

# Oyster Demand Adjustments to Alternative Consumer Education and Post Harvest Processes in Response to *Vibrio vulnificus*

William Huth, University of West Florida  
Greg Martin, Northern Kentucky University  
Ash Morgan, Appalachian State University  
Richard Sjolander, University of West Florida

ISSC *Vibrio* Education Subcommittee  
Manchester, New Hampshire, May 5, 2009

# Research Presentation Outline

- *Vibrio vulnificus* and oyster demand
- Research objectives
  - Interaction with ISSC education/outreach
- Research design
  - Survey methodology and contingent behavior
- Florida pilot study results and discussion
- Current research effort
  - Florida Sea Grant through National Sea Grant Gulf Oyster Industry Program (GOIP) Funding

# Industry Cause for Concern

- Recurring *V. vulnificus* incidences
  - Raises consumer awareness of product safety issues
  - Increases perceived risk associated with oyster consumption
- ISSC survey results
  - 33% of respondents reduced raw oyster consumption in 2002
    - Primary reason (48%): Personal health concerns
  - 20% said they reduced raw oyster consumption in 2004
    - Primary reason: Some other reason (29%) followed by a tie between personal health concerns and availability (23%)

# Literature Background

- Researchers have examined economic impacts of various “health scares” on consumer behavior
  - e.g., Eggs (cholesterol), Beef (Mad cow), Chicken (*Salmonella*), mussels (domoic acid)
  - Some scares have had large impacts and raised risk perceptions –reducing demand. Other scares no effect
  - Economic reaction to different hazards has varied and each hazard must be considered on a case by case basis
- Marketing and psychology research also has examined consumer behavior with respect to health issues
  - Protection Motivation Theory

# Project Overview

- Florida Sea Grant-funded exploratory pilot study in 2007
- Results are forthcoming in the *Journal of Agricultural and Applied Economics*, December, 2009 issue:
  - “Oyster Demand Adjustments to Counter-Information and Source Treatments in Response to *Vibrio vulnificus*.”
- Measured how news of a *V. vulnificus*-related death impacted the demand for oysters
  - Quantified “economic losses” associated with demand change
  - Economic loss was in terms of “consumer surplus,” a measure of change in individual welfare or satisfaction

# Project Overview (cont.)

- Also measured change in oyster demand from providing consumers with a counter-information brochure (varied by source) to mitigate surplus losses.
  - Do consumers distrust information disseminated by a government source? Apparently so.
  - What about third party, ngo or nfp information? Better received.
- The research also quantified the differences in risk perceptions contingent on oyster PHP alternatives and associated price points.
- Do consumers of raw versus cooked oysters behave differently? Yes.

