Theory

- Cost condition—as tax amount increases, percentage in favor should decline
  - Randomly assigned to tax amounts: 15, 65, 135, 265, 435
  - Cannot credibly ask about extremely low or high amounts
- Quantity condition—percentage in favor of preventing the scenario with more injuries should be higher
  - Two different injuries scenarios A & B
  - Provides an external “scope” test
- Requires random assignment to large statistically equivalent groups & balance of cost/injury assignment

Simplest Test of Quantity Condition (2 by 2 Tabulation of Version by Vote)			
Version	Vote		
	Against	For	Total
A	1,158 63.18%	675 36.82%	1,833 100.00%
B	1,066 58.48%	757 41.52%	1,823 100.00%
Total	2,224 60.83%	1,432 39.17%	3,656 100.00%
Pearson Chi2 = 8.474 Pr=.004			

Simplest Test of Cost Condition (5 by 2 Tabulation of Tax Amount by Vote)			
Version	Vote		
	Against	For	Total
15	330 45.08%	402 54.92%	732 100.00%
65	402 53.82%	345 46.18%	747 100.00%
135	464 63.22%	270 36.78%	734 100.00%
265	499 68.64%	228 31.36%	727 100.00%
435	529 73.88%	187 26.12%	716 100.00%
Total	2,224 60.83%	1,432 39.17%	3,656 100.00%
Pearson Chi2 = 163.170 Pr=.000			

<b>Table 3: Lower Bound Estimate for Mean Willingness to Pay</b>		
Description	Weighted	Without Weights
Mean WTP		
Smaller Set of Injuries		
Mean	136.11	132.36
Std error	6.34	5.52
Larger Set of Injuries		
Mean	153.01	152.25
Std error	6.87	6.04

For the smaller injury, the point estimate of economic losses is  
**\$15,332,412,434**  
 (112,647,215 households multiplied by \$136.11).

For the larger injury, the point estimate of economic losses is  
**\$17,236,150,367**  
 (112,647,215 households multiplied by \$153.01).

# Construct Validity Equation

- Willingness to pay is systematically related to:
  - Income (elasticity .42)
  - Attitudes toward protecting coastal areas, reducing pollution
  - Negative attitudes toward taxes, spending on public goods
  - Living in Gulf State (-), recreating in Gulf (+)
  - Trust in the government, belief in scientists
  - Many demographic predictors: age (-), apartment (+), environmentalist (+)
  - Beliefs related to plan: pay more (-); not work (-); magnitude of injuries

# Some Concluding Thoughts

- Oil Pollution Act of 1990 and Exxon Valdez settlement effectively stopped large uncontained spills in the United States from ships
  - Fundamentally changed liability structure
  - Substantially more attention to safety and quick containment
  - Required posting of \$1b bond for ships owned by companies without assets
  - “Bad” tankers went to other shipping routes
  - Limited liability for oil spills from offshore platforms to \$75m
  - BP spill not covered by this cap due to criminal liability
- Role of legal system & its interface with science & nonmarket valuation
- There are substantive questions involving what is the best split between primary and compensatory restoration from the perspective of the public’s interest
- Rare opportunity to do a large scale study without the usual budget constraints
  - Made many advances with respect CV that are likely become widely used