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Ethnic Differences in Stress, Coping, and Depressive Symptoms after the Exxon Valdez Oil Spill

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This study assessed levels of depressive symptomatology in a household probability sample of Alaskan Native ($N = 188$) and Euro-American ($N = 371$) residents of 13 communities in Alaska. Our objective was to examine ethnic differences in both the association between depressive symptomatology and exposure to the Exxon Valdez oil spill and subsequent cleanup efforts, and in the role of family support as a moderator of exposure to this technological disaster. Level of exposure was significantly associated with mean Center for Epidemiological Studies-Depression Scale scores in both Natives ($p < .05$) and Euro-Americans ($p < .01$). Both ethnic groups also reported significant declines in traditional relations with increasing levels of exposure ($p < .001$). However, Natives had a significantly higher mean Exposure Index score than Euro-Americans and were more likely to report working on cleanup activities, damage to commercial fisheries, and effects of the spill on subsistence activities. Depressive symptomatology was associated with reported participation in cleanup activities and other forms of contact with the oil in Natives, and reported damage to commercial fisheries, use of affected areas, and residence in a community in geographic proximity to the spill in Euro-Americans. Perceived family support was not directly associated with depressive symptoms in either ethnic group, but did serve to buffer the effects of exposure on depressive symptoms in Euro-Americans. The results suggest that cultural differences play an important role in determining the psychosocial impacts of a technological disaster, particularly with respect to exposure, appraisal of an event as stressful, perceived family support as a moderator of stress, and expression of depressive symptomatology.

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Since March 24, 1989, the day the supertanker Exxon Valdez ran aground on the rocks off Bligh Reef in Prince William Sound, there has been increasing concern about the social and psychological impacts among residents throughout the region affected by the spill. This concern stems from the ethnographic and anecdotal accounts 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. This conflict was accompanied by a dramatic increase in visits to community clinics for primary care and mental health services throughout the affected region. Moreover, significantly increased rates of physical health symptoms and psychiatric disorders have been reported after other natu-

ral (Logue et al., 1981a, 1981b; Shore et al., 1986a, 1986b) and technological (Baum et al., 1983; Bromet et al., 1980; Gatchel et al., 1985; Robins et al., 1986) disasters.

A potential moderator of the adverse physical and psychological consequences of disasters like the Exxon Valdez oil spill is the size of one's social network and the quality of perceived social support. The various forms of instrumental and emotional support obtained through social ties and relationships have been shown to moderate the effects of stressful life events and thus promote health and protect individuals against chronic disease, depression, and even death (Berkman and Syme, 1979; Cassel, 1976; Cobb, 1976; Dean and Lin, 1977; House et al., 1988).

However, the role of social support as a moderator of disaster-related stress has not been well documented. A study of Three Mile Island residents, for instance, found a significant inverse association between reported levels of social support and levels of emotional distress, but no relationship between social support and biochemical measures of stress (Fleming et al., 1982). Moreover, it is unclear whether social support moderates the effect of stressful life events on depression, as some studies have demonstrated (Lin et al., 1985; Kes-

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sler and McLeod, 1985), or whether the absence of social support or deterioration of social networks exercises a direct effect on depressive symptoms (Aneshensel and Stone, 1982; Grant et al., 1988). As Thoits (1982) observes, possible interactive effects involving life events and social support may confound the effect of life events on illness, leading to the erroneous conclusion that the elevated symptom levels or disease risk of persons experiencing a stressful life event or one particularly stressful experience like a disaster is due to the lack of support from one's social network when, in fact, that support was depleted by the events themselves. During a disaster, this depletion may occur at the individual level through the dispersal of social support networks or loss of individual social network members, and at the community level through the disruption of infrastructure and services.

Another element of natural and technological disasters that has not been well documented is the role of cultural differences in coping with disaster-related stress. In the context of the Exxon *Valdez* oil spill, this element is particularly important because of the ethnic diversity of the communities affected by the environmental destruction and involved in subsequent cleanup efforts, and because the role of social support in coping with stressful life events, disaster-related and otherwise, must be examined in its cultural context (Jacobson, 1987). This cultural context defines, at a minimum: a) the conditions under which support is given or received; b) the members of a social network available to provide support; and c) the normative and pragmatic types of support available (Palinkas et al., 1990, p. 441).

