

## 27 The Exxon Valdez Oil Spill

LAWRENCE A. PALINKAS

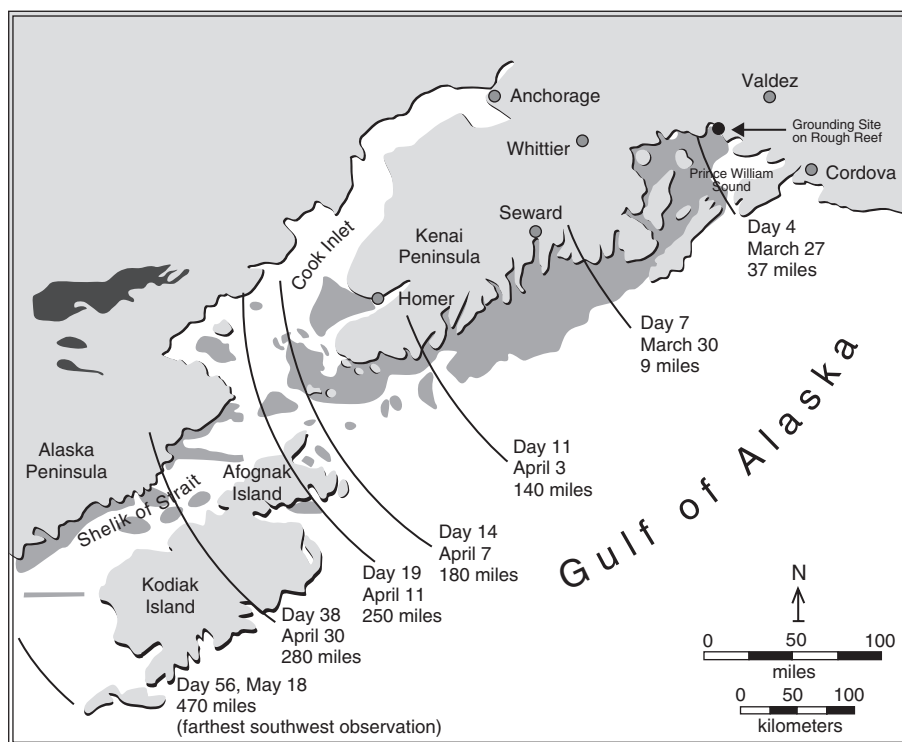
### 27.1. INTRODUCTION

On Friday, March 24, 1989, at approximately 12:30 a.m., the 987-foot supertanker *Exxon Valdez* ran aground on Bligh Reef (approximately 25 miles from the city of Valdez, Alaska), spilling over 11 million gallons (260,000 barrels) of crude oil into the once-pristine environment of Prince William Sound. The oil spread more than 750 km to the southwest along the Kenai Peninsula, Kodiak Archipelago, and the Alaska Peninsula (Figure 27.1). After considerable delay, Exxon officials arrived on the scene and initiated a sequence of actions designed to contain and clean up the spill. Fishing vessels were hired to help lay containment booms; fish tenders were hired to transport equipment and to ferry refuse to disposal or transshipment sites, and entire communities were hired to protect their own beaches. To protect vital resources, local governments were drawn into the response, committing the use of local community facilities (offices, meeting places, equipment, services, etc.) to organize, coordinate, and perform cleanup.

Under the direction of Exxon and its prime contractor, VECO, thousands of residents and nonresidents were hired to participate in the cleanup effort. Beaches were scoured with high-pressure water hoses and countless numbers of rocks were scrubbed to remove surface oil. Hundreds of fishing vessels boomed floating oil slicks while larger vessels (“skimmers”) siphoned off collected oil. The highly advertised wages (\$17.69 per hour) attracted both employed and unemployed individuals – initially from within Alaska, but later drawing workers from all over

the United States. Such high wages for unskilled workers made it difficult for local enterprises such as hotels, shops, restaurants, grocery stores, and canneries to retain their employees. A chain reaction had begun that was to affect virtually every aspect of social and economic relations in the region.

In the wake of the spill, the public; subsequent mitigation efforts by Exxon and federal, state, and local agencies; and eventual litigation over damages all primarily focused on the direct environmental and economic impacts. An estimated 1,000 to 2,800 sea otters died as a result of contact with the oil, along with an estimated 250,000 to 500,000 seabirds and 302 harbor seals; oiling of fur and feathers caused loss of insulating capacity and led to death from hypothermia, smothering, drowning, and inhalation or ingestion of toxic hydrocarbons (Peterson et al., 2003). Mass mortality also occurred among macroalgae and benthic invertebrates on oiled shores through a combination of chemical toxicity, smothering, and physical displacement during cleanup (Peterson et al., 2003). The elevated mortality of incubating pink salmon eggs in oiled streams for at least 4 years after the spill was attributed to exposure to polycyclic aromatic hydrocarbons (PAHs) from partially weathered oil (Bui, Sharr, & Seeb, 1998). Loss in revenues for the commercial fishing industry totaled over \$155 million in the 2 years immediately following the spill (Cohen, 1995), largely because of the total collapse of the herring fishery and a significant decline in the pink salmon fishery (Spies, Rice, Wolfe, & Wright, 1996). Fortunately, more recent studies on levels of toxins in fish have painted a



**Figure 27.1.** Map of the area affected by the Exxon Valdez oil spill, 1989.

Composite done by the Exxon Valdez Trustee Council from an original map by the Alaska Dept. of Environmental Conservation. It can be found on the site <http://www.wholetruth.net/history.htm>

somewhat hopeful picture of diminishing effects of the oil spill over time on the natural habitat of the region (Neff et al., 2006). Nevertheless, oil stranded by the spill has persisted in subsurface sediments of exposed shores for 16 years (Short et al., 2007). The remaining oil is in sufficient quantities and at toxic levels to induce chronic biological exposures with long-term impacts at the population level – especially among species associated with shallow sediments – and delayed population impacts from sublethal doses that compromise health, growth, and reproduction (Peterson et al., 2003).