# Research Strengths

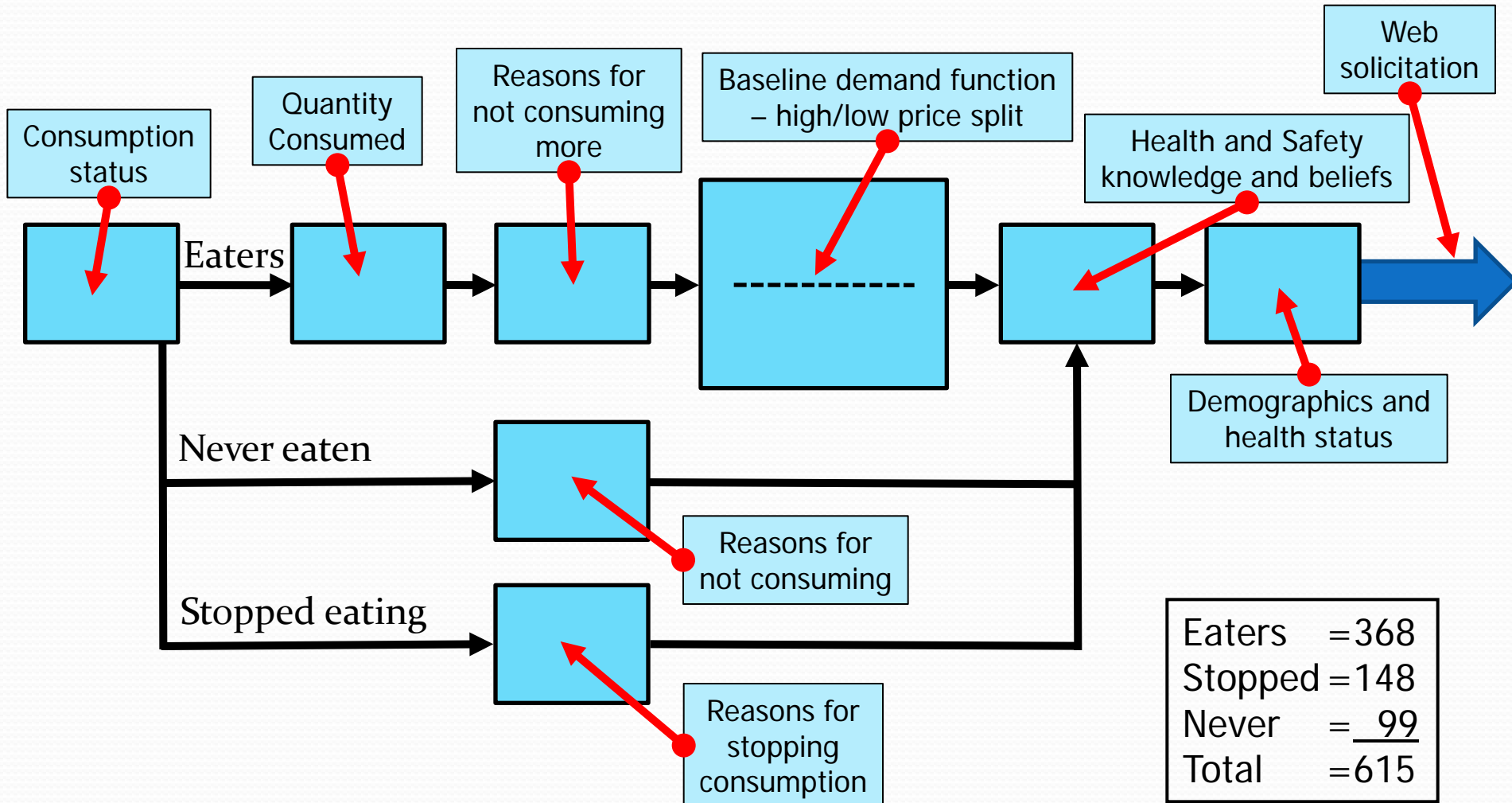
- A strong policy application orientation
  - Industry and institutional interest
  - Fits with the ISSC consumer education research agenda
    - Consumer education strategies to better inform oyster consumers of the actual risks associated with *V. vulnificus*.
- FDA mandates
  - Development and implementation of educational and outreach programs
  - Inform consumers about risks associated with *V. vulnificus*.
- Florida *V. vulnificus*. risk reduction plan for oysters
  - “Consumer education the first and foremost tool to reduce illness related to *Vibrio vulnificus*.”

