

# The *Exxon Valdez* and BP Oil Spills: A Comparison of Initial Social and Psychological Impacts\*

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## Abstract

The 1989 *Exxon Valdez* oil spill and the 2010 BP oil spill were the largest and most ecologically damaging releases of oil in North American history. This research provides a comparison of the social and mental health impacts of these two major technological disasters. Random samples of residents of Cordova, Alaska, and south Mobile County, Alabama, were collected 5 months after each event. A standardized indicator of event-related stress was used for both samples. The analysis revealed similarly high levels of initial psychological stress for survivors of both disasters. The strongest predictors of stress were family health concerns, commercial ties to renewable resources, and concern about economic future, economic loss, and exposure to the oil. Drawing on more than 20 years of research on the *Exxon Valdez* disaster, we discuss implications for residents of Gulf Coast communities.

## Keywords

disasters, oil spills, social impacts, stress

On April 20, 2010, the Deepwater Horizon drilling rig owned by Transocean Ltd. and contracted to BP exploded and started burning in the northern Gulf of Mexico. Located 50 miles off the Louisiana coast, the rig eventually sank, leaving a breached wellhead gushing an estimated 55,000 barrels of oil per day. Initial attempts to stop the spill were unsuccessful, and the well released an estimated 185 to 205 million gallons of

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crude oil before it was capped on July 15 and permanently sealed on September 19, 2010. The BP oil spill was declared a “spill of national significance” by Homeland Security Secretary Janet Napolitano on April 29 as oil began washing ashore along the Louisiana coast. Within 2 weeks after the explosion, the National Oceanic and Atmospheric Administration (NOAA) began restricting fishing in federal waters between Louisiana and Florida and slowly began opening them after the well was capped and sealed. However, in late November, NOAA banned deepwater trawling for shrimp for a 4,313-square-mile area of the Gulf, suggesting continuing risks for seafood safety (Kent & Specker, 2010).

The spill severely damaged and threatened several “at-risk” industries along the northern Gulf, including commercial and recreational fishing, tourism, and other enterprises tied to natural resources. Initial social impacts have been profound and will continue to evolve over time. Issues relating to long-term ecological impacts, seafood safety, water and air quality, dispersant use, beach contamination, tourism, and the claims process have spawned contentious debates among scientists, politicians, government officials, and other stakeholders, including area residents.

The BP disaster invites comparison to the 1989 *Exxon Valdez* oil spill (EVOS), which resulted in immediate and chronic ecological, economic, social, and cultural damages (see Ritchie, Gill, & Picou, in press). Given what is known about that environmental disaster, what might be expected to occur in the wake of the BP disaster? In the past 21 years, we and other colleagues have conducted empirical research that documents various community and human impacts of the EVOS (Arata, Picou, Johnson, & McNally, 2000; Dyer, Gill, & Picou, 1992; Gill, 1994, 2007; Gill & Picou, 1997, 1998, 2001; Picou, 1996a, 1996b, 1996c, 2000, 2009a, 2009b; Picou & Arata, 1997; Picou & Gill, 1996, 1997, 2000; Picou, Gill, & Cohen, 1997; Picou, Gill, Dyer, & Curry, 1992; Picou, Marshall & Gill, 2004; Picou & Martin, 2007; Ritchie, 2004; Ritchie & Gill, 2007, 2010). Most of these studies were conducted in Cordova, Alaska, noted as “ground zero” for the EVOS. Cordova is a small, isolated fishing community with strong economic, social, and cultural ties to renewable resources—particularly, fishery resources damaged by the EVOS. Prior to the spill, Cordova was consistently in the top 10 of the nation’s most profitable seafood ports; 21 years later, it is not even in the top 25. In addition, a subsistence heritage rooted in Alaska Native culture is integrated into community lifestyles. Comparatively, communities along the northern Gulf of Mexico are larger, with easy highway access and diverse economies, but many are closely tied to renewable resources affected by the BP disaster and have diverse occupational, ethnic, and subsistence lifestyles.

This research builds on and extends our understanding of the social impacts of oil spills in the context of the unfolding disaster in the Gulf of Mexico. Specifically, we focus on south Mobile County, Alabama. This area is bounded on the north by Interstate 10 and Highway 163, on the east by Mobile Bay, on the south by Dauphin Island and the Gulf of Mexico, and on the west by the Alabama state line. This geographical area includes two incorporated communities, Bayou La Batre and Dauphin Island, and numerous unincorporated rural communities.

Similar to Cordova, the local economy and people of this area are largely dependent on renewable natural resources. Bayou La Batre is known as the “Seafood Capital” of Alabama and is dependent on resources such as shrimp, oysters, crabs, mullet, and other finfish. Gulf waters, where a high volume of these resources are typically harvested, were contaminated by the oil spill. In addition, community commerce includes shipbuilding, marine supply businesses, marine repair shops, and other businesses that cater to the commercial harvesting and processing of seafood. On the other hand, Dauphin Island relies on tourism based on beaches and beach house rentals, boating, recreational fishing, and charter boat tours, which are all tied to natural resources affected by the oil spill.