However, definition of the character and content of social support is only one of the ways that cultural systems influence the stress-illness relationship. The degree of exposure to activities and events viewed as stressful may be affected by the residence patterns, kinship patterns, and belief systems of a particular ethnic group. The cognitive appraisal of these events and the degree to which they are considered stressful are also based on cultural patterns of belief and behavior. Finally, cultural systems dictate the consequences of stress on individuals in terms of symptom expression and illness behavior (Dressler and Badger, 1985; Kleinman, 1980; Kleinman and Good, 1985).

The Exxon *Valdez* oil spill provides an opportunity to examine the ways that the Alaskan Native and predominately Euro-American cultural systems influenced exposure, appraisal, coping, and the social and psychological consequences of a technological disaster. This study had three specific objectives. The first was to examine the association between levels of depressive symptomatology and exposure to the Exxon *Valdez* oil spill and subsequent cleanup efforts among Alaskan Native and Euro-American residents living in 13 differ-

ent communities in the Prince William Sound, Kenai Peninsula, Kodiak Island, Alaska Peninsula, and Southeast regions of Alaska. The second objective was to examine ethnic differences in the role of family support as a moderator of exposure to this technological disaster. The third was to determine whether the moderating influence of family support was itself affected by the disaster in either ethnic group.

Methods

Subjects

Between March 30 and May 15, 1990, a research team from Impact Assessment, Inc., La Jolla, CA, conducted a survey of 596 households in 13 communities (cities, towns, or villages as defined by the Alaska Department of Community and Regional Affairs), 11 in the region directly exposed to the oil spill itself and two control communities. The time frame for data collection represented the first major opportunity subsequent to the contract award to conduct household surveys at a time when most residents were not involved in commercial fishing, subsistence harvesting, or oil spill cleanup work—activities that would require their absence from the community.

Sampling frames were developed in the field from Census Bureau tract maps, other city maps, or maps developed by interviewers and local experts. In some instances addresses were drawn from electric company billing listings. In each case, however, the number and location of households were verified by a census conducted by study fieldworkers. After listing the addresses of all domiciles in the community, numbers were assigned to each household in the sampling frame. Random samples of households were then drawn at a predetermined ratio using computer-generated tables of random numbers. For communities with more than 650 households (*e.g.*, Valdez, Cordova, Seward, and Kodiak), approximately 7% of the households were selected for interviewing. Smaller communities, such as Tatitlek, Chenega Bay, Chignik, and Akhiok, were intentionally oversampled at a 50% or higher ratio based on the total number of households. Replacement households, necessitated in the case of refusals or unoccupied dwellings, were also selected from the same sampling frame using a table of random numbers.

Once each household was selected, a respondent within the household was randomly selected on the basis of birth date. For all persons within the household who were at least 18 years of age, the one whose birthday was closest to the date of the interview was selected as the respondent. If, for some reason, that person was unable to be interviewed, then the person with the next closest birth date was selected. Informed con-

sent was obtained from each respondent. Interview length ranged from 45 to 120 minutes.

Incomplete information on ethnicity resulted in the elimination of seven respondents, leaving a total sample size of 589. Approximately 84% of all randomly selected eligible subjects agreed to participate. The socio-demographic characteristics of the sample were representative of the population of each community based on data obtained from the most recent local census available.

Measures

Demographic variables. Demographic variables examined included age, gender, ethnicity, education, total household income in 1989, employment status, marital status, and community size. Age was measured in years. Education was measured using an 8-item variable ranging from less than sixth-grade to a graduate degree. Household income for 1989 was measured using a 13-item variable ranging from less than \$5,000 to more than \$150,000. Marital status included married, never married, not married but living together, widowed, divorced, and separated. Respondents were also categorized on the basis of whether they lived in a large (with a population of 2,000 or more) or small community.