Although the direct impacts of the oil spill on human health was believed to be minimal (Lord, 1997), there was also concern about the indirect social and psychological impacts. This concern stemmed from three distinct sources. The first was the largely anecdotal evidence of community conflict created by the unequal

distribution of cleanup jobs and compensation for the use of boats and equipment owned by local residents and the influx of outsiders and resulting strain on community services (Dyer, Gill, & Picou, 1992; Impact Assessment, 1990; Minerals Management Service, 1993; Palinkas, Downs, Petterson, & Russell, 1993; Rodin, Downs, Petterson, & Russell, 1992). The second source of concern was the dramatic increase in visits to community clinics for primary care and mental health services reported throughout the affected region (Impact Assessment, 1990; Russell, Downs, Petterson, & Palinkas, 1996). The third was the evidence from earlier research that found significantly increased rates of physical health symptoms, psychiatric disorders, and disruption of social relations after other technological disasters, such as those that occurred at Three Mile Island, Bhopal, Chernobyl, and Love Canal (Baum & Fleming, 1993; Baum,

Gatchel, & Schaeffer, 1983; Bogard, 1989; Bromet, Gluzman, Schwartz, & Goldgaber, 2002; Bromet, Parkinson, Schulberg, & Dunn, 1980; Brown & Harris, 1979; Davidson & Baum, 1991; Houts, Cleary, & Hsu, 1988; Levine, 1982; Robins et al., 1986; Shrivastava, 1987). These impacts have been attributed to the uncertainty underlying the extent and consequences of biophysical contamination (Davidson & Baum, 1991; Erikson, 1991; Vyner, 1988), the protracted litigation over compensation for damages incurred (Brown & Mikkelsen, 1989; Picou & Rosebrook, 1993), and the emergence of a “corrosive” community context, which prolongs the recovery process (Freudenberg & Jones, 1991; Kroll-Smith & Couch, 1991; 1993).

The *Exxon Valdez* spill represents a specific type of technological disaster, one that impacted a population living in predominately natural or renewable resource communities, and one that did not result in a loss of human life but did result in a loss of social and material resources. A natural or renewable resource community is a population of individuals who live within a bounded area and whose primary cultural, social, and economic existences are based on the harvest and use of natural renewable resources (Dyer et al., 1992; Gill, 1994). Such a community is highly vulnerable to negative impacts from technological disasters because long-term environmental change may prevent the timely recovery of an established resource base, thus threatening core cultural traditions (Dyer et al., 1992). Disruption of these traditions can result in on-going social disruptions or secondary disasters (Erikson, 1976), leading to conflicts between friends and family, resentment toward neighbors who have been spared loss or perceived to have been overcompensated for loss, and anger and suspicion toward outsiders engaged in cleanup and recovery (Erikson, 1976). Such impacts represent a loss of social support, which can have significant consequences (Hobfoll, 1989).

However, the *Exxon Valdez* oil spill was more than an account of disaster-related psychosocial impacts. It was also an event of sociocultural change (Dyer, 1993; 1993 Gill, Picou, 1997; Minerals Management Service, 1993; Palinkas,

Downs, et al., 1993). For both Native and non-Native residents of the small, rural communities in the affected region, the event represented the alteration of a traditional way of life in response to contact with the larger Euro-American social system. In this particular instance, this contact assumed two distinct forms. The first was the oil itself, whether physically during participation in cleanup efforts, culturally in terms of effects on traditional subsistence harvesting activities, or economically in terms of the subsequent closure of certain commercial fisheries. The second form of contact was the involvement of residents in the affected communities with the management and personnel of Exxon, VECO, representatives of numerous federal and state agencies, and a barrage of outsiders interested in participating in cleanup efforts for a variety of monetary or altruistic reasons.

## 27.2. PSYCHOSOCIAL IMPACTS

### 27.2.1. Exxon Valdez Oil Spill Studies

Although several studies of the psychosocial impacts of the oil spill were conducted (see Davis, 1996, for a review), only three studies provided any quantifiable estimates of the onset and persistence of psychiatric disorders. The first was the “Oiled Mayors” Study, conducted from 1989 to 1990 by Impact Assessment, Incorporated (Impact Assessment, 1990; McLees-Palinkas, 1994; Palinkas, Downs, et al., 1993; Palinkas, Petterson, Downs, & Russell, 2004; Palinkas, Petterson, Russell, & Downs, 1993; Palinkas, Russell, Downs, & Petterson, 1992; 1993; 2004; 1993; Rodin et al., 1992; Russell et al., 1996). In addition to methods for the assessment of fiscal and operations impacts on local governments and economic impacts on the private sector, the Oiled Mayors Study employed two different sets of methods in the assessment of social and psychological impacts of the oil spill. One was a qualitative analysis of data collected in 22 different communities by trained fieldworkers who conducted interviews with community leaders, health and social service workers, businessmen, and local residents.

The other set of methods used was a quantitative assessment of data collected from a survey of almost 600 randomly selected households located in 13 different communities between March 30 and May 15, 1990. Eleven of these communities ( $N=437$  households) were in the region directly exposed to the oil spill itself. In addition, two communities in southeast Alaska far from the oil spill ( $N=162$  households) served as a source of unexposed respondents. The impact of the oil spill on psychosocial outcomes was determined by classifying study participants by their exposure to the oil spill and subsequent events on the basis of responses to six different questions: (1) Did you or anyone in your household use, before the spill, areas along the coast that were affected by the spill? (2) Did you work on any of the shoreline or water cleanup activities of the oil spill? (3) Are there any other ways that you came into contact with the oil spill or cleanup activities, such as during recreation, hunting, fishing, or gathering activities? (4) Did you have any property that was lost or damaged because of the oil spill or cleanup? (5) Did the oil spill cause any damage to the areas you or other household members fish commercially? (6) Has the oil spill directly affected the hunting, fishing or gathering activities of any members of this household? Each response was coded 0 for a "no" response and 1 for a "yes"; the responses were then summed to provide a continuous measure of exposure with a range of 0 to 6 in an ordinal scale. The Exposure Index was found to have internal consistency reliability (Cronbach's  $\alpha=0.74$ ) for this population. The mean exposure score for all study respondents was 1.97 ( $SD=1.77$ ).

Subjects were classified into three groups on the basis of maximum level of exposure. Residents in the study communities were classified as being either exposed or unexposed, depending on whether their exposure index score fell above or below the group median (2.00). Exposed residents were further dichotomized into low-exposed (exposure index scores = 2 or 3) and high-exposed (exposure index score = 4 and above) groups on the basis of a median split. Psychosocial outcomes assessed

included depressive symptoms, using the Centers for Epidemiologic Studies – Depression (CES-D) Scale (Radloff, 1977), DSM-III diagnosis of Generalized Anxiety Disorder (GAD), and DSM-III-R diagnosis of posttraumatic stress disorder (PTSD), using modules from the Diagnostic Interview Schedule (Robins, Helzer, Cottler, & Goldring, 1989; Robins, Helzer, Croughan, & Ratcliff, 1981, 1989) and questions relating to levels of and problems with drinking, drug abuse, and domestic violence since the spill and changes in social and family relations compared to the same period in the year before the spill (1988) (Impact Assessment, 1990). Both postspill (respondents' recollections of having experienced the symptoms within the past year – i.e., since the oil spill) and lifetime (recollections of ever having experienced these symptoms) prevalences of GAD and PTSD were calculated, and prevalence (symptoms experienced in the past week) of CES-D scores of 16 and above and 18 and above (the latter reflecting the need to increase the scale's specificity and reduce the positive misclassification rate in the face of observed ethnic differences in response patterns to the measure; see Palinkas et al., 1992) (Palinkas, Petterson, et al., 1993).