The goal of our study was to document how the BP oil spill affects renewable resource communities and groups. Three research questions guided our research: (a) What are the mental health impacts of the BP spill, and how do they compare with data collected in Cordova 5 months after the EVOS? (b) What social factors contribute to elevated levels of stress in south Mobile County? and (c) What are the implications of our analysis for the future of communities and residents along the Gulf Coast? To address these questions, we provide a brief overview of the EVOS and a summary of social science research that has been conducted on that disaster in the past 20 years. Next, we discuss theoretical and conceptual foundations that provide an understanding of the human impacts caused by this technological disaster to guide our research on the BP spill. The primary dependent variable is a measure of psychosocial stress that provides direct comparisons with research findings in Cordova. Next, we describe our independent variables, indicate their relationships with psychological stress, and conduct a regression analysis to determine sociological variables that independently predict stress. We conclude with a summary and discussion of our results.

## Overview of the EVOS

On March 24, 1989, the supertanker *Exxon Valdez* ran aground on Bligh Reef in Prince William Sound (PWS), Alaska, spilling more than 11 million gallons of North Slope crude oil. The resulting oil slick contaminated 44,000 km<sup>2</sup>, including more than 1,900 km of coastline, and caused widespread environmental damage that was exacerbated by controversial cleanup techniques. An estimated 250,000 seabirds, 144 bald eagles, 4,400 sea otters, and 20 whales were among the initial casualties (Spies, Rice, Wolfe, & Wright, 1996), and billions of salmon and herring eggs were destroyed or damaged. Twenty years after the EVOS, only 10 of 26 resources and species had recovered from the oil spill (EVOS Trustee Council, 2010). Research has documented long-term impacts for the PWS ecosystem, including persistence of volatile levels of *Exxon Valdez* oil in intertidal regions, on beaches, and in salmon streams (Peterson, 2001; Peterson et al., 2003; Rice, 2009; Short et al., 2004, 2007) and significant declines in local fisheries, most notably, herring (Knudsen, 2009; Mitchell, 1999; Rice, 2009; Willette, 1996).

The EVOS had harmful consequences on local communities, particularly, those with strong economic, social, and cultural ties to renewable natural resources. In PWS,

Alaska Native villages, such as Tatitlek and Chenega Bay, resemble traditional subsistence communities with a lifestyle and cultural lifescape intimately tied to the environment (Dyer et al., 1992; Gill & Picou, 1997, 2001; Ritchie & Gill, 2010). Commercial fishing communities, such as Cordova, have strong economic and lifestyle ties to fisheries and other ecological resources damaged by the EVOS. Initial human impacts within these communities included high levels of collective trauma, social disruption, economic uncertainty, community conflict, and psychological stress. Analysis of quantitative data revealed that as important commercial and subsistence resources failed to recover and litigation remained unresolved, many local residents, particularly, those most closely tied to ecological resources (i.e., Alaska Natives and commercial fishermen), experienced chronic psychological stress, social disruption, and collective trauma (Arata et al., 2000; Gill, 2007; Picou & Martin, 2007; Picou et al., 2004; Picou, Formichella, Marshall, & Arata, 2009). These findings were supported by ensuing in-depth qualitative research (Gill, 2007; Ritchie, 2004; Ritchie & Gill, 2010).

### *EVOS Social Impact Literature Review*

Several major studies have examined human impacts of the EVOS at various points in time. In addition to our longitudinal research projects, the Oiled Mayors Study assessed cultural, social, economic, and psychological impacts across 11 oiled communities one year after the spill (Impact Assessment, 1990); Minerals Management Service included an EVOS component in its ongoing Social Indicators Study of Alaskan Coastal Villages (Endter-Wada et al., 1993; Reynolds, 1993); and the Alaska Department of Fish and Game examined patterns of subsistence in the impact area (Fall & Field, 1996; Fall & Utermohle, 1995). These studies generally address three interrelated levels of impacts: macro, middle range, and micro (Picou et al., 2009).

Macrolevel community impacts include infrastructure overloads, disruption to economic and occupational structures, and interrupted civic processes. For example, initial housing and lodging shortages and excessive demands for services occurred in local communities as EVOS cleanup workers inundated the area (Endter-Wada et al., 1993; Impact Assessment, 1990, 1998). A temporary economic boom disrupted economies as locals sought higher-paying cleanup jobs, leaving businesses with an inadequate workforce. Local governments depleted financial reserves responding to the spill, particularly in dealing with increased demands for public services, such as law enforcement, emergency response, and community mental health (Endter-Wada et al., 1993; Impact Assessment, 1990; Rodin, Downs, Petterson, & Russell, 1992).