Ethnicity was measured using a 12-item variable including: white/Caucasian, Koniag/Aleut/Sugpiaq, Eyak, Athapaskan, Yup'ik/Inupiaq, Other Alaskan Native, Filipino, Hispanic, Asian/Oriental, black, American Indian, and other. Individuals who identified themselves as members of one of the Alaskan Native or American Indian ethnic groups ($N = 188$) were defined as Native. Individuals who identified themselves as white/Caucasian ($N = 371$) were defined as Euro-American. Because of the small sample size ($N = 30$), individuals who identified themselves as Hispanic, Asian/Oriental, black, or other were excluded from further analysis.

Exposure. Exposure to the oil spill and subsequent events was assessed on the basis of responses by residents of the affected communities to six different questions: a) Did you or anyone in your household use, before the spill, areas along the coast that were affected by the spill?; b) Did you work on any of the shoreline or water cleanup activities of the oil spill?; c) 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?; d) Did you have any property that was lost or damaged because of the oil spill or cleanup?; e) Did the oil spill cause any damage to the areas you or other household members fish commercially?; and f) Has the oil spill directly affected the hunting, fishing, or gathering activities of any members of this household? Factor analyses revealed that all six questions formed a single principal compo-

nent in both ethnic groups, providing evidence that the items measured a common underlying concept

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. The Exposure Index was found to have an interitem reliability (Cronbach's alpha) of .74 for Natives and .73 for Euro-Americans in the study population.

Family support and social relations. Family support is a subset of the more general notion of social support which considers the total range of affective and instrumental support available to an individual from friends, neighbors, and other members of his or her social network. The level of perceived family support of study respondents was assessed by asking respondents to provide answers using a scale ranging from 1 (strongly disagree) to 5 (strongly agree) to a series of 10 questions relating to the types of support (moral, emotional, or problem solving) obtained from and provided to family members. This 10-item Family Support Scale had an internal reliability of .86 for Natives and .88 for Euro-Americans in the study population.

The oil spill's impact on social relations was examined by asking respondents whether relations with spouse or partner, children living at home, other relatives, neighbors and friends, people from other communities, and co-workers had improved, stayed the same, or declined since the spill. Each response indicating a decline in relations was coded as 1 and all other responses were coded as 0; the responses were summed to provide a continuous measure of declining social relations with a range of 0 to 6.

Depression. Depressive symptoms were measured using the Center for Epidemiologic Studies—Depression (CES-D) scale (Radloff, 1977). Respondents described their mood over the past week by rating each of 20 items on a scale from 0 (rarely or none [less than 1 day]) to 3 (most or all [5 to 7 days]). A depression score was calculated for each respondent by summing the ratings after first reversing the ratings of four reverse-worded items. If a respondent had completed 85% or more of the CES-D items but less than 100% ($N = 10$), responses to missing items were imputed by using the mean of that person's answers to the nonmissing items.

An analysis of interitem reliability found the scale to be highly reliable among both Natives and Euro-Americans with a Cronbach's alpha of .90 and .86 for the two groups, respectively. In both instances, the scale's reliability compared favorably with the reliability measures (.84 to .90) reported by Radloff (1977).

Results

A description of the characteristics of the study sub-

TABLE 1
Characteristics of Study Sample, Exxon Valdez Study, 1990

Characteristic	Ethnicity		Significance
	Native (<i>N</i> = 188)	Euro- American (<i>N</i> = 371)	
Social Characteristics			
Age ($\bar{X} \pm SD$)	40.6 \pm 15.4	40.7 \pm 12.8	NS
Sex (% female)	55.9	46.8	< .05
Education (% high school graduate)	62.9	95.1	< .001
1989 Income (% \geq \$40,000)	36.4	64.7	< .001
Employed (%)	74.2	83.6	< .01
Marital Status (% married)	58.6	67.6	< .05
Living in small communities (%)	72.3	10.8	< .001
Exposure-Related Characteristics			
CES-D score ($\bar{X} \pm SD$)	11.1 \pm 10.1	6.8 \pm 7.6	< .001
Family Support score ($\bar{X} \pm SD$)	38.4 \pm 5.4	40.4 \pm 5.7	< .001
Difference in household income ($\bar{X} \pm SD$)	.9 \pm 2.5	.5 \pm 1.7	< .05
Social relations score ($\bar{X} \pm SD$)	.4 \pm 1.1	.3 \pm .8	NS