The second study was conducted by John Picou and colleagues from the University of South Alabama (Arata, Picou, Johnson, & McNally, 2000; Dyer, 1993; Dyer et al., 1992; 1993; Gill, 1994; Picou, Gill, & Cohen, 1997; Picou, Gill, Dyer, & Curry, 1992). Picou and associates collected data in Cordova, Valdez, and Petersburg, Alaska, in a series of studies beginning 4 and 1-half months after the oil spill and lasting until 1992. Study samples ranged from 125 (Arata et al., 2000) to 449 (Picou & Gill, 1996). Data were gathered through personal interviews with respondents, mail-out surveys, and telephone interviews. Petersburg was selected as a control community because of its similarity in demographic and economic characteristics to Cordova, while Valdez was selected because it represented a nonrenewable resource community also impacted by the oil spill. Alaskan Natives in Cordova were sampled using a network snowball sampling strategy,

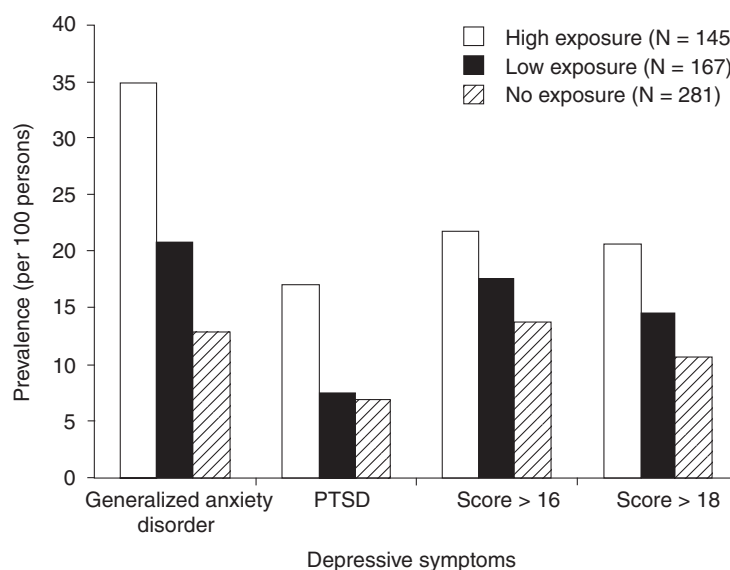
while non-Natives were sampled using a random household survey. Psychosocial impacts assessed included study participants' perceptions of changes in family, work, and community; measures of intrusive stress and avoidance behavior using the Impact of Events Scale (Horowitz, Milner, & Alvarez, 1979); and measures of anxiety, depression, and CR-PTSD using subscales from the SCL90-R (Arata, Saunders, & Kilpatrick, 1991).

Within a 12-month period after the oil spill itself, the Valdez Counseling Center conducted a survey of adult residents of the communities of Valdez ( $N=64$ ) and Cordova ( $N=53$ ) to determine the psychological impact of the *Exxon Valdez* oil spill for the purpose of mental health assessment and intervention planning (Donald, Cook, Bixby, Benda, & Wolf, 1990). Subjects were selected using a computer generated, simple random sample of registered voters. A second questionnaire was mailed to initial survey respondents approximately 8 months after the oil spill, and a third questionnaire was mailed approximately 12 months after the oil spill. Perceived social support was assessed using six

items taken from the Interpersonal Supportav Evaluation List (ISEL) (Cohen & Hoberman, 1983). Depressive symptoms were measured using the CES-D scale described earlier. The 20-item Frederick Reaction Index (Frederick, 1987) was used to evaluate the level of stress response to the oil spill.

### 27.2.2. Psychiatric Disorders

The Oiled Mayors Study found that exposure to the oil spill and subsequent cleanup was significantly associated with the postspill prevalence of GAD, PTSD, and CES-D scores of 16 and above and 18 and above (Figure 27.2). When age, sex, and ethnicity were controlled, compared with the unexposed group, members of the high-exposed group were 3.7 times (95% CI = 2.0–7.0) as likely to have GAD, 2.6 times (95% CI = 1.2–5.7) as likely to have PTSD, 1.8 times (95% CI = 0.9–3.6) as likely to have a CES-D score of 16 and above, and 2.1 times (95% CI = 1.0–4.5) as likely to have a CES-D score of 18 and above. Members of the high-exposed group were also two times (95% CI = 1.0–3.6) as likely to have GAD as members



**Figure 27.2.** Prevalence of generalized anxiety disorder<sup>a</sup>, PTSD<sup>a</sup>, and depressive symptoms<sup>b</sup> in Oiled Mayors Study respondents ( $N=593$ ) by exposure status, 1990.

Notes:

<sup>a</sup>One year after the spill.

<sup>b</sup>Centers for Epidemiologic Studies – Depression (CES-D) Scale scores within the past week.

of the low-exposed group who, in turn, were 1.9 times (95% CI = 1.0–3.6) as likely to have GAD as members of the unexposed group (Palinkas, Petterson, et al., 1993).

The high prevalence of psychiatric disorders revealed in the Oiled Mayors Study was confirmed by the results of the Picou et al. and the Valdez Counseling Center studies. Picou and colleagues (Picou et al., 1992; Dyer et al., 1992) identified significantly higher levels of intrusive stress and avoidance behavior in Cordova than in the control community of Petersburg 5 months after the spill and continuing over an 18-month period. Of the 43 Cordova respondents in the Valdez Counseling Center study, 36 (83%) reported symptoms consistent with the criteria for a diagnosis of PTSD. Of the Valdez sample, 65% reported symptoms consistent with PTSD at some point in the study (Donald et al., 1990).

Previous studies have found that comorbid conditions (the presence of more than one disorder in an individual) are more likely to occur after a disaster than single psychiatric disorders. For instance, Shore and his colleagues (Shore, Tatum, & Vollmer, 1986) found the presence of Mount St. Helen’s Syndrome, which consisted of symptoms of depression, anxiety, and post-traumatic stress disorder, in victims of the Mount

St. Helen’s disaster. A similar cluster of symptoms was reported by Smith and her colleagues (1990) among victims of a plane crash at a hotel. In the Oiled Mayors Study, household survey respondents in the high-exposed group were twice as likely to have at least one of the three psychiatric conditions ( $\chi^2 = 21.7, p < 0.0001$ ), 2.4 times as likely to have more than one of the three psychiatric conditions ( $\chi^2 = 12.0, p < 0.0001$ ), and 3.9 times as likely to have all three psychiatric conditions as individuals in the unexposed group ( $\chi^2 = 8.6, p = 0.003$ ) (Figure 27.3).

