

Ethnic Differences in Symptoms of Post-traumatic Stress after the Exxon Valdez Oil Spill

Lawrence A. Palinkas, PhD;¹ John S. Petterson, PhD;² John C. Russell, PhD;³ Michael A. Downs, PhD⁴

1. Department of Family and Preventive Medicine, University of California, San Diego USA
2. Impact Assessment, Inc., La Jolla, California USA
3. InfoMatrix, Inc., Placerville, California USA
4. EDAW, Inc, San Diego, California

Correspondence:

Lawrence A. Palinkas, PhD
Department of Family and Preventive Medicine
University of California, San Diego
9500 Gilman Drive
La Jolla, CA 92093-0807 USA
E-mail: lpalinkas@ucsd.edu.

Keywords: disasters; ethnicity; Exxon Valdez; post-traumatic stress

Abbreviations:

CI = 95% confidence interval
DIS = diagnostic interview schedule
OR = odds ratio
PTSD = post-traumatic stress disorder

Web publication:

Abstract

Introduction: Previous studies have reported ethnic differences in the prevalence of post-traumatic stress disorder (PTSD), but the reasons for these differences remain unclear.

Hypothesis: Ethnic differences in the prevalence of PTSD may reflect ethnic differences in (1) exposure to traumatic events; (2) appraisal of such event as traumatic; and (3) culturally-determined responses to standardized diagnostic instruments, reflecting differences in cultural meanings associated with physical symptoms and idioms of distress.

Methods: Ethnic differences in risk factors and factor structures of PTSD symptoms were examined in 188 Alaskan Natives and 371 Euro-Americans exposed to the Exxon-Valdez oil spill in 1989.

Results: High levels of social disruption were associated with PTSD one year after the oil spill in both ethnic groups. However, low family support, participation in spill clean-up activities, and a decline in subsistence activities were significantly associated with PTSD in Alaskan Natives, but not in Euro-Americans. Factor analysis of the Diagnostic Interview Schedule PTSD subscale revealed five factors for both ethnic groups. However, the items comprising these factors were dissimilar.

Conclusions: These results suggest that social disruption is sufficiently traumatic to be associated with symptoms of post-traumatic stress, but that a diagnosis of PTSD must take into consideration local interpretations of these symptoms.

Palinkas LA, Petterson JS, Russell JC, Downs MA: Ethnic differences in symptoms of post-traumatic stress after the Exxon Valdez oil spill. *Prehosp Disast Med* 2004;19(1):102-112.

Introduction

In recent years, there has been increasing attention devoted to the ethnocultural aspects of post-traumatic stress disorder (PTSD).¹⁻⁶ Although studies of refugee populations suggest that the PTSD is a valid construct in all ethnocultural groups, studies of military veterans,⁷⁻¹¹ disaster victims,¹²⁻¹⁴ and the general population have reported ethnic differences in symptoms of post-traumatic stress and the prevalence of the PTSD.¹⁵ One possible explanation for these differences is that exposure to certain events or to the severity of the event varies by ethnicity. For instance, higher rates of the PTSD among African-Americans in Vietnam may be due to their disproportionate representation in combat units. Similarly, higher rates among minority groups to natural disasters may reflect differences in location and quality of residence that are functions of socioeconomic status.¹⁶ However, Black and Hispanic military personnel were not disproportionately exposed to combat relative to non-Hispanic, white personnel,¹¹⁻¹⁷ and the lower socioeconomic status of many disaster victims may account for higher rates of psychiatric disorders independent of exposure to the disaster.¹⁶

A second possible explanation for ethnic differences in the prevalence of the PTSD subsequent to certain events is that they may be considered to be traumatic to one ethnic group and not to another. The criteria for a traumatic event were 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".¹⁸ The revised criteria take into account the possibility that "different people can have profoundly different conceptions as to what constitutes a realistic 'threat'".⁵ It also raises 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.¹⁹

It also may 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 the PTSD and poor social support in Vietnam veterans and disaster victims^{11, 20-23} and the loss of members of social networks in natural disasters and wars.⁷ 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.¹⁹

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. Hobfall 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.²⁴ 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 value as well as symbolic value in that they help to define for people who they are.

A third potential explanation for the ethnic differences in symptoms of post-traumatic stress and the prevalence of the PTSD is that patterns of response to standardized diagnostic instruments are culturally-determined, reflecting differences in cultural meanings associated with physical symptoms and idioms of distress. For expressions of emotions, the symptoms that characterize the diagnosis of the PTSD (i.e., re-experiencing, avoidance, and arousal) are culturally-constructed and subject to local variations in their expression (presence or absence of specific symptoms), interpretation as to their meaning (bereavement or pathology), and social significance (acceptance or isolation).^{1, 4-6} These local variations often are reflected in differences in patterns of responses to standardized diagnostic instruments,^{25, 26} making the interpretation of these responses as evidence of a "valid" clinical construct somewhat questionable.