Middle-range cultural impacts of the EVOS included social disruption and strained community relations, prolonged uncertainty, and disruption to subsistence lifestyles. Research documented social disruption, corrosive community characteristics, and loss of social capital (Gill, 1994; Gill & Picou, 1998; Picou et al., 2004; Ritchie, 2004). Technological disasters create uncertainty and people who experienced the EVOS were particularly uncertain about long-term effects on natural and social environments (Gill, 1994, 2007; Picou & Martin, 2007; Ritchie, 2004). Additional uncertainty was fueled

by litigation languishing in the courts for 14 years after a 1994 jury trial (Gill, 2007, 2008; Picou, 2009b; Picou & Martin, 2007; Ritchie, 2004).

Microlevel effects of the EVOS included disruptions to daily routines, family life, work, and future plans as well as serious mental health problems. Examples of stress included increased drug and alcohol use and domestic violence; chronic feelings of helplessness, betrayal, and anger; elevated levels of depression, anxiety, and posttraumatic stress disorder (PTSD); and adoption of avoidance coping strategies (Arata et al., 2000; Endter-Wada et al., 1993; Gill, 2007; Gill & Picou, 1998; Impact Assessment, 1990; Palinkas, Downs, Petterson, & Russell, 1993; Palinkas, Petterson, Russell, & Downs, 1993; Palinkas, Russell, Downs, & Petterson, 1992; Picou et al., 1992; Picou & Martin, 2007). Early negative effects on children included fear of being left alone, decline in academic performance, and difficulty interacting with others (Impact Assessment, 1990, 1998; Rodin et al., 1992). Longitudinal research indicated that much of the chronic, EVOS-related stress, anxiety, and social disruption was a by-product of being part of prolonged litigation (Gill, 2007; Picou, 2009b; Picou et al., 2004; Picou & Martin, 2007; Ritchie, 2004).

The numerous community-level social, economic, and mental health impacts documented for the EVOS suggest that similar consequences may be forthcoming for Gulf of Mexico communities affected by the BP oil spill. Indeed, there have been a number of suicides, increases in police calls, observable community conflict, and increased requests for mental health services throughout the impact region. Although these accounts have been reported in newspaper articles, few systematic data have been collected to verify these severe patterns of social disruption (Busby, 2010).

### *Theoretical and Conceptual Foundations*

This article advances theoretical and conceptual developments derived from a growing body of research on technological and natural disasters. Considering factors contributing to psychological stress, we draw on vulnerability (Cutter, 2005) and how it relates to resource dependency (Picou & Gill, 1996), the conservation-of-resources (COR) stress model (Arata et al., 2000; Hobfoll, 1988, 1991), recreancy (Freudenburg, 2000), and risk perceptions (Beck, 1996, 2002; Erikson, 1994; Giddens, 1990, 1991).

Vulnerability is a multidimensional, dynamic process based on levels of exposure to stressors, which typically relate to physical location, social class, and demographic characteristics. Moreover, a group may be highly vulnerable to one type of risk yet may be much less vulnerable to other types of risks, depending on the resources at stake and the efficacy to prepare and respond. In terms of disasters, physical location is a major factor, but attributes such as socioeconomic class, age, gender, race-ethnicity, and local culture contribute to vulnerability. Technological disasters highlight issues associated with vulnerability to hazardous substances, and evidence suggests that higher levels of exposure—including perceptions of exposure—contributes to increased levels of stress.

Oil spill disasters illustrate a type of vulnerability based on dependence on environmental resources damaged or threatened by the oil and cleanup response. Picou and Gill (1996) introduced the “renewable resource community” (RRC) concept to describe communities “whose primary cultural, social and economic existences are based on the harvest and use of renewable natural resources” (p. 881). The RRC concept is grounded in ecological-symbolic theory, which postulates that interpretive processes mediate how humans experience environmental trauma and that these processes are influenced by the type of environment that is damaged (Kroll-Smith & Couch, 1991, 1993). This perspective focuses attention on how communities and groups are affected by losses and threats to ecosystem resources. Individuals, groups, and communities with close economic, social, and cultural ties to damaged or threatened resources are particularly vulnerable to technological disasters (Ritchie & Gill, 2010).

The COR approach is based on the proposition that stress is related to loss of resources, threat of resource loss, and/or when resources are invested without gain or return (Hobfoll, 1988, 1989, 1991; Hobfoll & Lilly, 1993). Resources are categorized into four types: objects (e.g., physical possessions, natural resources), conditions (e.g., a good marriage, quality relationships), personal characteristics (e.g., high self-esteem, social competence), and energies (e.g., money, knowledge). Rapid loss of highly valuable resources assails basic values, places disproportionate demands on individual and collective resources, is beyond the typical range of resource use, and evokes powerful mental images, all of which contribute to psychological stress (Hobfoll, 1991).