jects by ethnicity is provided in Table 1. The Alaskan Native group largely comprised Koniags, Aleuts, and Suqpiags (60.6%), Southeastern coast tribes (Tsimshian, Tlingit, and Haida; 28.3%), and Native groups indigenous to other parts of Alaska (11.1%). The Native group had a higher proportion of women than the Euro-American group ($\chi^2 = 4.1$; $df = 1$; $p < .05$). Euro-Americans, on the other hand, reported higher levels of education ($\chi^2 = 97.4$; $df = 1$; $p < .0001$) and 1989 total household income ($\chi^2 = 37.3$; $df = 1$; $p < .001$) than Natives.

Table 1 also includes comparisons of characteristics that may have been influenced by exposure to the oil spill itself. Natives had a significantly higher mean depressive symptom score ($F[1,545] = 30.6$; $p < .001$) than Euro-Americans. Natives also reported a significantly higher increase in median household income after the oil spill than Euro-Americans ($F[1,502] = 3.9$; $p < .05$). In contrast, Euro-Americans had a higher Family Support Scale score than Natives ($F[1,505] = 14.9$; $p < .001$).

The association between ethnicity and exposure to the oil spill is described in Table 2. Overall, Natives had a significantly higher mean Exposure Index score than Euro-Americans ($F[1,558] = 10.2$; $p < .01$). Significantly greater percentages of Natives reported working on cleanup activities, damage to commercial fishing areas used by the respondent or other household members, and effects of the spill on hunting, fishing, or gathering activities of any household members than Euro-Americans. However, there was no difference between the two groups in the percentage of study subjects residing

in the affected communities (*i.e.*, those in geographic proximity to the spill) and control communities.

The association between mean CES-D scores and each of the characteristics of exposure is presented in Table 3. Depressive symptomatology was significantly associated with: reported participation in cleanup activities and other forms of contact with the oil in Natives; reported damage to commercial fishing areas, use of affected areas, and residence in a community in geographic proximity to the spill in Euro-Americans; and in mean Exposure Index score and reported effects on hunting, fishing, and gathering activities in both Natives and Euro-Americans.

The associations between individual social characteristics, social and economic consequences of the oil spill, CES-D scores, and Exposure Index scores were assessed through a series of Spearman rank-order correlations (Table 4). Similar results were obtained using Pearson product-moment correlations, reflecting the approximations of normal distributions in the variables examined. Depressive symptomatology was directly associated with female gender, an increase in household income, and a decline in social relations, and inversely associated with age in Natives. Among Euro-Americans, depressive symptomatology was directly associated with female gender and a decline in social relations, and inversely associated with Family Support Scale score. The Exposure Index score was further associated with employment status, 1989 total household income, and decline in social relations in both Natives and Euro-Americans; inversely associated with age and female gender in Euro-Americans; and directly associated with an increase in total household income in Natives.

Further examination of the correlations between each of the predictor and outcome variables revealed a significant positive correlation between increase in total household income and decline in social relations in Natives ($r = .19$; $p = .012$) but not in Euro-Americans ($r = -.01$; $p = .88$). Decline in social relations, in turn, was unrelated to perceived family support in both Natives ($r = .02$; $p = .77$) and Euro-Americans ($r = .04$; $p = .48$). Perceived family support was also unrelated to increase in total household income in both Natives ($r = .07$; $p = .36$) and Euro-Americans ($r = -.02$; $p = .66$).