Since the Oiled Mayors Study was cross-sectional, it was unable to determine the persistence of these symptoms over time. The Valdez Counseling Center, however, evaluated symptoms of PTSD and depression at three different points over a 1-year period following the oil spill itself (Donald et al., 1990). This study reported a decline in PTSD in Valdez from 50% 2 months after the spill, to 42% at 8 months after, to 30% at 12 months after. In Cordova, the prevalence of PTSD increased from 49% to 53.5% 8 months after the spill before declining to 44.2% at 12 months after the spill. In Valdez, the mean CES-D score increased from 6.5 2 months after the spill to 10.2 at 8 months after, before declining slightly to 8.6 12 months after. In Cordova, mean CES-D scores remained relatively constant

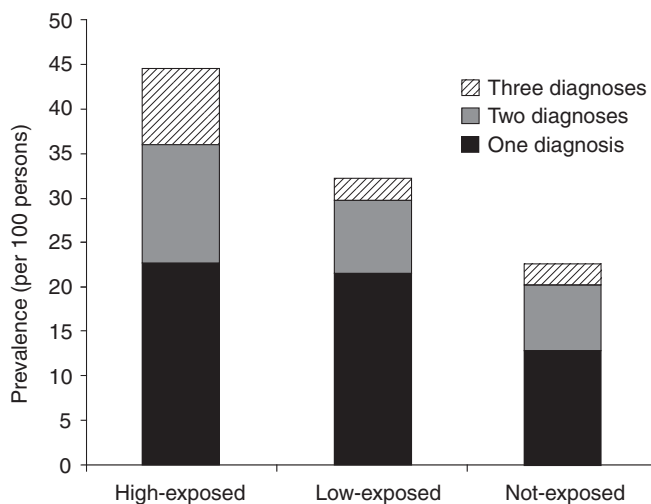


Figure 27.3. Prevalence of comorbid psychiatric disorders by exposure status, Oiled Mayors Study.

from 9.0 2 months after the spill, to 8.9 at 8 months after, to 9.3 at 12 months after. In the Picou study, residents of Cordova did experience an overall reduction in the level of intrusive stress as measured by the IES but no change in the level of avoidance behavior 14 months later (Picou et al., 1992).

The findings of an association between exposure to the oil spill and increased prevalence of PTSD is noteworthy because it raises the issue of whether events that do not result in a loss of life are sufficiently traumatic to meet the Criterion A requirements for a diagnosis of PTSD. In DSM-III-R, a traumatic event was defined as one that is

outside the range of usual human experience and that would be markedly distressing to almost everyone, e.g., serious threat to one's life or physical integrity; serious threat or harm to one's children, spouse, or other close relatives and friends; sudden destruction of one's home or community; or seeing another person who has recently been, or is being, seriously injured or killed as the result of an accident or physical violence. (American Psychiatric Association, 1987; p. 250)

Many have argued that only the experience of death of others or the imminent threat of death to oneself is sufficient to warrant a diagnosis of PTSD. This argument was supported by research on combat veterans (Friedman, Schneiderman, West, 1986) and victims of natural and man-made disasters (Shore, Vollmer, & Tatum, 1989; Green, Grace, & Gleser, 1985). Others have argued that the definition of an event as traumatic may vary from one culture to the next, from one individual to the next, and even from one experience to the next in the same individual (Davidson & Foa, 1993; Lindy, Green, & Grace, 1987; Neria, Nandi, & Galea, 2007; Norris, 1992) and that the definition of a traumatic event (Criterion A) should be broadened to allow for the empirical assessment of events that elicit symptoms of posttraumatic stress (Kilpatrick & Resnick, 1993).

In response to this debate, the criteria for a traumatic event was revised in DSM-IV to include both objective and subjective criteria and to eliminate the notion that the event must

be "outside the range of normal human experience" (American Psychiatric Association, 1994, pp. 427–428). The revised criteria took into account the possibility that "different people can have profoundly different conceptions as to what constitutes a realistic 'threat'" (Young, 1995, p. 289). It also raised the possibility that an event or series of events may be sufficiently traumatic to warrant a diagnosis of PTSD – even in the absence of death or serious physical injury – if it threatens one's physical integrity or the physical integrity of others (Tomb, 1994).

It may also be argued that an event is sufficiently traumatic to warrant a diagnosis of PTSD if it threatens one's social integrity as well. Several studies have noted an association between PTSD and poor social support in military combat veterans (Fontana & Rosenheck, 1994; King, King, Foy, Keane, & Fairbank, 1999; Schnurr, Lunney, & Sengupta, 2004) and disaster victims (Acierno et al., 2007; Feng et al., 2007; Galea et al., 2002) and the loss of members of social networks in natural disasters and war (Kinzie et al., 1990; Norris, Baker, Murphy, & Kaniasty, 2005). A stressor is more likely to produce PTSD if, among other things, it is isolating or does damage to one's community or support systems (Tomb, 1994).

Finally, it may be argued that an event is sufficiently traumatic to warrant a diagnosis of PTSD if it threatens the integrity of the physical environment. In his Conservation of Resources Model, Hobfoll (1988) defines psychological stress as a reaction to the environment in which there is a net loss or threat of a net loss of resources – objects, personal characteristics, conditions, or energies that are valued by the individual. According to this conservation of resources model, environmental circumstances may threaten people's status, position, economic stability, loved ones, basic beliefs, or self-esteem. The actual or threatened loss of these resources is important because they have instrumental as well as symbolic value in that they help people define who they are.

Finally, as Neria and colleagues (2007) have noted, differences in the definition of the A criterion between DSM-IV and DSM-III-R, the latter

being the basis for the assessment of PTSD in the Oiled Mayors Study, may influence rates, correlates, and course of PTSD, as documented across studies over time. Comparison of the results of this study with subsequent studies of other disasters would have to take these differences into account.

### 27.2.3. Substance Abuse

The oil spill resulted in a significant increase in alcohol and drug abuse as perceived by the respondents of the Oiled Mayors household survey. Individuals in the high-exposed group were significantly more likely to report an increase in drug and alcohol abuse in their community and among family and friends than individuals in the unexposed group (Palinkas, Downs, et al., 1993; Russell et al., 1996). In addition to a perceived increase in these activities, individuals in the high-exposed group were significantly more likely to report an increase in problems associated with drug and alcohol abuse in their community and among family and friends than individuals in the unexposed group (Palinkas, Downs, et al., 1992; Russell et al., 1996).

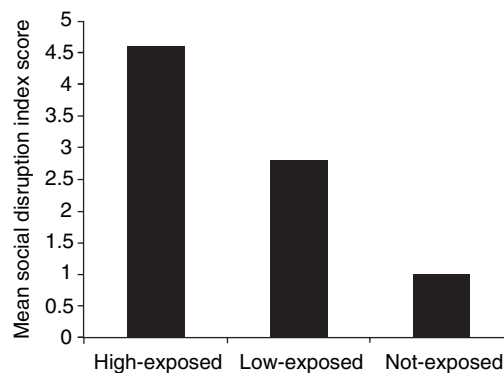
Self-reports of increases in alcohol and drug use were assessed in the Valdez Counseling Center study. However, only 3 of the 43 Cordova respondents and 1 of the 50 Valdez respondents indicated their alcohol consumption and/or illicit drug use had increased since the oil spill (Donald et al., 1990). In contrast to the Oiled Mayors Study, which asked respondents to describe patterns of substance use in others, this study asked respondents to describe their own patterns of use, which may account for the conflicting findings.