Recreancy is defined by Freudenburg (2000) as “the failure of experts or specialized organizations to execute properly responsibilities to the broader collectivity with which they have been implicitly or explicitly entrusted” (p. 116). This concept directs our attention to issues of institutional trust, specifically to institutions entrusted to protect the public, “control” technology, and respond to crises. Applied to disasters, recreancy is linked to causes or “triggering events” (Freudenburg, 1997). Disasters caused by meteorological, hydrological, or geological processes (i.e., natural disasters) are believed to be beyond human control, but society generally believes technology can be controlled and entrusts specific social organizations to do so. Technological disasters have an identifiable “primary responsible party” (PRP), providing a focus for blame and compensation as well as anger, frustration, fear, and hostility. Although focus is on the PRP, other organizations, including the government, usually share some culpability. These perceptions of recreancy shake confidence in the social order and contribute to community disruption and psychological stress.

Disasters such as the BP oil spill are what Erikson (1994) describes as a “new species of trouble” that “scare human beings in new and special ways, . . . [and] elicit an uncanny fear in us” (p. 144). These disasters also present a new species of risk that is a major feature of contemporary society (Beck, 1996). Technological disasters tend to create chronic uncertainty, particularly with respect to health effects, economic impacts, extent of environmental damage and recovery, fair and just reparations, and sociocultural recovery and closure. Perceptions of increased, uncontrolled risk contribute to chronic uncertainty, pose threats to ontological security, and add to anxiety and psychological stress (Giddens, 1990, 1991).

These theoretical and conceptual foundations provide insights into the profound psychological stress experienced in communities affected by technological disasters, such as the BP oil spill. Psychological stress is heightened among individuals and community groups who are vulnerable because of their ties to damaged or threatened resources. More generally, stress increases as resources are lost, threatened, and/or invested without gain. Corrosive communities are characterized by a loss of trust in institutions and organizations charged with protecting them from the risks of modern technology (Picou et al., 2004). These new forms of risk contribute to psychological stress by prolonging uncertainty and undermining ontological security.

## Methods

A telephone survey of residents of south Mobile County was administered by the University of South Alabama Polling Group from September 6 through 28. A random-digit dialing technique was used, and to be eligible, respondents had to be age 18 or older and had to have lived in the area for more than 1 year. A sample of 412 residents responded to the telephone survey.<sup>1</sup> The survey was modeled after those we had used in our EVOS research and included a standardized measure of psychological stress as well as measures of ties to resources, resource loss, perceptions of recreancy, risk perceptions, and demographic characteristics.

Sample characteristics show that 6 out of 10 respondents were female, 7 out of 10 were married, 9 out of 10 were White, and the median age was 56. More than 87% of the respondents were high school graduates, and 57% reported a total household income of less than \$50,000. Within the sample area, 36% were from Bayou La Batre and adjacent unincorporated communities, 29% were from Grand Bay, 15% were from Dauphin Island, and 19% were located throughout rural areas of the county. The sample averaged 33 years of residence in the area. The average household size was three persons, and 44% lived in two-person households. One third of the households had children younger than the age of 18.

Our analysis begins by examining psychological stress as a dependent variable. We describe the operationalization of stress and stress characteristics of the sample and compare the results to those observed in Cordova across 11 years. Next, we describe each set of independent variables in terms of operationalization of variables, sample characteristics, and relationships with psychological stress. Finally, we develop a linear regression model to further delineate social contextual variables that predict increased psychological stress.

## Findings

### *Psychological Stress: The Impact of Event Scale (IES)*

Psychological stress was assessed using the IES (Horowitz, 1974, 1986a, 1986b; Horowitz, Wilner, & Alvarez, 1979). A proxy for a measure of PTSD, the IES measures event-specific psychological stress given the underlying rationale that highly stressful

**Table 1.** Mean Intrusive Stress, Avoidance Symptoms, and Total Impact of Event Scale (IES) Scores for South Mobile County 2010 and Cordova, 1989 to 2006, With Comparisons to Selected Clinical Cases

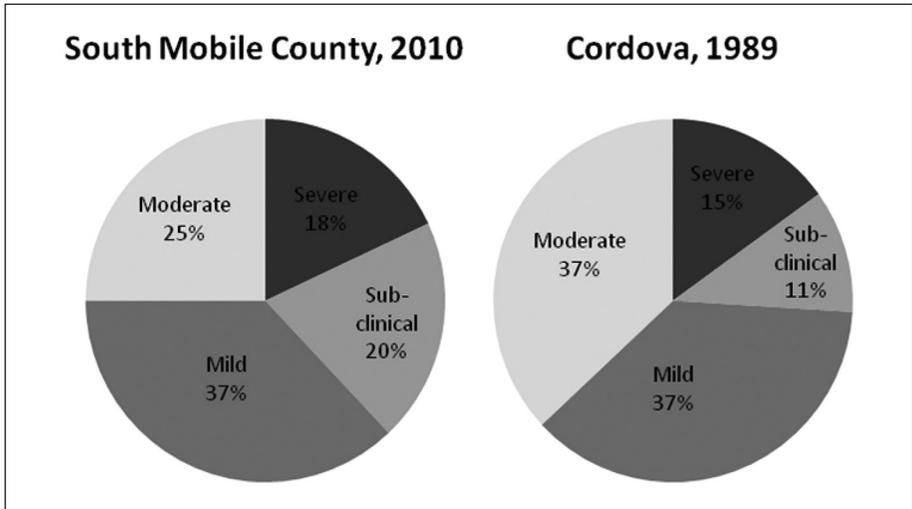
Year	Total IES	Intrusive Stress	Avoidance Symptoms
South Mobile County, Alabama			
2010 (n = 412)	25.0	13.7	11.3
Cordova, Alaska			
1989 (n = 117)	27.6	16.6**	11.0
1990 (n = 69)	19.6	10.1	9.6
1991 (n = 221)	19.9	9.5	7.5
1992 (n = 159)	16.6	8.5	8.1
2000 (n = 372)	21.2	11.1	10.9
Clinical cases <sup>a</sup>			
Bereavement from parental death			
3-6 weeks after death	No data	21.6	No data
6 months after death	No data	13.8	No data
Rape victims			
Initial assessment	49.8	23.8	26.0
2 years after the rape	27.4	11.4	16.0