The Exxon Valdez oil spill provides a unique opportunity to examine these potential explanations for ethnic differences in symptoms and prevalence of the PTSD. Contrary to the differential exposure hypothesis, a series of studies conducted approximately one year after the Exxon

Valdez oil spill found no ethnic group differences in the prevalence of post-spill PTSD despite the fact that Alaskan Natives reported more exposure than other ethnic groups to the oil spill and participation in spill clean-up.²⁷ On the other hand, increasing exposure to the oil spill and participation in subsequent clean-up activities were associated significantly with the prevalence of the PTSD in Alaskan Natives, but not in other ethnic groups.²⁸ The destruction of the natural resources is believed to have posed a greater threat to the social resources of the Alaskan Natives than it did to the social resources of other ethnic groups because social relations of Alaskan Natives are grounded in activities of subsistence production and distribution. However, the earlier studies did not specifically examine whether the observed ethnic differences could be attributed to cultural differences in the conservation of resources,²⁴ or to differences in the patterns of response to the questions used to identify individuals who were symptomatic of the PTSD.

To address these issues, we conducted further analyses on data collected approximately one year after the oil spill to determine if the prevalence of post-traumatic stress disorder was associated with the disruption of subsistence activities and/or social relations in either ethnic group, and to compare the factor structures of symptoms of PTSD as reported by Alaskan Natives and Euro-Americans living in Alaska at the time of the oil spill.

Methods

Subjects

A survey of 714 households in 13 communities was conducted between 30 March and 15 May 1990. Eleven of these communities were in the region directly exposed to the oil spill itself. In addition, two communities in Southeast Alaska that were away from the oil spill served as a source of unexposed respondents. These two were selected because of their similarities to the two major types of communities in the affected region with respect to their demographic (large, predominately non-Native vs. small, predominately Native) and economic (based primarily on commercial extraction of natural resources vs. heavily involved in subsistence production and distribution) characteristics.

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 community, however, the number and location of households was 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.

After the sampling frame for each community was completed, random samples of households were 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,

Characteristics	Alaskan Natives (n = 188)	Euro-Americans (n = 371)
Age (x ±SD)	40.6 ±15.4	40.7 ±12.8
Gender (% female)	55.9*	46.8
Education (% high school graduate)	62.9***	95.1
1989 Income (% >\$40,000)	36.4***	64.7
Unemployed (%)	18.8	14.8
Marital status (% married)	58.6*	67.6
Community size (% living in small communities)	72.3***	10.8
Subsistence activities (% reporting decline)	54.8*	45.2
Family support score (x ±SD)	38.4 ±5.4***	40.4 ±5.7
Social Disruption index score (x ±SD)	2.6 ±3.6	2.2 ±2.8

Prehospital and Disaster Medicine © 2004 Palinkas

Table 1—Characteristics of Exxon Valdez study sample by ethnicity (x ±SD = mean ±standard deviation; n = number) (**p* < 0.05; ***p* < 0.01; ****p* < 0.001)

Chenega Bay, Chignik, and Akhiok, intentionally were over-sampled at a 50% or higher ratio based on the total number of households to obtain sufficient numbers of Alaskan Natives for analysis. Replacement households, necessitated in the case of refusals or unoccupied dwellings, also were 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 birthdates. 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, the person with the next closest birthdate was selected. Informed consent was obtained from each respondent after the interview procedures had been fully explained. Face-to-face interviews were conducted by 15 trained fieldworkers and lasted between 45 and 120 minutes.

Individuals from 599 (84%) of all randomly selected households agreed to participate. The sociodemographic characteristics of the sample were compared to those reported for each community in the most recent local census available. Overall, the sample was representative of the population of each community with respect to age (excluding residents under 18 years of age), gender, and ethnicity. Incomplete information resulted in the elimination of five respondents, leaving a total sample size of 594.

Measures

Demographic variables: Demographic variables examined included age, gender, ethnicity, socioeconomic status, marital status, and community size. Socioeconomic status was determined on the basis of the number of years of formal education, median household income for 1989, and employment status. The three primary Native cultural groups represented in this study were the Aleuts, Pacific Eskimo (Koniag, Chugach, and Unegkurmiut), and Southeast Coast Indians (Tsimshian, Haida, and Tlingit). However, these groups all were placed into one large ethnic group (n = 188) for analysis because of extensive inter-group kin ties, dependence on similar subsistence resources and practice of similar modes of resource production and distribution, and similar history of contact with the west.²⁹ 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: Following the procedures utilized in cross-sectional studies of previous disasters,^{30,31} the impact of the oil spill was determined by classifying study participants on the basis of their exposure to the oil spill and subsequent events. This was assessed 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 clean-up activities of the oil spill?; (3) Are there any other ways that you came into contact with the oil spill or clean-up 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 clean-up?; (5) Did the oil spill cause any damage to the areas you or other household members fish commercially?; and (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", then, the responses were summed to provide a continuous measure of exposure with a range of 0 to 6 in an ordinal scale. The mean exposure score for all study respondents was 1.97 ±1.77. Factor analyses revealed that all six questions formed a single principal component in both ethnic groups, providing evidence that the items measured a common underlying concept.³² The validity of responses to these questions indicate the extent to which individuals were involved with the oil spill and its aftermath was determined by the use of extended interviews with study participants. The Exposure Index was found to have an internal consistency reliability (Cronbach's alpha) of 0.74 for Natives and 0.73 for Euro-Americans in the study population.

Subjects were classified into three groups on the basis of maximum level of exposure. Residents in the affected 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).