### 27.2.4. Disruption of Social Relations

Analyses of the data collected in the Oiled Mayors Study household survey found that exposure to the oil spill had a number of adverse effects on social relations both within and outside the household (Palinkas, Downs, et al., 1993; Russell et al., 1996). Compared with the unexposed group, individuals in the high-exposed

group were significantly more likely to report an increase in fighting in their community and among family and friends, and an increase in problems associated with domestic violence in their community. A measure of social disruption (Palinkas et al., 2004) that included relations both within and outside the household was 4.6 times greater in high-exposed individuals than in unexposed individuals, and 2.8 times greater in low-exposed individuals than in unexposed individuals (Figure 27.4). Exposure to the oil spill and cleanup was significantly associated with reported declines in social relations with relatives not in the home, friends and neighbors, coworkers, and residents of other communities, compared to the same period in 1988 (Palinkas, Downs, et al., 1993; Russell et al., 1996). Individuals in the high-exposed group were also significantly more likely to report a conflict with outsiders and with friends since the spill than individuals in the unexposed group.

Picou and associates also found evidence of severe disruption in social relations within the family, the workplace, and the community in 1989 resulting from the oil spill (Dyer et al., 1992). In 1989, Cordova respondents were significantly more likely to report disruption in relations within the family, in the workplace, and within the community than their counterparts in Petersburg. Moreover, although the decline in the percentage reporting such disruption was greater in Cordova than Petersburg between 1989 and 1990, greater proportions of Cordova



**Figure 27.4.** Mean social disruption index score by exposure status, Oiled Mayors Study, 1990.

respondents reported such declines in 1990 than their counterparts in Petersburg.

Although numerous studies have found social support to mediate the association between traumatic events and psychiatric disorders (Brewin, Andrews, & Valentine, 2000), it is also possible that the psychiatric disorders experienced by victims of the *Exxon Valdez* oil spill contributed to the disruption of social relations. Studies of PTSD and social support among a sample of Gulf War I veterans found that PTSD symptoms more strongly predicted subsequent social support than social support predicted subsequent PTSD (Keane, Marshall, & Taft, 2006). Kaniasty and Norris (2004) have observed a similar phenomenon among victims of disasters and acts of terrorism.

### 27.3. RISK AND PROTECTIVE FACTORS

Analyses of the psychosocial impacts of the oil spill described earlier revealed distinct subgroups or segments of the population that were especially vulnerable. For instance, women were particularly vulnerable to the effects of exposure to the oil spill and cleanup activities on the prevalence of GAD (OR=1.4, 95% CI=1.2–1.7), PTSD (OR=1.4, 95% CI=1.2–1.7), and CES-D scores of 18 and above (OR=1.1–1.6). Younger adults (18–44 years) were at increased risk of depressive symptoms (Palinkas, Petterson, et al., 1993). However, the increased risk of psychiatric disorders, substance abuse, domestic violence, and disruption of social relations was especially evident among five particular subgroups: local residents who participated in spill cleanup activities; residents who experienced loss of commercial, subsistence, and social resources; families and children; Alaska Natives; and participants in subsequent litigation.

#### 27.3.1. Cleanup Participants

Studies of the *Exxon Valdez* oil spill suggested that individuals involved in cleanup activities were subjected to similar forms of stress for a number of reasons. These individuals were most exposed to the devastation resulting from

the spill; they were able to observe firsthand the extent of the environmental damage resulting from the spread of oil and to grasp the significance of this damage in terms of its impact on their traditional way of life. They were also involved in the handling of remains of countless birds, otters, and other animals that were victims of the oil. They worked long hours attempting to halt the spread of oil and to remove it from affected shorelines and beaches. Despite the lucrative salaries offered by Exxon's contractor, VECO, the pace and intensity of work led to fatigue and increased stress in many of those involved in cleanup activities. For many of those living in areas directly exposed to the oil spill, participation in cleanup activities often required spending long periods away from the community and the family, the suspension of subsistence pursuits that otherwise form the basis for many important social ties and obligations, and separation of parents from their children.

Finally, the unequal distribution of cleanup jobs within and between communities led to feelings of bitterness and discontent such that cleanup workers were often subjected to criticism for having "sold out" to Exxon. In some instances, accepting these positions meant the risk of becoming social pariahs within the community and even within the family (Gill & Picou, 1997; Palinkas, Downs, et al., 1993). The Social Indicators Study also provided evidence that spill-related jobs were unequally distributed within the community, leading to tensions and hostility between those with jobs and those without. Survey respondents with relatively little work over the preceding year were less likely to have secured spill employment, and "moreover, tensions between those who accepted spill jobs and those who eschewed such jobs tended to disrupt customary social networks which are often key channels of mutual support and collaborative assistance, especially in small and predominately Native communities" (McNabb, 1991; p. 33).

Overall, a review of the available evidence on the effects of the *Exxon Valdez* oil spill suggests that participating in cleanup activities was associated with significantly increased rates

of psychiatric disorder; a perceived decline in health status; increases in reported substance abuse and domestic violence within communities and among families and friends, and increased problems associated with these activities; and a decline in social relations and increase in levels of social conflict. Oil spill workers were 1.7 times more likely to report an increase in domestic violence in their community and 3.3 times more likely to report an increase in domestic violence among family and friends than individuals not employed as oil spill workers (Russell et al., 1996).

Community residents who worked on the oil spill cleanup experienced a decline in mental health. In the Oiled Mayors Study, when age, sex, and ethnicity were controlled, respondents who participated in cleanup activities (N=148) were 2.3 times (95% CI=1.5–3.7) as likely to have GAD, 1.8 times (<1.0–3.4) as likely to have PTSD, 1.5 times (0.9–2.5) as likely to have a CES-D score of 16 and above, and 1.9 times (1.1–3.2) as likely to have a CES-D score of 18 and above as were members of the unexposed group (N=445). However, only the odds ratios for GAD and a CES-D score of 18 and above were statistically significant. This may be attributed to the fact that Native cleanup workers had higher rates of PTSD and a CES-D score of 16 and above than Natives not participating in cleanup; in contrast, non-Natives not participating in cleanup activities had higher rates of these disorders than non-Native cleanup workers. The Valdez Counseling Center study found that respondents who earned the most money from oil spill cleanup activities in Cordova also were most likely to experience symptoms of PTSD (Donald et al., 1990).

Reported declines in social relations with family members were also significantly associated with whether the parent participated in cleanup activities. Cleanup workers were more 3.4 times more likely to report a decline in relations with spouse, 3.1 times more likely to report decline in relations with children, 5.6 times more likely to report a decline in relations with other relatives in the home, and 2.8 times more likely to report a decline in relations with relatives not

in the home, as compared with individuals not involved in cleanup (McLees-Palinkas, 1994). Cleanup workers were also 2.4 times more likely to report arguments about the oil spill with family members and 1.6 times more likely to report arguments about the spill with others. The Social Indicators Study found that single parent households were especially affected by the decline in social relations because they were more likely to report being relocated for spill-related work (McNabb, 1991).