<sup>a</sup>Data for clinical patients obtained from Horowitz (1986b). Data for rape victims obtained from Seidner, Amick, and Kilpatrick (1988).

\*\**T* test significant at the .002 level (South Mobile County–Cordova comparison).

events are likely to produce high levels of recurring, unintentional, distressing feelings and thoughts (intrusive stress) as well as high levels of intentional efforts to suppress these feelings and avoid reminders of the event (avoidance symptoms). The scale consists of 15 items and respondents are asked how frequently during the past 7 days they experienced each item in the context of a specific event (in this case, the BP oil spill).<sup>2</sup> Responses are coded as *never* (0), *rarely* (1), *occasionally* (3), and *often* (5). The IES has a range of 0 to 75, with higher scores indicative of higher levels of stress. Two standardized subscales, Intrusive Stress and Avoidance Symptoms, can be separated from the total IES to more clearly identify stress issues. Clinical applications of the IES as well as its application in other disasters, including our research in Cordova, provide a basis for a comparative analysis.

Our south Mobile County sample had a mean IES score of 25.0, and the means for the Intrusive Stress and Avoidance Symptoms subscales were 13.7 and 11.3, respectively (Table 1). These results are comparable to findings from Cordova 5 months after the EVOS. A *t* test comparison of the two communities revealed no significant difference between south Mobile County and 1989 Cordova community samples with regard to the total IES and Avoidance Systems subscale, but the two samples did differ on



**Figure 1.** A comparison of Impact of Event Scale clinical categories: South Mobile County, 2010, and Cordova, 1989

Intrusive Stress (Cordova was higher). Table 1 also reveals that the mean level of IES in south Mobile County was similar to that of victims of rape 2 years after the assault.

IES scores can be used to clinically classify individuals into subclinical, mild, moderate, and severe stress categories (Hutchings & Devilly, 2005). As shown in Figure 1, one fifth of south Mobile County respondents were in the *severe* category, and another one fourth were in the *moderate* range. This compares to the sample from Cordova, in which more than one half were classified as either severe or moderate.

In summary, event-related psychological stress among residents of south Mobile County, 5 months after the BP oil spill, was similar to that of residents of Cordova 5 months after the EVOS. These stress levels are relatively high, and if the trends observed in Cordova in the years following the EVOS hold (see Table 1), we can expect significant spill-related psychological stress to continue in south Mobile County in the next decade.

### *Independent Variables*

Four sets of independent variables were examined to understand their relationships with the IES and Intrusive Stress and Avoidance Symptoms subscales. This section describes each set in terms of how variables were operationalized, sample characteristics based on the variables, and how each variable was related to the IES and its subscales.<sup>3</sup>

***Vulnerability and exposure.*** Indicators of vulnerability included basic demographic and social variables as well as measures of exposure to oil and dependence on ecological

resources. Demographic characteristics, such as gender, race, and marital status, were measured on a 0-1 categorical basis (male or female, non-White or White, unmarried or married). Although not provided in tabular form, *t* test comparisons revealed race to be the only variable significantly related to the IES and its subscales, with non-Whites experiencing higher stress levels than Whites. A correlation analysis revealed that income and education were significantly related to the IES and its subscales, with those in lower income categories and lower levels of education more likely to experience high levels of stress.

Our exposure variable was based on items indicating whether the respondent had worked on shoreline cleanup (6.3% did), had worked on the Vessel of Opportunity program (8.3% did), owned property that was damaged by oil (5.1% did), and had contact with oil in other ways (27.2% did). Respondents who had experienced any one item were coded as exposed (1), and the remainder were coded as not exposed (0). Approximately 1 out of 3 respondents experienced some type of exposure to oil, and a *t* test analysis indicated that exposure was significantly related to the IES and its subscales.