# Florida Pilot Project Design

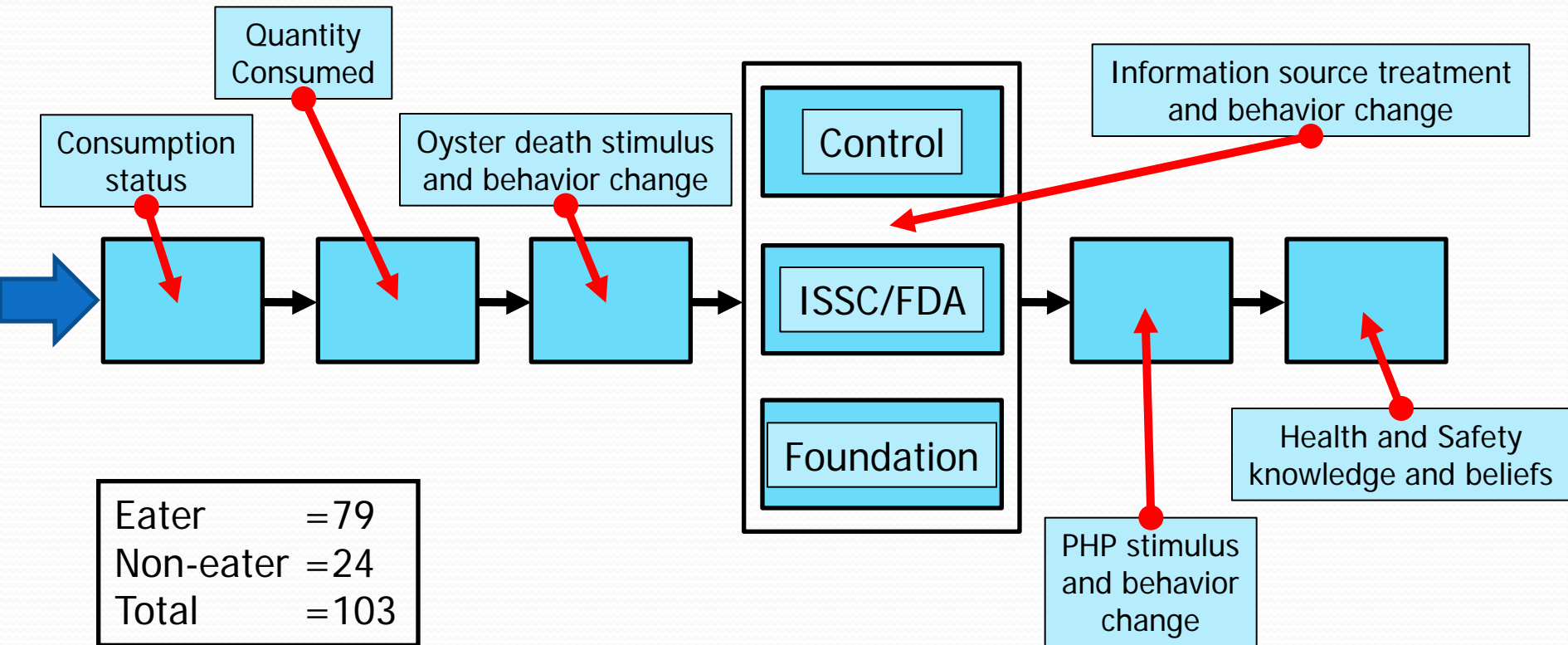
- Focused on contingent behavior analysis
  - Followed the method developed in Parsons et al., 2006
- Gathered a wide variety of exploratory oyster market measures (consumer knowledge, perceptions, opinions, beliefs, behaviors)
- Developed a bi-modal (telephone/web) data collection method



# Data Collection – Telephone RDD Survey



# Data Collection – Web Experiment

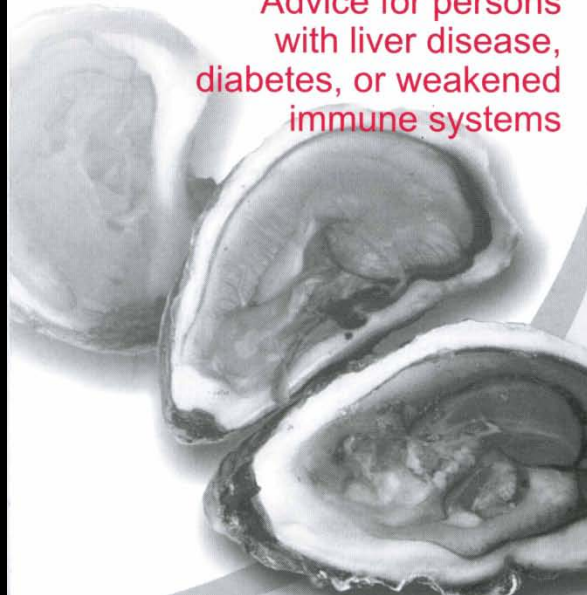


Information Source  
Treatment View 1

# The Risk of Eating **Raw** Molluscan Shellfish

Containing *Vibrio vulnificus*

Advice for persons  
with liver disease,  
diabetes, or weakened  
immune systems



## DID YOU KNOW...?

### Treatment View 2

you have **liver disease, diabetes,** or a **weak immune system,** raw shellfish containing the bacteria *Vibrio vulnificus* can make you seriously ill.

You can avoid illness simply by abstaining from consumption of raw shellfish. Eat only shellfish that have been thoroughly cooked.

## WHAT IS VIBRIO VULNIFICUS?

*Vibrio vulnificus* is a bacteria that can cause severe illness or death to at-risk people who eat raw shellfish.