### 27.3.2. Resource Loss

Consistent with Hobfoll's (1989) Conservation of Resources Theory, individuals who reported loss of important economic, cultural, and social resources experienced significantly higher levels of psychological symptoms and prevalence of psychiatric disorders. In the Oiled Mayors Study, 47.9% of Alaska Natives and 35.3% of non-Natives participating in the Household Survey reported the spill damaged commercial fishing areas they had used (Palinkas et al., 1992). Non-Native local residents who reported damage to commercial fishing areas reported significantly higher levels of depressive symptoms than non-Natives who did not report such damage (Palinkas et al., 1992). The prevalence of postspill PTSD was also significantly higher in Alaska Natives and non-Natives who reported damage to commercial fishing areas (19.8% and 14.3%, respectively) than their counterparts who reported no such damage (5.2% and 6.4%, respectively) (Palinkas et al., 2004). In the Picou study, individuals who experienced loss of income, despite taking on additional jobs to avoid loss, experienced significantly higher levels of depression, anxiety, and PTSD symptomatology (Arata et al., 2000). Another study by Picou and Gill (1996) found that IES measures of spill-related intrusive stress were significantly higher in the renewable resource community of Cordova than in the nonrenewable resource community of Valdez. Furthermore, this study found significantly higher levels of intrusive stress among commercial fishermen than people who worked in other occupations in Cordova.

In the Oiled Mayors Study, exposure to the oil spill and participation in subsequent cleanup was significantly associated with reported declines in traditional subsistence activities. Compared to the same period in the year before the spill, between 60% and 90% of Alaska Natives and between 43% and 75% of non-Natives in the high-exposed group reported a decline in time spent hunting, fishing, and gathering, time normally spent with people from other households engaged in these activities, the amount of harvested resource foods shared with others and with elders, the amount of harvested resource foods received from others, number of household members engaged in these activities, and opportunities for children to learn hunting, fishing, and gathering (Palinkas, Downs, et al., 1993). Natives and non-Natives alike who reported that the spill and cleanup had affected their hunting, fishing, and gathering activities also reported significantly higher levels of depressive symptoms (Palinkas et al., 1992) and prevalence of PTSD (Palinkas et al., 2004) than those who reported no such effects.

As noted previously, the oil spill and subsequent cleanup also disrupted social relations both within the families and within and between affected communities. A decline in social relations was significantly associated with depressive symptoms and postspill prevalence of PTSD in both Alaska Natives and non-Natives in the Oiled Mayors Study (Palinkas et al., 1992, 2004). The postspill prevalence of PTSD was also associated with a decline in support from family members among Alaska-Natives (Palinkas et al., 2004). Picou and colleagues (Dyer et al., 1992; Picou et al., 1992) found that 5 months after the spill, residents of Cordova experienced significant social disruption in personal, family, and work settings. Arata and colleagues (2000) found deterioration in relationships with others to be significantly associated with SCL90-R measures of depression, anxiety, and PTSD.

### 27.3.3. Families and Children

The Oiled Mayors Study also found a significant impact of the oil spill and subsequent cleanup on social relations within the family. Owing to

spill-related disruptions, there was a reported decrease in time respondents spent visiting with other household members. According to the household survey data collected in the Oiled Mayors Study, in most communities 15% to 30% of the households reported decreases in time spent interacting with family members (Russell et al., 1996). In several native communities with high rates of cleanup involvement, 45% to 65% reported such decreases. Forty-five percent of those who worked on the cleanup reported less time spent with other household members, compared with 16% of those who did not work on the spill. Similarly, from 10% to 30% of the respondents in each of the affected communities indicated less time available for family vacations as a result of spill-related activities (Russell et al., 1996). As compared with individuals in the unexposed group, individuals in the high-exposed group were significantly more likely to report declines in socializing with other household members; sharing food, money, and other resources with family members; and overall household time together since the spill (McLees-Palinkas, 1994; Russell et al., 1996).

Some of the statements taken from Oiled Mayor Study participants (Impact Assessment, 1990; p. 45) are exemplary of the types of interpersonal disruptions the cleanup created in various communities:

Yes, as a family we kind of lost it ... my husband ... we were so close. Then the oil spill came and he is drinking more and [we] separated.

... the loss of earnings of my husband [was bad] ... and the fact that he wasn't here this summer. It was a burden on our relationship.

My husband's alcoholism got worse. He had quit before the spill. Now we're separated because of the spill.

[The cleanup] contributed to my break-up with my fiancée. The spill caused lots of pressure for me to keep my business going - I was stressed and it affected my relationship.

In some instances, those who worked long hours on the spill simply had less time and energy to devote to their family relationships. In other

instances, the cleanup created tensions related to family roles. For example, in Native communities where there was little child care available, the oldest child was often placed in charge of siblings as parents worked on the cleanup. When mothers and fathers returned home there were conflicts over the eldest child once again assuming a "child" rather than a caretaker role. These types of conflicts seemed small when viewed in isolation, but when viewed within the context of individual stress, coupled with community divisiveness and conflict and household disruptions, each additional stressor added to the overall disruption experienced by individuals, families, and communities (McLees-Palinkas, 1994). However, it is unclear whether these impacts were long term. Dyer and associates (1992) reported that 58% of Alaskan Natives noted disruptive changes in family relations in 1989, which declined to 25% in 1990. Nevertheless, the entire Cordova cohort was more likely to report disruptive changes in family relations in both 1989 and 1990 than their counterparts in Petersburg (Dyer et al., 1992).

The household survey data and ethnographic interviews obtained from the Oiled Mayors Study found that for children, increasing exposure to the oil spill event was significantly associated with a decline in school work and grades, greater fear of being left alone, fighting more with other children, and difficulty getting along with parents (McLees-Palinkas, 1994). Exposure to the oil spill was also significantly associated with the two global measures of children's behavioral dysfunction: parent's assessment that the oil spill had an effect on their children and scores on an index of children's behavioral disruption. These associations were independent of the gender, ethnicity, age of the parent, and the structure of the family. However, the association between exposure to the oil spill and reports of bedwetting being a new problem since the oil spill was greater in households with preschool children (infants to 5 years), reports of children's sleep problems was greater in households with school age children (6–12 years), reports of a decline in children's grades and school work was greater in households with

adolescents. Although parental or adult reports of children's behavior referred to all children in the household, the results of this study indicated that parents or adults were more likely to report a certain dysfunctional behavior among children in the household if children of a particular age and, indirectly, level of emotional and cognitive development, were present in the household. These results thus confirmed the findings of other studies that indicate that level of cognitive and emotional development influences the types of symptom risk and symptom expression exhibited by children after a disaster.