Characteristics	Alaskan Natives (%)	Euro-Americans (%)
Total	12.2	8.6
Age		
<40 yrs	15.0	8.9
>40 yrs	8.8	8.2
Gender		
Men	6.0	7.1
Women	17.1*	10.4
Education		
≥12 yrs	12.0	10.4
<12 yrs	13.6	7.6
1989 household income		
≥\$40,000	9.1	8.5
<\$40,000	14.5	9.1
Employment status		
Employed	14.6	9.5
Unemployed	2.9	5.7
Marital status		
Married	10.1	9.6
Not married	15.6	6.7
Living in small community		
No	9.8	8.2
Yes	13.2	12.5
Subsistence activities		
Increase/no change	3.8	6.1
Decrease	20.6***	12.8*
Family support		
High	8.0	10.4
Low	19.3*	8.1
Social disruption		
Low	3.2	4.7
High	21.1***	12.4**

Prehospital and Disaster Medicine © 2004 Palinkas

Table 2—Prevalence of post-traumatic stress disorder by ethnicity and social characteristics (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$)

Exposed residents were dichotomized further into “low-exposed” and “high-exposed” groups on the basis of a median split.

Subsistence: The impact of the oil spill on traditional subsistence production and distribution activities was assessed by asking respondents the time they normally spent hunting, fishing, and gathering, time spent with people from other households on these activities, the amount of harvested resource foods shared with others and with elders, the amount of harvest resource foods received from other families, the number of household members engaged in subsistence production activities, and the opportunities for children to learn subsistence production skills. Respondents were asked whether these activities increased, stayed the same, or decreased since the spill compared with the same time in 1988. Responses were coded as “1” if respondents reported a decline in activities, “0” if respondents reported no change in activities, and “-1” if respondents reported an increase in activities. This Subsistence Disruption Index had an internal consistency reliability of 0.90 for both Natives and Euro-Americans in the study population.

Family Support and Social Relations: 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 from an instrument developed by Procidano and Heller relating to the types of support (moral, emotional, problem-solving) obtained from and provided to family members.³³ This 10-item Family Support Scale (FSS) had an internal consistency reliability of 0.86 for Natives and 0.88 for Euro-Americans in the study population.

The impact of the oil spill on social relations was examined by asking respondents about the following: (1) changes in time spent visiting or socializing with other household members, sharing resources with family members, overall household time together, participating in community celebrations or activities, participating in religious activities, visiting or socializing with friends, volunteering, and participating in clubs or organizations; (2) changes in relations with spouse, children, relatives living in the home, relatives not living in the home, neighbors and friends, people from other communities, and co-workers; (3) spill-related arguments with household members and other family and friends; and (4) conflicts with outsiders and friends. Responses to categories 1 and 2 questions were coded as “1” if respondents reported a decline, a “0” if respondents reported no change or not applicable (e.g., they were not married or had no children), and a “-1” if respondents reported an increase in activities or responses. Responses to categories 3 and 4 questions were coded as “1” if the answer was yes and “0” if the answer was no. The Social Disruption Index was found to have an internal consistency reliability of 0.88 for Natives and 0.81 for Euro-Americans in the study population.

Type of exposure	Alaskan Natives (n=188)		Euro-Americans (n=371)	
	Yes (%)	No (%)	Yes (%)	No (%)
Affected area used by household	15.7	8.1	10.7	6.6
Participation in clean-up	20.8**	6.9	9.0	7.0
Other contact with oil	18.5	8.9	9.7	8.0
Property damaged or lost	37.5**	9.9	9.4	8.6
Damage to commercial fishing areas	18.9**	6.1	11.5	7.1
Effects on hunting, fishing and gathering	19.8**	5.2	14.3*	6.4
Not exposed	5.8		8.3	
Low exposed	5.3		6.8	

Prehospital and Disaster Medicine © 2004 Palinkas

Table 3—Prevalence of post-traumatic stress disorder by exposure and ethnicity (* $p < 0.05$; ** $p < 0.01$)

Post-traumatic Stress Disorder (PTSD): Following a procedure similar to the one adopted in other community-based studies of post-traumatic stress disorder,^{12,34,35} a modified form of Version III of the Diagnostic Interview Schedule (DIS) was used to identify cases of post-traumatic stress disorder (PTSD), based on DSM-IIIIR criteria.³⁶⁻³⁷ A respondent was diagnosed with the PTSD if he or she experienced one or more of the following symptoms lasting a month or more: persistent unpleasant or disturbing memories, repeated bad dreams or nightmares, feeling worse when in a situation that reminded you of a past event, flashback; three or more of the following: loss of interest in or stop caring about previously important activities, trying hard not to think of something that happened to you or avoidance of feelings about past event, avoidance of places or activities that reminded you of something that had happened, avoidance of other people, loss of feeling or reduction in emotion, change in future plans, and inability to remember part of past; and two of the following: difficulty falling or staying asleep, irritability or outbursts of anger, difficulty concentrating; hypervigilance, startled by noise, and physiological reactivity upon exposure to events that symbolize or resemble as aspects of the traumatic event, manifested either by feeling panicky, fearful or anxious, or by autonomic hyperactivity (sweating, breathing heavily, heart pounding).

Statistical Analysis

Prevalence rates of post-traumatic stress disorder, based on respondents' recollections of having experienced the

symptoms within the past year (i.e., after the oil spill), were calculated using a computer algorithm that applied DSM-IIIIR decision rules. Comparison of prevalence rates and proportional distributions of demographic characteristics were based on chi-square tests, while t-tests were used in comparisons of group means. Types of exposure to the oil spill and other potential risk factors for the PTSD, including age, gender, ethnicity, marital status, socioeconomic status variables, decline in subsistence activities, family support, and disruption of social relations were analyzed by means of multivariate hierarchical logistic regressions which were used to calculate odds ratios (ORs) and 95% confidence intervals (CIs) using SPSSPC software to estimate adjusted odds of a diagnosis of PTSD associated with each factor, controlling for all other factors for each ethnic group.