Finally, the direct and buffering effects of perceived family support were examined in a series of stepwise multiple regression models (Table 5). A decline in social relations was the strongest predictor of depressive symptoms in Natives. No direct or buffering effects of perceived family support on depressive symptoms were found in Natives. A decline in social relations was a significant independent predictor of depressive symptoms in Euro-Americans, in addition to female gender

TABLE 2
Characteristics of Exposure by Ethnicity, Exxon Valdez Study, 1990

Variable Level	Ethnicity				χ^2
	Natives (N = 188)		Euro-Americans (N = 371)		
	(N)	(%)	(N)	(%)	
Exposure					
Affected area used by household	102	54.3	187	50.5	.69
Participation in cleanup	72	38.3	71	19.1	24.06***
Other contact with oil	65	34.6	145	39.1	1.08
Property damaged or lost	16	8.5	32	8.6	.00
Damage to commercial fishing areas	90	47.9	131	35.3	8.24**
Effects on hunting, fishing, and gathering	91	48.4	105	28.3	22.14***
Reside in affected community	135	71.8	267	72.0	.00
Exposure Index score ($\bar{X} \pm SD$)		2.3 \pm 1.9		1.8 \pm 1.7	

* $p < .05$; ** $p < .01$; *** $p < .001$.

TABLE 3
Mean (\pm SD) CES-D Score by Exposure Status and Ethnicity, Exxon Valdez Study, 1990

Variable Level	Ethnicity					
	Natives (N = 188)			Euro-Americans (N = 371)		
	Yes	No	F	Yes	No	F
Exposure						
Affected area used by household	11.5 \pm 10.1	10.7 \pm 10.2	.2	7.8 \pm 8.1	5.9 \pm 6.8	5.9*
Participation in cleanup	13.7 \pm 12.4	9.5 \pm 8.1	7.9**	6.6 \pm 6.6	6.9 \pm 7.8	.9
Other contact with oil	13.3 \pm 12.3	9.9 \pm 8.5	4.9*	7.6 \pm 8.3	6.4 \pm 7.0	2.2
Property damaged or lost	14.4 \pm 11.3	10.8 \pm 10.0	1.9	8.5 \pm 9.0	6.7 \pm 7.4	1.5
Damage to commercial fishing areas	12.0 \pm 10.8	10.3 \pm 9.5	1.3	7.9 \pm 8.2	6.3 \pm 7.1	4.1*
Effects on hunting, fishing, and gathering	13.4 \pm 11.8	9.0 \pm 7.9	9.0**	8.7 \pm 8.6	6.1 \pm 7.0	8.7**
Reside in affected community	11.7 \pm 10.4	9.6 \pm 9.3	1.6	7.4 \pm 8.0	5.4 \pm 6.1	5.1*

* $p < .05$; ** $p < .01$.

TABLE 4
Correlations^a Between Social Characteristics, Social and Economic Consequences, CES-D Score, and Exposure Index Score by Ethnicity, Exxon Valdez Study, 1990

Variable	Ethnicity			
	Natives (N = 188)		Euro-Americans (N = 371)	
	CES-D	Exposure	CES-D	Exposure
Social Characteristics				
Age	-.17*	-.14	-.08	-.17***
Sex (1 = male, 2 = female)	.17*	-.06	.17***	-.14**
Education	<.01	<.01	-.06	.10*
Employment (1 = employed, 2 = unemployed)	.01	-.20**	.03	-.11*
1989 Household income	-.08	.29***	-.04	.23***
Marital status (1 = married, 2 = unmarried)	.11	.04	.03	.06
Community size (1 = small, 2 = large)	-.07	-.13	-.02	-.02
Oil Spill Consequences				
Change in household income	.19*	.30***	<.01	.04
Perceived family support	<.01	.13	-.05	-.10*
Decline in social relations	.40***	.31***	.18***	.32***

^aCorrelations are Spearman rank-order correlations, showing two-tailed levels of significance: * $p < .05$; ** $p < .01$; *** $p < .001$.

and Exposure Index score. Although perceived family support was not directly associated with depressive symptoms in Euro-Americans, it did serve to buffer the effects of exposure to the oil spill in this ethnic group, as indicated by the significant interactive effect of exposure and Family Support Scale score on depressive symptoms.