In describing life for families during the cleanup, a resident of one of the affected communities commented:

[the jobs] were not just 8 to 5 jobs. They were like to 7 or 12 [at night] and sometimes longer. They worked until midnight unloading boats, got home, slept three hours, and got up and went back to work. So that put a lot of stress on the families, because one person wasn't there ... and the children were scared because they didn't realize what was happening, because the adults were all excited ... so the children were real concerned about it, what was going on and not understanding why they weren't able to clean it up and be involved in some way. (Impact Assessment, 1990; p. 46)

The director of one of the day care facilities in Seward, who had extended periods of contact with children, described the behavioral changes she saw in children following the oil spill. Many were irritable and cried more frequently than usual, which the director attributed to feelings of anger and neglect because their parents were away from them for so many hours at a time. The director commented, "The kids had always used to color so nicely but since the oil spill they take a black crayon and cover everything black," which she believed was a manifestation of those feelings. In May of 1989, 2 months after the spill, the kids were learning about and drawing pictures of sea life. All of the children reportedly drew the oil spill as part of their pictures even though the subject of the oil spill hadn't been raised at the day care (Impact Assessment, 1990).

In all but two communities, more than half of the parents indicated that their children exhibited separation anxiety. Summed for the entire sample of parents in the household survey ( $N=326$ ), 73% indicated that their children did not like being left alone, a phenomenon they attributed to the effects of the spill and cleanup. The figures varied by site, with only 35% reporting separation anxiety at one Native village. In two other communities, Kodiak and Chignik, 85% of the parents reported such symptoms in their children. This is an important indicator of the disruptive effects of the spill and cleanup on children (Impact Assessment, 1990).

Another indicator of behavioral problems with children as a result of the spill was that 79% of all parents reported that they did not get along with their children as well as they did before the spill. There was some variation in responses between communities with a range of 47% to 95% reporting worsened child-parent relationships. The figures suggest that as a result of spill and cleanup-induced changes and disruptions, there was a general deterioration of child-parent relationships (Impact Assessment, 1990).

The lack of available day care, a typical problem in many communities, became exacerbated by the spill. Two-thirds of the parents in the household survey indicated they had problems with finding suitable child care services after the spill. However, there was significant variation between sites. In one Native village, only 11% indicated child care problems, while in another, 80% reported such problems. In non-Native communities, 40% to 70% of parents reported problems with day care availability (Impact Assessment, 1990). In part, these problems reflect the reduced day care services as a result of day care workers leaving their jobs to work at much higher wages on the spill cleanup. It also reflects the outside employment of family members who might otherwise stay at home and take care of children. As a consequence, children often were unsupervised for the periods of time that they were not in school. As one former day care worker from Cordova said, “[I] left my [day care] job because we couldn’t keep enough people working there. Childcare is always a challenge

but when \$17 an hour is available rather than \$6.00 an hour ... The [day care] job is harder also because of stressed out kids, they are always away from [their] parents, the kids feel abandoned” (Impact Assessment, 1990; p. 48).

In the Oiled Mayors Study, the postspill prevalence of GAD, PTSD, and CES-D scores of 16 and above was significantly associated with exposure to the oil spill among parents but not among other adults (McLees-Palinkas, 1994). Household survey respondents reporting effects of the oil spill on the behavior of their children were more likely to have a psychiatric disorder than individuals not reporting effects of the spill on their children. The postspill prevalence of GAD, PTSD, and the prevalence of depressive symptoms were all significantly associated with reports of the following: children having problems sleeping, children getting upset when someone talks about the oil spill, bedwetting being a new problem for children in household, children’s fear of being left alone, children in household fighting more with other children, and children in household fighting more with parents since the oil spill. Reports of problems finding child care for children since the oil spill were significantly associated with the postspill prevalence of GAD (OR=3.5, 95% CI=1.6–7.2), PTSD (OR=3.7, 95% CI=1.3–10.5), and CES-D scores of 16 and above (OR=2.4, 95% CI=1.1–5.5) among parents in the affected communities, independent of age, gender, ethnicity, exposure status, and level of family support (McLees-Palinkas, 1994).

#### 27.3.4. Alaska Natives

While the oil spill affected Alaska Natives and non-Natives alike, the former were especially vulnerable to many of the psychosocial impacts described earlier. In the Oiled Mayors Study, 38.3% of the 189 Alaska Native participants reported participating in cleanup activities, compared with 19.1% of the 405 non-Native participants ( $p < 0.001$ ) (Palinkas et al., 1992). Alaska Natives were also significantly more likely than non-Natives to report damage to commercial fishing areas (47.9% vs. 35.3%,

$p < 0.01$ ) and effects on hunting, fishing, and gathering (48.4% vs. 28.3%,  $p < 0.001$ ). Natives were particularly vulnerable to the effects of exposure on the prevalence of CES-D scores of 16 and above (OR=1.3, 95% CI=1.1–1.5) (Palinkas, Petterson, et al., 1993) and the effects of participation in cleanup or other contact with oil and change in household income on mean CSD-D scores (Palinkas et al., 1992). Low family support, participation in spill cleanup activities, and a decline in subsistence activities were significantly associated with PTSD in Alaska Natives but not in Euro-Americans (Palinkas et al., 2004). Among Alaska Natives, PTSD was significantly associated with participation in cleanup activities, reports of property lost or damaged as a result of the spill, and effects on hunting, fishing, and gathering. Among Euro-Americans, PTSD was significantly associated only with effects on hunting, fishing, and gathering. Picou and colleagues reported that Alaska Natives living in Cordova reported higher levels of intrusive stress than non-Native commercial fishermen (Gill & Picou, 1997).

### 27.3.5. Litigation

As they are usually the result of human error, technological disasters are often followed by prolonged litigation that seeks to attribute blame to some person, persons, or institutions believed to be responsible for the disaster and to obtain compensation for the damages, both material and psychosocial, incurred as a result of the disaster (Picou et al., 2004). The *Exxon Valdez* oil spill was no exception to this pattern. As described by Hirsch (1996), within days if not hours of the spill, seemingly hundreds of lawyers descended on small towns and villages throughout Alaska. In 1994, an Anchorage jury awarded \$287 million for actual damages and \$5 billion for punitive damages to a group of plaintiffs that included 32,000 fishermen, Alaska Natives, landowners, and others whose livelihoods were gravely affected by the disaster. After several appeals by Exxon, the punitive damages award was eventually reduced to \$2.4 billion. To date, Exxon has yet to pay this amount to the plaintiffs

(Lief, Cabraser, Heimann, & Bernstein, 2008). Moreover, claims by Alaska Natives that the oil spill had irreparably damaged their traditional culture, largely through the destruction of local subsistence resources, were dismissed by the court on the grounds that such losses could not be quantified in monetary terms; this led to their further victimization by the oil spill (Gill & Picou, 1997). As a result, Picou and colleagues (2004) found that the status of litigant and the litigation stress were significant predictors of psychological stress 3 and 1½ years after the oil spill. They concluded that litigation is a critical characteristic of technological disasters that precludes timely community recovery and promotes chronic social and psychological impacts.