Renewable resource ties were measured by asking residents how much they used coastal areas along the Gulf of Mexico for commercial activities before the spill. Responses were coded as either connected (1) or not (0), with 4 out of 10 respondents (43%) reporting a commercial connection to coastal resources. *T* test analysis indicated a significant relationship with the IES and subscales: Those with commercial connections to damaged or threatened resources were more likely to experience higher levels of stress.

**Resource loss.** The survey contained two items concerning economic effects related to the oil spill. We first assessed economic loss by asking, "How would you describe the overall economic impact of the oil spill on your household?" Responses were coded on a 5-point Likert-type scale from *very positive* (1) to *very negative* (5). The economic impact variable had a mean of 3.73, with 22% indicating they experienced very negative impacts and almost 40% reporting somewhat negative impacts.

A second item examined the threat of economic loss by asking respondents to indicate their confidence in their economic future using a 5-point Likert-type scale where higher scores indicated greater concern. The economic future variable had a mean of 2.69 and more than one half (56%) were very concerned or concerned. A correlation analysis of both indicators indicated a significant relationship with the IES and its subscales.

**Perceptions of recreancy: Trust in institutions.** Perceptions of recreancy were measured by asking respondents to indicate how much they trusted 10 different entities involved in the oil spill disaster. Each entity was rated from *no trust* (1) to *a lot of trust* (5). As indicated in Table 2, the BP Corporation, the federal government, federal court system, and the Minerals Management Service were the least trusted entities. On the other hand, the Coast Guard and NOAA were the most trusted entities. Three entities—BP, local government, and state government—were significantly correlated with the IES and subscales. That is, a lack of trust in these entities resulted in increased psychological stress.

**Table 2.** Perceptions of Recreancy (Trust in Institutions) Among South Mobile County Residents 4 Months After the 2010 BP Oil Spill: Means and Correlations With Psychological Stress

Institution	M	SD	Correlations		
			Impact of Event Scale Coefficient	Intrusive Stress Coefficient	Avoidance Symptoms Coefficient
BP Corporation	2.12	1.21	-.237***	-.242***	-.202***
Federal government	2.25	1.32	-.032	-.063	.003
Federal courts	2.60	1.28	-.052	-.103*	.005
U.S. Coast Guard	4.21	1.03	-.045	-.027	-.058
Minerals Management Service	2.73	1.35	-.007	-.070	.057
Environmental Protection Agency	2.87	1.36	.025	-.018	.065
National Oceanic and Atmospheric Administration	3.51	1.19	-.067	-.056	-.069
Food and Drug Administration	3.00	1.32	-.074	-.104*	-.033
Alabama state government	2.77	1.24	-.147**	-.171***	-.104**
Local government	3.01	1.31	-.187***	-.196***	-.153**

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .000$  (one tailed).

**Risk perceptions.** We developed indicators of concern about family health impacts, health effects of dispersants, air quality, seafood safety, and oiled seafood harvesting areas using a 5-point Likert-type scale where higher scores indicated greater concern. As shown in Table 3, all five risk concerns were significantly related to the IES.

**Regression Analysis**

On the basis of correlation analysis and *t* tests, 17 variables were initially found to have a statistically significant relationship with the IES and/or the Intrusive Stress and Avoidance Symptoms subscales. These were race, income, education, exposure to oil, commercial ties to damaged resources, economic loss, concern for economic future, trust in BP, trust in state government, trust in local government, trust in federal courts, trust in the Food and Drug Administration, and risk concerns about family health, dispersants, air quality, seafood safety, and oiled harvest areas. A separate regression model was initially run for each set of independent variables.<sup>4</sup> This analysis confirmed that the vulnerability variables of ties to commercial resources and exposure to oil as well as the two resource loss variables were significant predictors of stress. Trust in BP, however, was the only recreancy variable that remained significant, and two risk perception variables, concern for seafood safety and concern about the health effects of dispersants, were not significant predictors of stress in the initial regression and were dropped from further regression analysis.

**Table 3.** Risk Perceptions Among South Mobile County Residents 4 Months After the 2010 BP Oil Spill: Means and Correlations With Psychological Stress

Risk Issue	M	SD	Correlations		
			Impact of Event Scale Coefficient	Intrusive Stress Coefficient	Avoidance Symptoms Coefficient
Family health	2.10	1.22	.432***	.414***	.395***
Dispersants	3.97	1.19	.240***	.273***	.176***
Air quality	2.72	1.35	.359***	.338***	.332***
Seafood safety	2.82	1.39	.200***	.224***	.150***
Oiled harvest area	3.56	1.15	.335***	.338***	.290***

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .000$  (one tailed).