From 1989 to 2002, the U.S. Food and Drug Administration (FDA) recorded 341 serious illnesses associated with consumption of raw oysters and clams containing the *Vibrio vulnificus* bacteria. Ninety-eight percent (98%) of these illnesses have been associated with consumption of raw oysters with 2% associated with Eastern Hard Clams. While illnesses are infrequent, about half (179) have resulted in death.

## WHERE IS IT FOUND?

*Vibrio vulnificus* is found naturally in warm coastal waters, such as the Gulf of Mexico, where levels of the bacteria are elevated during the summer months. *Vibrio vulnificus* is **NOT** a result of pollution, and can be found in waters approved for shellfish harvesting. *Vibrio vulnificus* does **NOT** change the appearance, taste, or odor of shellfish.

## ARE YOU AT RISK?

You are at risk of serious illness if you eat raw shellfish and have any of these health conditions:

- **Liver disease** (from hepatitis, cirrhosis, alcoholism, or cancer)
- **Iron overload disease** (hemochromatosis)
- **Diabetes**
- **Cancer** (including lymphoma, leukemia, Hodgkin's disease)
- **Stomach disorders**
- **Or any illness or medical treatment that weakens the body's immune system**

Unsure of your risk? Ask your doctor.

**Healthy people are not at risk of serious infection.**

## HOW CAN YOU AVOID INFECTION?

If you are at risk, raw or undercooked shellfish containing *Vibrio vulnificus* can make you sick.

You can also become infected if these bacteria enter your body through an open wound while swimming.

To safeguard your health, take these precautions:

- Physicians recommend that those at risk not eat any food of raw animal protein origin. This includes raw shellfish.
- **EAT** oysters or clams that have been **THOROUGHLY COOKED**--heat destroys the bacteria
- **NEVER** swim or wade in seawater when you have sores or open wounds



# Treatment View 3 CONTROL Condition

## WHAT ARE THE SYMPTOMS?

- Skin lesions
- Stomach pain / Nausea
- Vomiting
- Diarrhea
- Shock

If you have consumed raw shellfish, and have any of these symptoms, ***seek medical attention immediately.***

For those at risk, infection can lead to death within two days. Early, aggressive antibiotic treatment is the most effective therapy.

*Vibrio vulnificus* rarely affects healthy individuals. When it does, symptoms are mild and temporary.

## COOKING TIPS

### IN THE SHELL

- Cook live oysters or clams in small pots so those in the middle are cooked thoroughly.
- **BOILING:** After the shells open, boil live oysters or clams for another 3-5 minutes.
- **STEAMING:** In a pot that is already steaming, cook live oysters or clams for another 4-9 minutes.

### SHUCKED OYSTERS

- **BOIL** or **SIMMER** for at least 3 minutes or until edges curl
- **FRY** at 375°F for at least 3 minutes
- **BROIL** 3 inches from heat for 3 minutes
- **BAKE** at 450°F for 10 minutes

# Treatment View 3 ISSC/FDA Condition

## WHAT ARE THE SYMPTOMS?

...ur within 24-48  
...e:

- Skin lesions
- Stomach pain / Nausea
- Vomiting
- Diarrhea
- Shock

If you have consumed raw shellfish, and have any of these symptoms, ***seek medical attention immediately.***

For those at risk, infection can lead to death within two days. Early, aggressive antibiotic treatment is the most effective therapy.

*Vibrio vulnificus* rarely affects healthy individuals. When it does, symptoms are mild and temporary.

## FOR MORE INFORMATION

Contact the following:

- FDA Food Safety hotline: **1-888-723-3366**
- FDA website: **[www.cfsan.fda.gov](http://www.cfsan.fda.gov)**
- ISSC website: **[www.issc.org](http://www.issc.org)**

## COOKING TIPS

### IN THE SHELL

- Cook live oysters or clams in small pots so those in the middle are cooked thoroughly.
- **BOILING:** After the shells open, boil live oysters or clams for another 3-5 minutes.
- **STEAMING:** In a pot that is already steaming, cook live oysters or clams for another 4-9 minutes.