Discussion

In this study, both Alaskan Native and Euro-Americans ethnic groups were affected by the Exxon Valdez oil spill. The association between exposure to the oil spill and subsequent cleanup efforts and depressive symptomatology conforms with the findings of other

TABLE 5
Hierarchical Stepwise Regression of CES-D Score on Exposure, Social Characteristics, and Consequences of Exposure by Ethnicity, Exxon Valdez Study, 1990

Variable	Ethnicity					
	Natives (N = 188)			Euro-Americans (N = 371)		
	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
Age	-.13	-.11	-.11	-.04	-.05	-.04
Sex (1 = male, 2 = female)	.18*	.12	-.12	.19***	.21***	-.21***
Exposure	.16*	.05	.53	.16**	.09	.92*
Family support	—	-.04	.03	—	-.09	.07
Decline in social relations	—	.35***	.35***	—	.17**	.18**
Difference in household income	—	.14	.14	—	<.01	<.01
Exposure × family support	—	—	-.50	—	—	-.83*
Constant	6.41	11.70	5.97	2.42	6.85	-2.21
R	.30	.47	.48	.24	.32	.34
R ²	.09	.22	.23	.06	.10	.11
Adjusted R ²	.08	.19	.19	.05	.08	.09
F	5.98***	7.05***	6.14***	6.41***	5.47***	5.37***

* $p < .05$; ** $p < .01$; *** $p < .001$.

studies of this population which found that exposure to the oil spill was associated with significant increases in the prevalence of generalized anxiety disorder and posttraumatic stress disorder, reports of alcohol and drug abuse and domestic violence within the community and among families and friends, rates of selected chronic diseases, and levels of social conflict (Palinkas et al., in press). These results also conform with other studies which found elevated rates of depressive symptomatology and other psychiatric disorders associated with exposure to both natural and technological disasters. For instance, research on the impacts of the Three Mile Island accident by Baum and his colleagues (1983; Gatchel et al., 1985) found that residents reported significantly higher levels of somatic complaints, depression, anxiety, fear, suspiciousness, and alienation than controls. Exposure was associated with increased rates of generalized anxiety disorder, posttraumatic stress disorder, and single-episode depression among victims of the Mount St. Helens disaster (Shore et al., 1986a, 1986b). Although a study of the Times Beach flood and dioxin contamination found no significant increase in rates of depression, anxiety, and posttraumatic stress disorder in highly exposed individuals (Robins et al., 1986), another study of this disaster found that exposed residents had higher rates of reported health decline than indirect exposure and no exposure groups (Smith et al., 1986).

However, the two ethnic groups differed with respect to the degree and type of exposure, appraisal of the event as stressful, the use of perceived family support to cope with the event, and level of depressive symptomatology. Although equal proportions of Natives and Euro-Americans resided in the affected and control communities, significantly greater percentages of Natives than Euro-Americans reported participation in

cleanup activities, damage to commercial fisheries, and effects on subsistence activities. Furthermore, by disrupting traditional patterns of subsistence production and distribution, exposure to the oil spill had greater cultural significance for the Natives because these activities dominate the social relations and cultural framework of Alaskan Native communities (Berger, 1985; Fienup-Riordan, 1983). Involvement in cleanup activities precluded participation in subsistence activities, and Native residents of the affected communities were afraid to consume subsistence items in fear that they were contaminated by the oil, despite the efforts of the Alaska Department of Fish and Game to convince them otherwise.

The conclusion that Natives and Euro-Americans differed with respect to the oil spill because of its impact on subsistence activities is further supported by themes in ethnographic data collected in 12 Native communities (Impact Assessment, Inc., 1990). For example, subsistence activities in one Prince William Sound Native village were completely disrupted by the oiling of their beaches and fishing grounds. This disruption was more than an economic threat and a disruption of social activities and relationships such as experienced to some degree by all exposed communities; it was also perceived to be a threat to the continued survival of Native culture and the individual identity that derives from it. As expressed by one informant from this community: "When we worry about our subsistence way of life we worry about losing our identity . . . it (subsistence) is that spirit that makes you who you are, makes you think the way you do and act the way you do and how you perceive the world and relate to the land. Ninety-five percent of our cultural tradition is now subsistence . . . it's what we have left of our tradition" (Palinkas et al., in press).