Final regression models were developed for the IES and the Intrusive Stress and Avoidance Symptoms subscales. Each model included basic demographic control variables and the other variables found to be significant in the initial regression analysis (Table 4). Six variables were statistically significant across all three models. For the IES, the strongest predictors were threats to economic future and family health concerns, followed by economic loss, commercial ties to natural resources, exposure to oil, and age. Moreover, age became a significant predictor of stress in the regression model, with older respondents reporting higher levels of stress. The model for Intrusive Stress was similar to that of the IES; however, the Avoidance Symptoms model included trust in BP as a significant predictor variable. The final regression models accounted for 44% of the variance in the IES, 42% in the Intrusive Stress subscale, and 36% in the Avoidance Symptoms subscale.

## Summary and Discussion

These results document significant mental health impacts for residents of south Mobile County resulting from the BP oil spill. The analysis revealed a consistent relationship between increasing levels of event-related psychological stress and family health concerns, economic loss, concern for future economic loss, ties to ecosystem resources, and exposure to oil. These findings are also consistent with research in the immediate aftermath of the EVOS and empirically validate the importance of vulnerability, resource loss, recreancy, and risk perceptions for understanding social and psychological consequences of the BP oil spill.

These findings are also consistent with and expand several previous systematic studies of the emotional impacts of the BP spill. A study conducted by the National Center for Disaster Preparedness found that parents reported mental health problems for approximately 19% of their children, with these problems being more pronounced for

**Table 4.** Final Regression Models for Impact of Event Scale (IES) and Intrusive Stress and Avoidance Symptoms Subscales: South Mobile County Residents 5 Months After the 2010 BP Oil Spill

Predictor Variable	IES Model		Intrusive Stress Model		Avoidance Symptoms Model	
	Beta	p	Beta	p	Beta	p
<b>Vulnerability variables</b>						
Renewable resource ties	.165	.000	.097	.037	.213	.000
Exposed to oil	.128	.004	.143	.001	.098	.038
<b>Resource loss variables</b>						
Economic future concern	.281	.000	.311	.000	.215	.000
Economic damages	.170	.000	.190	.000	.127	.007
<b>Recreancy variables</b>						
Trust in BP	-.080	.067	-.056	.207	-.094	.045
<b>Risk perception variables</b>						
Family health concern	.198	.000	.195	.000	.176	.001
Oiled harvesting areas	.079	.092	.090	.060	.058	.249
Air quality concern	.078	.120	.063	.217	.087	.122
<b>Demographic control variables</b>						
Age	.099	.022	.093	.035	.093	.044
Income	.003	.959	.001	.978	.004	.948
Education	-.037	.456	-.019	.706	-.051	.344
Gender	.034	.439	.031	.493	.033	.483
Race	-.065	.142	-.031	.487	-.090	.056
Marital status	-.031	.471	-.038	.378	-.019	.673
Adjusted R <sup>2</sup>	.44		.42		.36	

families with incomes less than \$25,000 annually and for those families who reported that they may move from their current residence (Abramson et al., 2010, pp. 8-10). A Gallup Poll revealed that residents in Gulf Coast counties suffered a decline in “overall emotional health,” particularly for depression, stress, worry, and sadness, following the BP spill (Witters, 2010). A telephone poll of residents of south Louisiana found that “self-rated stress levels” had more than doubled following the BP spill. Furthermore, 60% to 80% of the 900 respondents interviewed were worried about the spill and the future economic impacts that could result for residents of their communities (Lee & Blanchard, 2010). These studies reveal a convergence of evidence that the BP spill has seriously disrupted Gulf Coast communities and that residents are worried about their health and the environment and are fearful about additional negative economic consequences.

Instead of using very general indicators of stress, depression, anxiety, and worry, our research used a standardized indicator of spill-related stress that can be directly

compared to the psychological outcomes of other disasters and various traumatic events (Gill & Picou, 1998). The IES serves as a proxy for symptoms of PTSD, and our results suggest that post-BP spill mental health sequelae include symptoms of PTSD at levels similar to those experienced shortly after the EVOS. It is apparent that the BP spill has created a social context in south Mobile County that is characterized by uncertainty regarding exposure to oil and contamination of renewable resources that are the foundation for community survival. This context of uncertainty has produced significant levels of psychological stress and is likely to continue.

Given our research findings, efforts to diminish psychological stress among survivors of the BP disaster should focus on dealing with health and economic concerns and focus on vulnerable populations, particularly, those with commercial ties to damaged natural resources. Within this context, our data may underestimate the severity of psychological stress, given that minorities; commercial shrimpers, particularly, Vietnamese shrimping families; and others associated with seafood processing are underrepresented in our sample.

After 20 years of research on the social and psychological impacts of the EVOS, what can we expect to unfold in Gulf Coast areas, such as south Mobile County? First, there is a high probability of chronic mental health problems. In Cordova, community IES levels, as well as indicators of depression, remained relatively high for more than 11 years (see Table 1). Chronic psychological stress was particularly pronounced among commercial fishermen and Alaska Natives because of their close ties to damaged resources. This long-term pattern of distress was caused by uncertainty regarding prolonged litigation and emerging damage to ecosystem resources, such as herring (Knudsen, 2009).