Chi-square tests also were used to compare the prevalence of individual PTSD symptoms between Alaskan Natives and Euro-Americans. Multivariate logistic regression analysis was used to calculate the odds that Alaskan Natives would report a specific PTSD symptom relative to Euro-Americans after controlling for other potential confounders including exposure to the oil spill and sociodemographic characteristics known to be associated with PTSD. Responses to the DIS items assessing each of these symptoms were factor analyzed to determine if the instrument elicited the same constructs in Alaskan Natives and Euro-Americans. Exploratory factor analyses were conducted because the lack of data on the structure of the PTSD component of the DIS in these populations precluded the use of an a priori structure for purposes of comparison of the two ethnic groups. Principal components analysis with varimax rotation was employed in all of the factor analyses. A minimum eigenvalue of 1 was used as exclusionary criteria for the factors.

Results

The social and demographic characteristics of the Alaskan Native and Euro-American respondents in the household survey are summarized in Table 1. Compared to Euro-Americans, the Alaskan Native sample included a significantly greater proportion of women and residents of small communities and a significantly smaller proportion of high school graduates, residents of households earning \$40,000 or more in 1989, and married adults. Alaskan Natives also reported more disruption to traditional subsistence activities and less family support than did Euro-Americans.

Although the prevalence of post-traumatic stress disorder subsequent to the oil spill was slightly higher among Alaskan Natives, the difference between the two ethnic groups was not statistically significant (Table 2). However, Alaskan Native women were more likely to have a diagnosis of PTSD than were Native men. No gender difference was found among the Euro-Americans. Similarly, the prevalence of PTSD was associated with low family support among Alaskan Natives but not among Euro-Americans ($p < 0.05$). The prevalence of PTSD was significantly associated with reported declines in subsistence activities and amount of social disruption in

Risk Factors	Alaskan Natives		Euro-Americans	
	Step 1 OR (95%CI)	Step 2 OR (95%CI)	Step 1 OR (95%CI)	Step 2 OR (95% CI)
Demographic characteristics				
Age (<40 vs ≥ 40 yrs) ^a	1.0 (0.3-3.5)	0.7 (0.1-3.3)	0.7 (0.3-1.8)	0.7 (0.2-2.1)
Gender (female vs male)	20.7 (3.9-110.8)	17.1 (2.4-122.2)	1.7 (0.7-4.4)	2.1 (0.7-6.4)
Education (< 12 vs ≥ 12 yrs)	1.7 (0.4-7.7)	2.6 (0.4-17.5)	2.3 (0.9-5.7)	3.3 (1.2-9.3)
1989 household income (< \$40,000 vs ≥ \$40,000)	1.8 (0.4-7.1)	2.2 (0.4-11.6)	1.1 (0.4-3.2)	1.5 (0.5-4.6)
Employment status (unemployed vs employed)	0.2 (<0.1-0.5)	0.1 (<0.1-0.7)	0.4 (0.1-1.6)	0.3 (<0.1-1.4)
Marital status (unmarried vs married)	3.0 (0.8-11.0)	3.2 (0.8-13.5)	0.7 (0.2-2.1)	0.6 (0.2-2.1)
Family support (low vs high)	14.4 (2.9-71.5)	17.8 (2.4-130.4)	1.3 (0.5-3.3)	1.7 (0.6-4.8)
Community size (small vs large)	1.6 (0.3-7.9)	1.2 (0.2-8.0)	2.4 (0.7-7.8)	2.5 (0.7-9.0)
Exposure measures (yes vs no)				
Area used by household affected	0.6 (0.1-2.9)	0.2 (<0.1-1.6)	1.8 (0.6-5.4)	1.9 (0.6-6.2)
Work on spill clean-up	6.2 (1.2-32.2)	5.0 (0.6-38.7)	0.4 (0.1-1.7)	0.7 (0.2-3.0)
Other contact with spill	0.4 (<0.1-1.7)	0.3 (<0.1-1.8)	0.7 (0.2-1.9)	0.8 (0.3-2.6)
Property lost or damaged	5.6 (1.1-31.2)	6.0 (0.8-44.0)	2.0 (0.5-8.7)	0.5 (<0.1-4.5)
Commercial fisheries damaged	0.8 (0.2-4.6)	0.9 (0.1-6.8)	0.9 (0.3-2.8)	0.9 (0.3-3.0)
Subsistence (decrease vs increase/no change)	24.3 (3.0-196.7)	7.8 (0.7-91.6)	2.0 (0.7-5.4)	1.1 (0.3-3.9)
Social disruption (high vs low)	-	13.9 (1.2-163.3)	-	3.6 (1.1-12.0)

Prehospital and Disaster Medicine © 2004 Palinkas

Table 4—Odds ratios (OR = 95% Confidence Intervals) for post-traumatic stress disorder associated with sociodemographic characteristics, exposure to the Exxon Valdez Oil Spill, and social disruption, by ethnicity (^a Risk group identified first in parentheses)

both ethnic groups ($p < 0.001$, $p < 0.05$); however, Alaskan Natives reporting a decline in subsistence or high levels of social disruption were seven times more likely to have PTSD than were Natives reporting an increase or no change in subsistence activities or low levels of social disruption. In contrast, Euro-Americans reporting a decline in subsistence or high levels of social disruption were two times more likely to have PTSD than were Euro-Americans reporting an increase or no change in subsistence activities or low levels of social disruption.