### SHUCKED OYSTERS

- **BOIL** or **SIMMER** for at least 3 minutes or until edges curl
- **FRY** at 375°F for at least 3 minutes
- **BROIL** 3 inches from heat for 3 minutes
- **BAKE** at 450°F for 10 minutes



**INTERSTATE SHELLFISH  
SANITATION CONFERENCE**  
(803) 788-7559 • [www.issc.org](http://www.issc.org)

# Treatment View 3 FOUNDATION Condition

## WHAT ARE THE SYMPTOMS?

24-48

- Skin lesions
- Stomach pain / Nausea
- Vomiting
- Diarrhea
- Shock

If you have consumed raw shellfish, and have any of these symptoms, ***seek medical attention immediately.***

For those at risk, infection can lead to death within two days. Early, aggressive antibiotic treatment is the most effective therapy.

*Vibrio vulnificus* rarely affects healthy individuals. When it does, symptoms are mild and temporary.

## COOKING TIPS

### IN THE SHELL

- Cook live oysters or clams in small pots so those in the middle are cooked thoroughly.
- **BOILING:** After the shells open, boil live oysters or clams for another 3-5 minutes.
- **STEAMING:** In a pot that is already steaming, cook live oysters or clams for another 4-9 minutes.

### SHUCKED OYSTERS

- **BOIL** or **SIMMER** for at least 3 minutes or until edges curl
- **FRY** at 375°F for at least 3 minutes
- **BROIL** 3 inches from heat for 3 minutes
- **BAKE** at 450°F for 10 minutes

The American Shellfish Foundation has approved the contents of this brochure. For more information about preventing shellfish-related illnesses, contact:

**American  
Shellfish  
Foundation**

1-800-477-5321

[www.shellfishfoundation.org](http://www.shellfishfoundation.org)

# Economic Model

- Oyster demand was measured as a function of perceived risk
  - Considered differences between raw and cooked oyster consumers
- Measured demand change following health scare news
- Measured mitigating impacts of a counter-information brochure that was varied by source
- Measured impact of PHP treatment and price premium on consumer behavior



# Primary Pilot Study Results

- Raw and cooked oyster consumers responded differently to the *V. vulnificus* health scare
  - Cooked oyster consumers reduced demand for oysters
    - Exhibited risk aversion
    - Incurred consumer surplus/welfare economic losses
    - \$4.12 per-meal consumer surplus loss
      - Substantial aggregate economic loss
  - Raw oyster consumers did not change their behavior
    - Exhibited optimistic bias
    - They were fully informed about consumption risks
    - Exhibited maladaptive coping behavior

# Primary Results (cont.)

- Counter-information brochure with no source or sourced to ISSC/FDA had no impact on demand
- Brochure sourced to a not-for-profit organization increased demand
  - Reaffirmed the importance of consumer education information in oyster markets
  - Source credibility is an important component of educational treatment efficacy

# Primary Results (cont.)

- Consumers do not respond favorably to PHP-treated oysters
  - Perhaps because consumers perceive PHP as reducing the taste and texture of the product
  - Resulting policy implications for oyster processing companies that invest substantial funds into PHP equipment
- PHP-treated oysters with an associated price premium had a significant demand reduction effect (reduced willingness to pay)
- Rich set of exploratory consumer data

# A sampling of market data...

## Oyster Non-Consumption Motives

Segment	Health/ Safety	Taste/ Appearance	Availability/ Cost	Other
Never Ate	10 %	<b>67%</b>	1%	<b>22%</b>
Don't Eat Now	<b>29%</b>	<b>46%</b>	10%	16%
Don't Eat More	14%	5%	<b>42%</b>	<b>38%</b>

# Raw Oyster Eater Facts ( $n=211$ )

- 20% eat ONLY raw
- Eat 5 months per year and 2.4 meals per month
- 37% only eat oysters during “R” months
- 51% know where the oysters they eat were harvested
- 84% consider oysters to be safe
- 20% said cooked and raw equally likely to cause illness
- 67% said it was possible to die from eating raw oysters
  - Estimated mean of 15 oyster deaths per year
- 39% thought that risk could not be removed by treating oysters in the shell, 34% out of the shell
- 56% female, Mean age 55, Mean income, \$76.5k