Class action litigation connected to the EVOS went through a series of appeals that ultimately led to consideration by the U.S. Supreme Court 14 years after a 1994 jury decision (Gill, 2008; Gill, Picou & Ritchie, 2010). Our research found that being involved in unresolved litigation became the strongest factor explaining chronic psychological stress (Picou et al., 2004). Moreover, the Supreme Court ruling cut punitive damages by 90%, and the process left many survivors with a lack of closure. For the BP disaster, the claims process has become a bureaucratic and legal obstacle and a source of contention and stress. Indeed, the governor of Alabama has described the process as "extortion" (Murtaugh, 2010). The start of BP litigation will be delayed until 2013 and promises to be a prolonged process with a precedent in *Exxon v. Baker* that will most likely limit punitive damage awards. If damage awards through the BP claims process and courts are delayed, serious community disruption and mental health problems will persist along the Gulf Coast.

The prolonged failure of the PWS herring population contributed to uncertainty of ecological recovery in the EVOS disaster. Prior to the EVOS, commercial herring activities contributed to more than one third of Cordova's fishery revenues, and the market price of PWS herring permits averaged \$240,000. In 1994, the herring population collapsed and to date, there has not been a viable commercial season for herring and herring permits are worth less than \$8,000 (Knudsen, 2009). The BP oil spill damaged marine

ecosystems and resources. In particular, if recovery of shrimp, oysters, crab, and other fish is slow, groups tied to these resources will probably continue to experience psychological stress. As was the case in Cordova, members of these groups are not inclined to seek professional treatment for mental health issues and may require specialized programs to deliver services (Picou, 2009a).

However, it is apparent that recovery along the northern Gulf Coast involves more complex issues than was evident in the EVOS. The coastal economy is more diverse and local community impacts are more nuanced than in Alaska's oiled communities. For example, community impacts and recovery in Louisiana are also related to economic ties to the oil and gas industry, which experienced a decline following a temporary federal moratorium on deepwater drilling. Community impacts in areas such as Baldwin County, Alabama, and Pensacola, Florida, are related to tourism based on attractive beaches and recreational marine boating and fishing. Given that the economic and social impacts of Hurricane Katrina still linger across this area, recovery from the BP spill becomes increasingly problematic.

It is also important to note that recovery along the northern Gulf Coast involves perceptions held by the broader U.S. public. In particular, perceptions held by tourists and potential consumers of seafood products are critical. Tourists need to be assured that the beaches are safe, the water is clean, and the fish they catch are safe to eat. Likewise, consumers of seafood, particularly, shrimp, need to be assured that products from the Gulf of Mexico are not contaminated. This is essential to rebuild the tourism and seafood industries and to restore local economies based on these resources. Specifically, trustworthy sources are needed to address health issues, including air quality, dispersants, and seafood safety. Clearly, there is a general lack of trust in BP because it has a vested interest in limiting perceptions of damage and harm.

Although social capital appears to be strong and intact in the immediate aftermath of the BP disaster, our experience with the EVOS suggests that this may change over time. Long-term social disruption manifested as community fragmentation, tension, and even open conflict may affect trust and social ties—social capital. If this occurs, such an environment would contribute to social capital loss spirals, as found years after the EVOS. Similarly, loss of social capital may further increase stress levels, diminishing overall community well-being. Moreover, given that one third of our sample indicated a desire to move from their community, there is also potential for outmigration in the long term as a result of declining economic conditions, which are at least in part related to the spill. This would also alter community relations, diminishing not only social capital but human capital as well. At the very least, these issues warrant monitoring and attention in communities along the Gulf of Mexico by both researchers and policy makers.

Like the EVOS, and technological disasters in general, the BP oil spill will continue to reveal “contested” scientific evidence concerning ecological damages; emerging secondary traumas, such as the claims process and litigation; and serious community conflict and mental health problems (Kroll-Smith & Couch, 1990). Our data reveal initial mental health impacts that parallel those observed in 1989 immediately following the

EVOS. Given the social scientific evidence amassed over time in PWS, we can conclude that social disruption and psychological stress will characterize residents of gulf coast communities for decades to come.

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### **Notes**

1. The refusal rate was 54%.
2. (a) I thought about it when I didn't mean to. (b) Pictures about it popped into my mind. (c) Other things kept making me have thoughts about it. (d) I had to stop myself from getting upset when I thought about it. (e) I tried to remove it from my memory. (f) I had trouble falling asleep or staying asleep. (g) I had waves of strong feelings about it. (h) My feelings about it were kind of numb. (i) I had a lot of feelings about it that I didn't know how to deal with. (j) I had dreams about it. (k) I stayed away from reminders of it. (l) I felt as if it had not really happened. (m) I tried not to talk about it. (n) I tried not to think about it. (o) Reminders of it brought back feelings I first felt about it.
3. Our survey included social capital indicators, but none was significantly correlated with the Impact of Event Scale. The data will serve as baseline measures for future research.
4. Space limitations prevent these initial models from being presented in tabular form.

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## Bios

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