The association between exposure to the oil spill and the post-spill prevalence of post-traumatic stress disorder in the two ethnic groups is described in Table 3. Among Alaskan Natives, PTSD was significantly associated with participation in clean-up activities ($p < 0.01$), reports of property lost or damaged as a result of the spill ($p < 0.01$), and effects on hunting, fishing and gathering ($p < 0.01$). Among Euro-Americans, PTSD was significantly associated only with effects on hunting, fishing and gathering ($p < 0.05$). PTSD was significantly ($p < 0.01$) associated with increasing exposure to the oil spill among Alaskan Natives but not among Euro-Americans.

Hierarchical logistic regression analyses were performed to test the effects of the demographic characteristics, measures of exposure to the spill and clean-up, and social disruption on the likelihood of post-traumatic stress disorder in either ethnic group. Separate analyses were conducted for Alaskan Natives and Euro-Americans in a two-step procedure. The first step (Step 1) included all potential demographic and exposure-related risk factors; the second step (Step 2) included level of social disruption. Among Alaskan Natives, female gender, being employed, low family support, participation in oil spill clean-up activities, having property lost or damaged as a result of the spill, and a decline in subsistence activities were associated with PTSD in Step 1 (Table 4). In Step 2, female gender, being employed, and low family support remained as statistically significant independent predictors of the development of PTSD. Alaskan Natives who reported high levels of social disruption were 14 times more likely to have PTSD after the oil spill than were Natives who reported low levels of social disruption, independent of the other potential risk factors. Among Euro-Americans, none of the potential risk factors were significantly associated with PTSD in Step 1;

	Alaskan Natives	Euro-Americans	OR	95% CI
Re-Experiencing				
Unpleasant memories	20.2**	11.6	1.74	1.07-2.82
Bad dreams	10.6	4.9	2.12	1.08-4.14
Disturbing memories	17.6	11.9	1.39	0.84-2.29
Felt worse	13.3	7.3	1.66	0.92-2.99
Flashback	12.2	8.1	1.38	0.77-2.48
Feel anxious, fearful or panicky	14.4	10.0	1.33	0.77-2.28
Physical reaction	10.1*	4.6	2.04	1.02-4.07
Avoidance				
Lost interest in activities	17.0	12.9	1.16	0.70-1.91
Tried not to think about past	23.4**	14.3	1.64	1.04-2.58
Stopped caring about activities	8.0	6.5	1.13	0.57-2.23
Avoid places or activities	11.8	7.5	1.39	0.76-2.54
Avoid feelings	13.8*	7.3	1.74	0.97-3.12
Cut off from others	14.9*	9.2	1.49	0.86-2.57
Could not feel	11.2*	5.7	1.78	0.93-3.39
Change in plans	20.7	17.3	0.99	0.62-1.58
Couldn't remember parts of past	14.4	16.4	1.24	0.75-2.05
Arousal				
Trouble concentrating	19.7**	11.3	1.78	1.09-2.90
Stay on guard	17.6	14.3	1.07	0.65-1.74
Sleep problems	14.4	14.0	1.00	0.60-1.66
Startled by noises	6.4	5.1	1.13	0.53-2.41
Bothered by little things	19.1	13.7	1.27	0.78-2.06

Prehospital and Disaster Medicine ©2004 Palinkas

Table 5—Prevalence of post-traumatic stress disorder symptoms by ethnicity (OR = odds ratio; 95% CI = 95% confidence interval) (* $p < 0.05$; ** $p < 0.01$)

in Step 2, only education and level of social disruption were statistically significant independent predictors for the development of PTSD. Euro-Americans reporting high levels of social disruption were 3.6 times more likely to have PTSD than were those reporting low levels of social disruption, independent of other potential risk factors.

The PTSD subscale of the DIS displayed high internal consistency in both ethnic groups (Cronbach's alpha = 0.88 in Euro-Americans and 0.91 in Alaskan Natives). However, statistically significant higher proportions of

Alaskan Natives than Euro-Americans reported unpleasant memories, attempts to avoid thinking about the past, avoidance of feelings, feeling cut off from others, inability to feel, trouble concentrating, and physical reactions (Table 5). After controlling for exposure to the oil spill and sociodemographic variables known to be associated with the PTSD (age, gender, socioeconomic status), Alaskan Natives were more likely than Euro-Americans to report unpleasant memories, nightmares and other bad dreams, attempts not to think about the past, having trouble concentrating, and physical reactions.

To determine whether the pattern of PTSD symptoms experienced by Alaskan Natives was, in any way, different from that experienced by Euro-Americans, factor analyses were conducted of the DIS items used to calculate the algorithm for PTSD. Principal components factor analysis with varimax rotation identified five factors for both ethnic groups (Tables 6a and 6b). However, the items comprising these factors were dissimilar. The factor accounting for the highest percentage of variance among the Alaskan Natives was a combination of re-experiencing and avoidance and included the following six items: (1) feeling worse; (2) a physical reaction; (3) could not feel; (4) a flashback; (5) avoidance of places or activities; and (6) bothered by little things. The factor accounting for the highest percentage of variance among the Euro-Americans was a combination of arousal and avoidance and included the following seven items: (1) trouble concentrating; (2) loss of interest; (3) bothered by little things; (4) feeling anxious, fearful or panicky; (5) stopped caring about activities; (6) sleep problems; and (7) tried not to think of the past. The two ethnic groups also differed with respect to the assignment of individual items to Factors 2, 3, and 4. The only factor structure that the two groups shared in common was Factor 5, which was comprised of only one item, the inability to remember parts of the past.