In addition to differences in level of exposure to the oil spill event, Natives and Euro-Americans also appear to differ with respect to their appraisal of the event as stressful. For instance, although Natives were more likely than Euro-Americans to report damage to commercial fisheries resulting from the spill, such damage was associated with level of depressive symptomatology in Euro-Americans but not in Natives. On the other hand, the large amounts of cash income earned from the oil spill cleanup activities was significantly associated with depressive symptoms among Natives but not among Euro-Americans. An earlier study of Yup'ik Eskimos in the Bristol Bay area found that the influx of cash earned from commercial salmon fishing in the late 1970s and early 1980s resulted in increased social differentiation among formerly economically homogeneous Native communities (Palinkas, 1987). In the present study, Natives appear to have profited from participating in oil spill cleanup activities, reflected in the significant increase in total household income. However, this profit was appraised by Natives as a source of stress because it led to increased social differentiation and conflict, since not everyone profited equally. In the predominately Native communities, the economic gains were counterbalanced by social losses, because those people with whom a Native resident might have a potential conflict were often members of extended families who were bound together in networks of subsistence production and distribution. Faced with concerns about their food supply for the year, the unequal access to income derived from cleanup activities meant that some members of these subsistence networks would be able to purchase nonsubsistence food and other items with cash while others would not be able to do so. Thus, Native residents who profited from oil spill cleanup activities were more likely to be depressed because they were not engaged in subsistence activities on the one hand and were possibly ostracized from extended family networks for not engaging in subsistence production and distribution on the other.

Data collected from ethnographic fieldwork conducted as part of this study provide additional support to this conclusion (Impact Assessment, Inc., 1990). For instance, a resident of one Kodiak Island Native community expressed distress with a close relative who had exploited the money-making opportunities presented by the oil spill that resulted in other families not receiving economic benefits they otherwise would have received. When asked about what resort existed for resolving such conflict, the informant replied, "Some of these people that did that . . . we have a feeling about our relations . . . a lot of people are related . . . I'm not gonna go file a suit against my (relative) over money, we don't usually do things like that. . . ." In other situations like this, informants noted that the distress experi-

enced with the actions of family members were largely unexpressed because of the need to maintain amicable relationships so that cooperative subsistence activities could be sustained. This contrasts sharply with residents in predominately non-Native communities where there was also conflict about unequal access to money-making opportunities or perceived exploitation of these opportunities. However, in these non-Native communities, the conflicts more often resulted in the rupture of friendships or open conflict among family members, whereas in Native communities these conflicts were often unexpressed or resulted in severing necessary cooperative working relationships if they were expressed.

The ethnographic data further illustrate how the sociocultural factors in Native communities interacted with the organization of the oil spill cleanup to influence the appraisal of cleanup activities as stressful among Native residents. In another Kodiak Island Native community, conflict developed among close relatives and neighbors over the division of labor in the hiring of labor for oil spill cleanup work. The nonresident cleanup contractor hiring local labor gave positions of leadership to younger persons who were to supervise older residents. This caused strains in the relationships of family members and work crews, whose cultural values were that the elder members of the work crew were the ones who should be in charge and earning the higher wages that went with the supervisory position. In another instance, a woman was given a position of hiring authority for village labor, which especially distressed the male villagers who believed that a man should have the position. These examples express a theme in the ethnographic data about how Native social relationships were affected by the oil spill in unique ways that were less pronounced in non-Native communities.

Natives and Euro-Americans also differed with respect to the role of perceived family support as a moderator of the stress-depressive symptomatology relationship. Although exposure to the oil spill was significantly associated with a decline in social relations and increased social conflicts among Natives and Euro-Americans alike, it was correlated with a decline in perceived family support among Euro-Americans only. Moreover, perceived family support was not inversely associated with a decline in social relations or depressive symptomatology in either ethnic group. However, such support buffered the effects of exposure on depressive symptoms in Euro-Americans but not in Natives. It would seem, therefore, that the meaning attached to perceived family support in the context of coping with a technological disaster varies by ethnicity.