# “At Risk” Raw Oyster Eater Facts ( $n=34$ )

- 9% eat ONLY raw (much less, vs. 20%)
- Eat 6 months per year and 2.3 meals per month (+, same)
- 29% only eat oyster during “R” months (-)
- 53% know where the oysters they eat were harvested(+)
- 82% consider oysters to be safe (-, 84%)
- 20% said cooked and raw equally likely to cause illness (same)
- 77% said it was possible to die from eating raw oysters (+)
  - Mean of 12 oyster deaths per year (-,  $n=12$ )
- 35% thought that risk could not be removed by treating oysters in the shell, 35% out of the shell (-, same)
- 53% female, Mean age 59, Mean income, \$61.7k (-, +, -)

# Pilot study concluding remarks

- First contingent behavior study on oyster consumer behavior and *V. vulnificus*-related information treatments
- Raw and cooked oyster consumers behave differently following a health scare event
- Substantial surplus losses due to news of a health scare
  - Cooked oyster consumers only
- Brochure source credibility is important in mitigating consumer surplus losses
- ISSC may want to consider the role of source credibility in future consumer education strategies

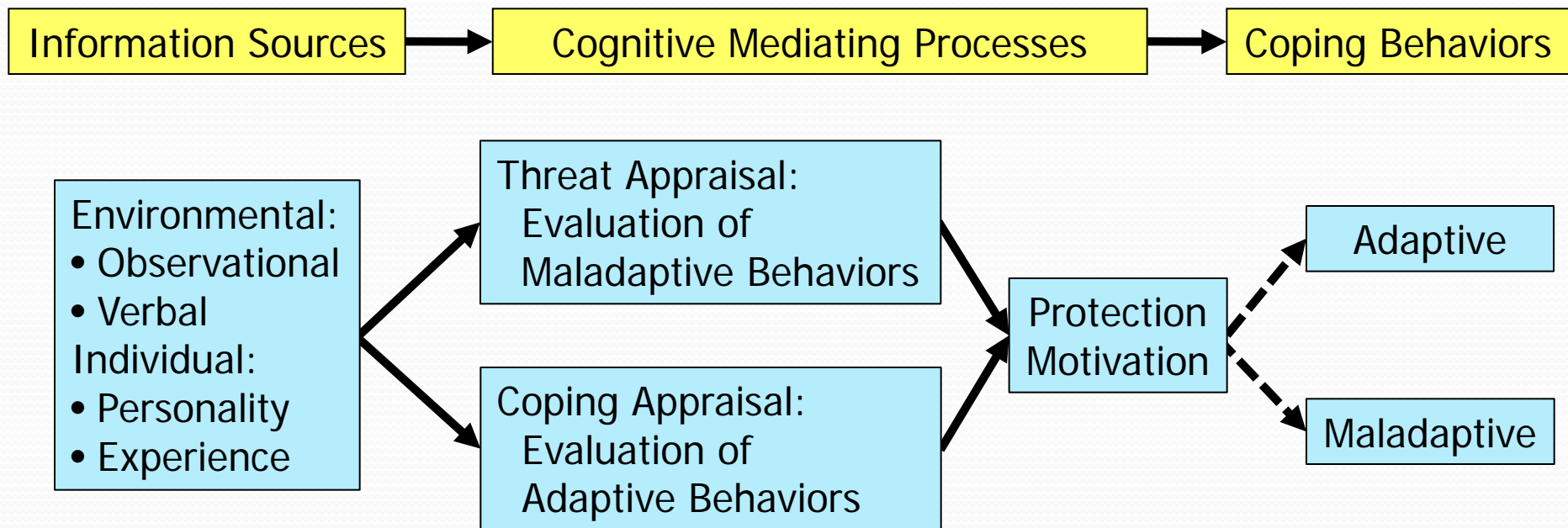
# Current Research Overview

- NOAA/GOIP-funded research grant (\$250k) to change the population sampled to primary oyster-producing and consumption states
- Increase data collection to key oyster states (California, Texas, Florida, Louisiana, ?)
- Add additional information source treatments
- Change to Web Panel sampling
- Incorporate a theoretical base



# Protection Motivation Theory

Motivating people through persuasive communications to act to protect themselves by changing selected health attitudes and behaviors...