Discussion

Consistent with the Conservation of Resources model of psychological distress, individuals exposed to the Exxon Valdez oil spill who reported a complex of symptoms that meet the criteria for a diagnosis of post-traumatic stress disorder experienced a loss of both natural and social resources. However, these data also reveal important cultural variations in this association. Alaskan Natives and Euro-Americans exposed to the oil spill were distinguished by differences in presentation of symptoms and in the meaning attached to the events that supposedly were responsible for these symptoms.

Alaskan Natives were more likely than Euro-Americans to have participated in clean-up activities and report damage to commercial fishing areas and effects on non-commercial hunting, fishing, and gathering activities.³² However, even after adjusting for these differences in exposure, the Exxon Valdez oil spill was associated with the prevalence of post-spill PTSD in Alaskan Natives, but not in Euro-Americans. Natives who reported participation in clean-up activities, property damaged or lost, and damage to commercial fishing areas had a higher prevalence of post-

Alaskan Natives									
Factor 1 Re-experiencing-avoidance		Factor 2 Avoidance		Factor 3 Arousal-re-experiencing		Factor 4 Arousal-avoidance		Factor 5 Avoidance	
Felt worse	0.83	Stay on guard	0.71	Sleep problems	0.65	Startled by noises	0.80	Couldn't remember parts of past	0.86
Physical reaction	0.71	Change in plans	0.70	Tried not to think of past	0.65	Stopped caring about activities	0.72		
Could not feel	0.66	Cut off from others	0.64	Disturbing memories	0.63	Bad dreams	0.41		
Flashback	0.57	Lost interest	0.56	Unpleasant memories	0.59				
Avoid places or activities	0.56	Avoid feelings	0.54	Feeling anxious, fearful, panicky	0.56				
Bothered by little things	0.55			Trouble concentrating	0.49				
Eigenvalues									
8.08		1.39		1.30		1.23		1.03	

Prehospital and Disaster Medicine © 2004 Palinkas

Table 6a—Factor Structure for Alaskan Natives^a of post-traumatic stress disorder symptoms by ethnicity (^acoefficients are factor loadings)

Euro-Americans									
Factor 1 Arousal-avoidance		Factor 2 Avoidance-re-experiencing		Factor 3 Avoidance		Factor 4 Arousal-re-experiencing		Factor 5 Avoidance	
Trouble concentrating	0.71	Avoid places or activities	0.74	Could not feel	0.71	Flashback	0.70	Couldn't remember parts of past	0.76
Lost interest	0.62	Felt worse	0.70	Change in plans	0.64	Startled by noises	0.61		
Bothered by little things	0.60	Unpleasant memories	0.56	Avoid feelings	0.59	Physical reaction	0.50		
Feeling anxious, fearful, panicky	0.57	Bad dreams	0.53			Cut off from others	0.43		
Stopping caring about activities	0.53	Disturbing memories	0.48			Stay on guard	0.36		
Sleep problems	0.50								
Tried not to think of past	0.49								
Eigenvalues									
7.06		1.38		1.24		1.10		1.09	

Prehospital and Disaster Medicine © 2004 Palinkas

Table 6b—Factor Structure for Euro-Americans^a of post-traumatic stress disorder symptoms by ethnicity (^acoefficients are factor loadings)

spill PTSD than did Natives who did not report these types of exposure to the spill. Both Alaskan Natives and Euro-Americans who reported effects of the oil spill on subsistence-related hunting, fishing, and gathering had a higher prevalence of post-spill PTSD than did those who reported no effects on these activities. However, the results of the multiple logistic regression analyses indicated that the decline in subsistence activities in the year after the oil spill was an independent risk for PTSD in Natives, but not in Euro-Americans.

The extent to which the natural environment was damaged by the oil spill remains a subject of considerable debate.³⁸ Nevertheless, during the year after the spill, subsistence activities of local residents were reduced significantly because of the closure of certain areas to resource harvesting by state fish and game officials and the widespread fear that many subsistence foods were contaminated by the oil. In addition, Exxon provided clean-up employment opportunities at high wages to local residents in an attempt to offset the loss of commercial fishing income. However, these activities effectively removed individuals from their communities for long periods of time and prevented them from engaging in subsistence production and distribution activities.²⁸ This may explain why being employed and participating in spill clean-up also were independent risk factors for PTSD in Alaskan Natives, but not in Euro-Americans. Interruption of the cycle of activity associated with subsistence has important symbolic significance for continuity in maintaining Alaskan Native culture because such activities fundamentally are social in nature,³⁹ and because they provide an important linkage between self and social identities.⁴⁰

Participation in spill-related clean-up employment was an independent risk factor for the development of PTSD in Alaskan Natives, but not in Euro-Americans for a second reason. Clean-up employment opportunities were perceived by many to be distributed unevenly throughout the region. Some villages had a larger percentage of residents employed in such activities than did other villages. Even within a community, some kin groups had a larger percentage of members employed in such activities than other kin groups. This led to conflict between and among Alaskan Native villages, effectively isolating individuals from actual or potential social resources.²⁸ Clean-up employment also involved separation from family and friends for long periods of time, which also contributed to a sense of social isolation.