Nevertheless, it is clear that the oil spill and subsequent cleanup efforts resulted in a decline in traditional

social relations with family members and nonkin groups for both Natives and Euro-Americans. This decline was also a significant predictor of depressive symptoms in both ethnic groups. Since these relations were with individuals and groups who otherwise served as a source of social support, it is possible that the disaster may have had a greater impact on the quality and quantity of support actually received than on the normative construct of perceived family support available. Such a conclusion emphasizes the point addressed by Thoits (1982), that a decline in social support may itself be a source of stress. It also supports the contention expressed by Kleinman (1987) and Young (1980) that stressors and supports are not separable, discrete categories, but exist in a mutually determining relationship. As Kleinman observed, in the historical context of relationships with family members and friends, events such as the Exxon *Valdez* disaster "are given personal meaning and the social significance they bring to the person is modulated or even transformed" (Kleinman, 1987, p. 65).

The two ethnic groups also differed significantly with respect to the level of depressive symptomatology. In part, this difference may be attributed to the ethnic differences in exposure, appraisal, and coping. However, Alaskan Natives in general have higher rates of psychiatric disorders than non-Natives, reflected in significantly increased rates of suicide, alcohol-related morbidity and mortality, and inpatient psychiatric admissions (Kraus and Buffler, 1979; Hlady and Mid-daugh, 1988). In addition, although some studies have found the CES-D scale to have cross-cultural validity (Aneshensel et al., 1983; Roberts, 1980), other studies have also found ethnic differences in the factor structure of the CES-D items (Baron et al., 1990; Guarnaccia et al., 1989). A number of factors have been postulated to account for these differences, including a response bias associated with a need for social approval among certain ethnic groups (Kinzie and Manson, 1987) or culturally patterned ways of responding to questions about symptomatology (Guarnaccia et al., 1990); the fact that the depression measured by the CES-D is itself a cultural category (Kleinman and Good, 1985); and differences in cultural meanings and idioms of distress (Kleinman and Good, 1985). Thus, the significantly higher levels of depressive symptomatology in Alaskan Natives compared to Euro-Americans found in this study may be attributed, in part, to factors unrelated to exposure.

It is also possible that the lumping together of Alaskan Natives who represent distinct cultural traditions and who reside in different social environments (*i.e.*, large predominately non-Native cities versus small, predominately Native villages) may obscure important intragroup differences with respect to the expression of

distress or exposure to the disaster. However, we found no significant differences between Aleuts, Athapaskan Indians, Southeast Coast Indians, and other Alaskan Native groups represented in this study with respect to the levels of depressive symptomatology and exposure to the oil spill (data not shown). Similarly, we found no significant difference between the predictor variables (exposure, age, gender, education, employment, and income) and outcome variables (depression, perceived family support, social relations, and increase in household income) between Natives living in small, predominantly Native communities and Natives living in large, predominantly non-Native communities.

Finally, as with any cross-sectional study, it was not possible to determine causality in the observed relationships. However, the consistent pattern of increasing rates of depressive symptoms with increasing exposure to the spill and subsequent cleanup efforts does suggest a dose-response relationship among both ethnic groups. Nevertheless, the existence of a causal association between the oil spill and patterns of social and psychiatric disorder can only be resolved by comparing baseline measures of these conditions with a set of prospective measures across time.

Conclusion

The Exxon *Valdez* oil spill had a profound impact on the psychological health and well-being of both Alaskan Natives and non-Natives residing in the affected communities. A significant association between mean depressive symptom scores and exposure to the oil spill and subsequent cleanup efforts was found in both Alaskan Natives and Euro-Americans. However, the two ethnic groups differed with respect to the following: participation in the spill cleanup activities and the cultural significance attached to exposure and its effect on traditional subsistence activities; appraisal of the socioeconomic stratification resulting from differential participation in the spill cleanup activities as stressful; the role of perceived family support as a moderator of the relationship between disaster-related stress and depressive symptomatology; and symptom expression. In both ethnic groups, the decline in kin and nonkin-based social relations was a significant independent predictor of depressive symptomatology. In light of the experience of the Alaskan Natives and Euro-Americans living in the affected communities, the psychological distress, affect, or emotions detected by standardized diagnostic instruments such as the CES-D may be considered as expressions and constituents of social relations (Kleinman and Good, 1985) which differ from one ethnic group to the next and which are themselves affected by the disaster and its aftermath.

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