## 27.4. INTERVENTIONS AND MENTAL HEALTH SYSTEMS

The experience of the *Exxon Valdez* oil spill suggests that individuals living in communities impacted by technological disasters might benefit from interventions and programs in three specific areas: mental health services, postdisaster cleanup and recovery, and disaster-related litigation.

### 27.4.1. Mental Health Services

In the aftermath of the oil spill, locally available mental health services were scarce and overwhelmed by the number of local residents and transient workers seeking services (Donald et al., 1990; Impact Assessment, 1990). This was especially true in the smaller Alaska Native villages (Gill & Picou, 1997). What services were available either existed outside the region or were provided by outsiders with little knowledge of local culture and conditions. A quote from an Alaska Native in Cordova illustrates the difficulty of accessing services in remote communities in the aftermath of a disaster:

The social service people are good at their jobs. [But] these people were damaged by the spill, just like everybody else. They tried to cope, their workload went up, but it was like the hurt helping the hurt. It was very difficult for them.

And we would not accept at all a stranger coming in from Fairbanks or Juneau, or Nome, to be our social worker, and sit there and say: "Yes, I know how you feel." No, you don't know how I feel, because you were not there. You did not go through the scare, the trauma, the fright, the financial disaster. There was nothing that a social worker from anywhere else can say to help us. We have got to heal from within. (Dyer, 1993, pp. 82–83)

Services in the aftermath must be locally available and culturally competent. However, as the aforementioned quote illustrates, those services are themselves strained by the disaster as providers also experience traumatic symptoms. While there is no clear resolution to this dilemma, one solution would be the establishment of teams of mental health responders comprised of local service providers, peer counselors, and outside professionals who serve in an advisory capacity or whose main role is to provide treatment for local providers.

### 27.4.2. Cleanup and Recovery

In many respects, the *Exxon Valdez* oil spill provided a textbook case of what not to do in the aftermath to a technological disaster. As noted earlier, Exxon and its contractor VECO, were criticized for responding with "too little too late" and with developing hiring practices that contributed to an influx of outsiders that overwhelmed local services and facilities and resulted in an unequal distribution of income. One of the lessons learned from the cleanup experience is that companies and government agencies responsible for cleanup activities should pay greater attention to the health and well-being of those participating in such activity. This includes setting reasonable limits to the number of hours worked and making mental health services available to cleanup workers. The issue of an unequal distribution of resources is also important to prevent the formation of a corrosive community (Picou et al., 2004). Policies should be put into place that insure more equal distribution of employment and other economic opportunities to local residents affected by the disaster.

### 27.4.3. Litigation

When the process is relatively brief and the outcome relatively successful, litigation can provide numerous social and psychological benefits to those impacted by a technological disaster (Murphy & Keating, 1995). However, as illustrated by the *Exxon Valdez* oil spill, this is rarely the case. The stress associated by the uncertainty of ever achieving closure to the event may have been as profound as the initial shock of living in a world covered by oil. To address this stress and uncertainty, mental health providers should be working with representatives of the legal system to set realistic expectations for potential litigants by informing them of the process and likely outcomes of litigation, the role and value placed on negotiation in the litigation process, and the services available to litigants who are poorly equipped to deal with the intense demands placed on their time, privacy, and credibility.

### 27.4.4. Future Directions

Apart from the obvious need to conduct longitudinal research in the aftermath of technological disasters, the lessons of the *Exxon Valdez* oil spill suggest several avenues for research, policy, and planning to minimize the occurrence of adverse social and psychological outcomes in future oil spills. It is clear that natural renewable resource communities, such as those located in Prince William Sound, are especially vulnerable to mental health consequences of technological disasters that contaminate and destroy the natural environment. One reason is that for these communities, the natural environment plays a key role in the social environment and the personal and cultural identity of the community. Further, these communities typically lack the medical and mental health resources necessary to respond quickly in the aftermath of a large-scale disaster like the oil spill. Although timely efforts to provide counseling and referral are critical in such instances, it remains unclear as to whether specific programs and policies tailored to the needs of each community are necessary. For instance, empirically tested treatments for trauma, such as exposure therapy,

cognitive therapy, and anxiety management techniques, may require modification to meet the needs of rural and predominately non-Euro-American communities. Similarly, community-based participatory research techniques might be applied in developing and evaluating interventions designed to prevent the deterioration of social support networks in the aftermath of an event like the oil spill. Such interventions might target families as well as individuals. Policies may be required to minimize the influx of outsiders involved in subsequent cleanup efforts to prevent local resources and infrastructure from being overwhelmed by their presence.

### 27.5. CONCLUSION

Although the oil spill did not place individuals in the affected communities in any immediate physical danger (i.e., apart from the potential long-term effects of prolonged exposure to aromatic hydrocarbons), as is the case in a natural disaster, it did threaten to destroy an entire way of life. For Alaskan Natives, that way of life revolved around the production and distribution of subsistence items harvested from the sea. The short-term and possibility of long-term destruction of the environment threatened the basis for individual identity, self-esteem, and social relations among Alaskan Natives throughout the affected community. For Non-Natives living in the region, the possible destruction of the commercial fisheries that supported their economic livelihood proved to be equally devastating. Although the cleanup employment provided short-term relief, it did little to resolve long-term uncertainty and a sense of vulnerability to future oil spills. While this sense of the death of a way of life may have diminished over time, it produced social and psychological trauma that would not have been present had it not been for the spill of oil into Prince William Sound.

Efforts to clean up the damage caused by the oil spill proved to be as devastating, if not more so, to the mental health and well-being of the affected communities as the damage itself. Although Exxon may have acted with good intentions in offering substantial wages for cleanup jobs, the unequal

distribution of these employment opportunities created or exacerbated preexisting conflicts within households, families, and communities. The availability of spill-related employment also disrupted services and threatened resources in communities faced with an influx of outsiders looking for work and the disappearance of key social service personnel (e.g., child care workers) as they left for higher paying spill-related cleanup jobs away from the community. The long hours devoted to cleanup work for the sake of short-term economic gain to balance the potential long-term economic losses also led to a decline in physical and mental health, a disruption of social activities and relationships, and a concern for the lack of adequate child care for children.

When the *Exxon Valdez* ran aground in Prince William Sound, it spilled oil into a social and a natural environment. That spill resulted in increased rates of depressive symptoms, anxiety, and PTSD, especially in women and Alaskan Natives. The spill also resulted in increased levels of alcohol and drug abuse, social conflict, disturbances in behavior of children, and a decline in perceived quality of life. Only further research will determine whether these impacts are transient or whether they are lasting consequences of permanent changes in the social, cultural, and economic fabric of these communities.

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