For Alaskan Natives, then, a decline in subsistence activities and participation in oil spill clean-up employment were independent risk factors for the development of PTSD because they were associated with a decline in social resources. The odds of satisfying the requirements for the diagnosis of PTSD no longer remained statistically significant among those who reported either a decline in subsistence activities or participation in spill-related employment in this ethnic group after controlling for level of social disruption after the oil spill. Alaskan Natives and Euro-Americans who reported high levels of social disruption were more likely to meet the diagnostic criteria for PTSD

than were those who reported low levels of social disruption, but the two ethnic groups differed with respect to the nature of that disruption and its relationship to the oil spill.

Although social disruption may be associated with the development of PTSD, it is unclear whether these two phenomena are causally linked and, if so, in which direction. In the case of the Exxon Valdez oil spill, these data alone provide little information that would enable us to determine whether the disruption of social relations were responsible for or the consequence of symptoms of PTSD in either ethnic group. Nevertheless, whether a disruption of social relations is a cause or a consequence of PTSD, it would seem that the two phenomena were fundamentally joined in both ethnic groups, making the disorder as much of a social phenomenon as it is an individual phenomenon. Furthermore, it is precisely because PTSD is a social phenomenon that an understanding of the local context is essential to the interpretation of the idioms of distress that are transformed by the clinical construct into a diagnosis of PTSD.⁴

The interpretation of these idioms of distress also is important in determining whether the same phenomenon is being assessed in different ethnocultural groups. In this study, the responses to the individual items of the PTSD subscale of the DIS exhibited high reliability among both Alaskan Natives and Euro-Americans. Nevertheless, Alaskan Natives were more likely to report some symptoms than were Euro-Americans even though the overall prevalence of PTSD in the two ethnic groups was not different. After controlling for differences in exposure to the oil spill and selected social and demographic risk factors, Alaskan Natives were significantly more likely than were Euro-Americans to report unpleasant memories, nightmares, attempts to avoid thinking about past events, difficulty concentrating, and physical reactions. Furthermore, Alaskan Natives and Euro-Americans exhibited a different factor structure of PTSD symptoms. A combination of symptoms associated with re-experiencing the traumatic event and avoidance of stimuli associated with the events accounted for the greatest percentage of variance among Alaskan Natives, while a combination of symptoms associated with avoidance of stimuli and persistent arousal accounted for the greatest percentage of variance among Euro-Americans. A report of feeling "cut off from others" was associated with symptoms of avoidance among Alaskan Natives, but was associated with symptoms of arousal among Euro-Americans. Additional research is required to determine why the responses of the two ethnic groups to this instrument assumed these particular patterns. Nevertheless, these results suggest that the ethnic differences in the prevalence of PTSD associated with the oil spill may be attributed, in part, to differences in patterns of response to the DIS interview protocol.

The presence of cultural differences in idioms of distress also raises the issue of the cross-cultural validity of the PTSD diagnosis and its assessment in epidemiological and clinical studies using standardized tools such as the Diagnostic Interview Schedule. Even if a central universal core of PTSD symptoms can be established, as some have

argued,⁴¹ there remains the problem of whether differences in rates of disorder are due to levels of psychiatric illness or ways of responding to questions. In their review of epidemiological studies of the mental health of Puerto Ricans, Guarnaccia and his colleagues concluded that "cross-cultural validity can occur only when indigenous categories of experience are incorporated into assessment schedules".²⁵

Conclusion

Although the clinical diagnosis of the PTSD places emphasis on events that threaten one's life or "personal integrity", an event like the Exxon Valdez oil spill is sufficiently traumatic to warrant a diagnosis of PTSD if it threatens one "social integrity" through increased social conflict and isolation, even if the event does not result in a loss of life. In this instance, the diagnosis transforms a social experience of conflict and isolation into a personal experience of disease. However, this transformation is problematic because the constituents of social integrity

were different for the Alaskan Natives and Euro-American Non-Natives who were exposed to the oil spill. The PTSD diagnosis also fails to take into account cultural variations in the presentation and interpretation of these symptoms. Such variations also make the attempt of the clinical construct of PTSD to structure local idioms of distress into a universal discourse of disease somewhat problematic because there is no guarantee that the same construct is being assessed in different cultural contexts.

Acknowledgements

This paper is based on a larger study supported by a contract from the "Oiled Mayors" Subcommittee of the Alaskan Conference of Mayors to Impact Assessment, Inc.; John S. Petterson, Principal Investigator. Dr. Robert Bolin participated in the design and administration of the household survey. Drs. James Shore and Spero Manson provided advice in the administration and analysis of the Diagnostic Interview Schedule PTSD items.