# PMT – Experimental Design

Information Sources

Cognitive Mediating Processes

Coping Behaviors

- Environmental:
- Observational Learning
  - Verbal Persuasion
- Individual:
- Personality Variables
  - Prior Experience

VV-related death stimulus

Media X source educational stimuli

- Print medium
  - Audio-visual medium
- X
- Control (no named source)
  - Government/trade (FDA/ISSC)
  - NGO (“Health” foundation)
- PHP stimulus

Measured variables

# PMT – Experimental Design (cont.)

Information Sources

Cognitive Mediating Processes

Coping Behaviors

## Maladaptive behavior threat appraisal:

- Perceived rewards of mal. behavior
- Perceived severity of consequences
- Perceived vulnerability to consequences

- Perceptions measured both *pre* and *post* exposure to information treatments
- Health “at risk” assessment

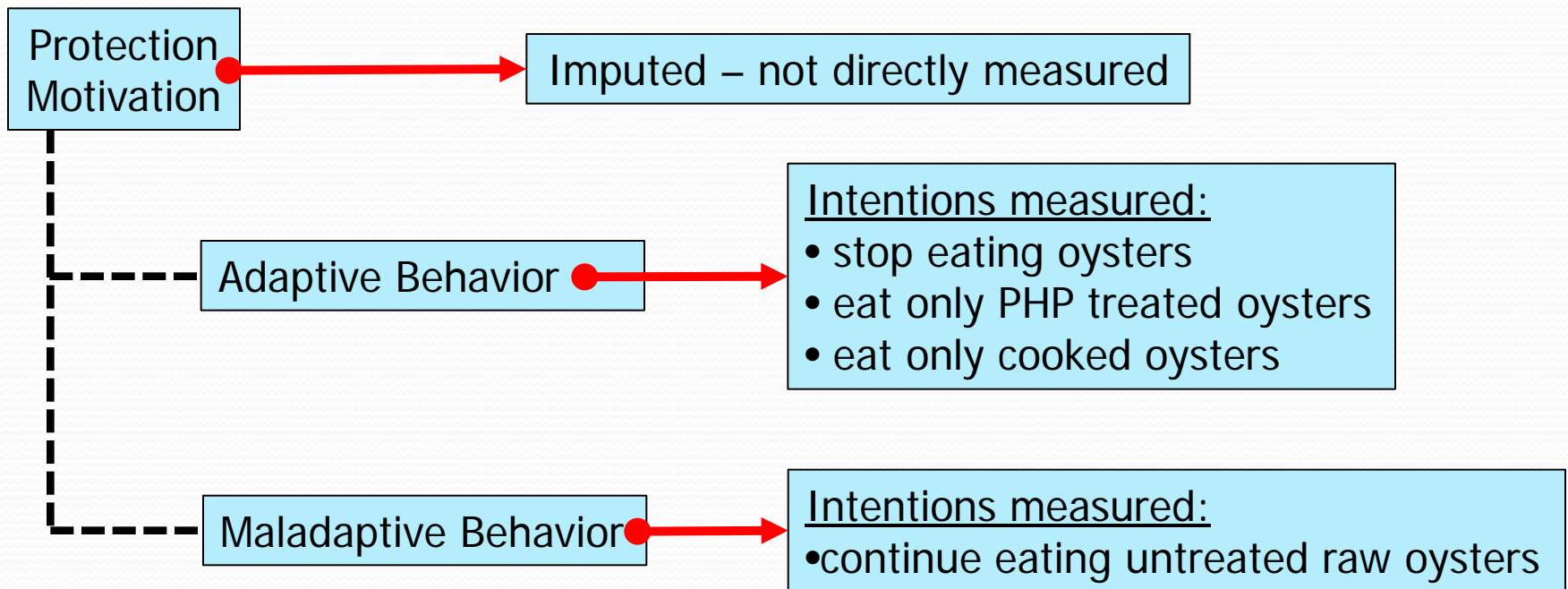
## Adaptive behavior coping appraisal:

- Belief that PHP or cooking is effective
- Belief that one can successfully perform the adaptive behavior
- “Costs” of adopting the behavior

Beliefs measured *post* exposure to information treatments

“Economic” costs measured *post* exposure and compared with baseline demand data

# PMT – Experimental Design (cont.)



# Some questions for the audience...

- What markets do we survey?
- Are there better information source stimuli?
- What DON'T we know about oyster consumers? But would like to
- Possible extensions:
  - Vibrio parahaemolyticus* and Norovirus?
- Economic impacts of product recalls?