References

- Eisenbruch M: From post-traumatic stress disorder to cultural bereavement: diagnosis of Southeast Asian refugees. *Social Science and Medicine* 1991;33:673-680.
- Boehnlein JK, Kinzie JD: Commentary: DSM diagnosis of post-traumatic stress disorder and cultural sensitivity: A response. *Journal of Nervous and Mental Disease* 1992;180:597-599.
- Mollica RF, Caspi-Yavin Y, Bollini P, et al: The Harvard Trauma Questionnaire: validating a cross-cultural instrument for measuring torture, trauma, and post-traumatic stress disorder in Indochinese refugees. *Journal of Nervous and Mental Disease* 1992;180:111-116.
- Kleinman A: *Writing at the Margin: Discourse between Anthropology and Medicine*. Berkeley CA: University of California Press, 1995.
- Young A: *The Harmony of Illusions: Inventing Post-traumatic Stress Disorder*. Princeton, NJ: Princeton University Press, 1995.
- Marsella AJ, Friedman MJ, Gerrity EM, Scurfield RM (eds). *Ethnocultural Aspects of Post-traumatic Stress Disorder*. Washington DC: American Psychological Association, 1996.
- Kinzie JD, Boehnlein JK, Leung PK, et al: The prevalence of post-traumatic stress disorder and its clinical significance among Southeast Asian refugees. *American Journal of Psychiatry* 1990;147:913-917.
- Mghir R, Freed W, Raskin A, Katon W: Depression and post-traumatic stress disorder among a community sample of adolescent and young adult Afghan refugees. *Journal of Nervous and Mental Disorder* 1995;183:24-30.
- Fawzi MC, Pham T, Lin L, et al: The validity of post-traumatic stress disorder among Vietnamese refugees. *Journal of Traumatic Stress* 1997;10:101-108.
- Sack WH, Seeley JR, Clarke GN: Does PTSD transcend cultural barriers? A study from the Khmer Adolescent Refugee Project. *Journal of the American Academy of Child and Adolescent Psychiatry* 1997;36:49-54.
- Fontana A, Rosenheck R: Post-traumatic stress disorder among Vietnam theater veterans: A causal model of etiology in a community sample. *Journal of Nervous and Mental Disease* 1994;182:677-684.
- Garrison CZ, Bryant ES, Addy CL, et al: Post-traumatic stress disorder in adolescents after Hurricane Andrew. *Journal of the American Academy of Child and Adolescent Psychiatry* 1995;34:1193-1201.
- Gleser GC, Green BL, Winger C: *Prolonged Psychosocial Effects of Disaster: A Study of Buffalo Creek*. New York: Academic Press, 1981.
- Green BL, Lindy JD, Grace MC, et al: Buffalo Creek survivors in the second decade: Stability of stress symptoms. *American Journal of Orthopsychiatry* 1990;60:43-54.
- Breslau N, Davis G, Andreski P: Risk factors for PTSD-related traumatic events: A prospective analysis. *American Journal of Psychiatry* 1995;152:529-535.
- Solomon S, Smith EM: Social support and perceived controls as moderators of responses to dioxin and flood exposure. In: Ursano RJ, McCaughey BG, Fullerton CS (eds), *Community Responses to Trauma and Disaster: The Structure of Human Chaos*. New York: Cambridge University Press, 1994.
- Kulka RA, Schlenger WE, Fairbank JA, et al: *Trauma and the Vietnam War Generation: Report of Findings from the National Vietnam Veterans Readjustment Study*. New York: Brunner/Mazel, 1990.
- American Psychiatric Association: *Diagnostic and Statistical Manual of Mental Disorders* (4th ed). Washington, DC: American Psychiatric Association, 1994.
- Tomb DA: The phenomenology of post-traumatic stress disorder. *Psychiatric Clinics of North America* 1994;17:237-250.
- Green BL, Grace MC, Lindy JD, et al: Risk factors for PTSD and other diagnoses in a general sample of Vietnam veterans. *American Journal of Psychiatry* 1990;147:729-733.
- Keane TM, Scott WO, Chavoya GA, et al: Social support in Vietnam veterans with post-traumatic stress disorder: A comparative analysis. *Journal of Consulting and Clinical Psychology* 1985;53:95-102.
- Madakashira S, O'Brien KF: Acute post-traumatic stress disorder in victims of a natural disaster. *Journal of Nervous and Mental Disease* 1987;175:286-290.
- Carr VJ, Lewin TJ, Kenardy JA, et al: Psychosocial sequelae of the 1989 Newcastle earthquake: III. Role of vulnerability factors in post-disaster morbidity. *Psychological Medicine* 1997;27:179-190.
- Hobfoll SE: *The Ecology of Stress*. Hemisphere: Washington, DC: Hemisphere, 1988.
- Guarnaccia PJ, Good BJ, Kleinman A: A critical review of epidemiological studies of Puerto Rican mental health. *American Journal of Psychiatry* 1990;147:1449-1456.
- Kinzie JD, Manson SM: The use of self-rating scales in cross-cultural psychiatry. *Hospital and Community Psychiatry* 1987;38:190-196.
- Palinkas LA, Petterson JS, Russell J, Downs MA: Community patterns of psychiatric disorders after the Exxon Valdez oil spill. *American Journal of Psychiatry* 1993;150:1517-1523.
- Palinkas LA, Downs MA, Petterson JS, Russell J: Social, cultural and psychological impacts of the Exxon Valdez oil spill. *Human Organization* 1993;52:1-13.
- Davis NY: Contemporary Pacific Eskimo. In: Damas D (ed), *Handbook of North American Indians*, Vol. 5. Washington, DC: US Government Printing Office, 1984.
- Baum A, Gatchel RJ, Schaeffer M: Emotional, behavioral and psychophysiological effects of chronic stress at Three Mile Island. *Journal of Consulting and Clinical Psychology* 1983;51:565-572.

31. Shore JH, Vollmer WM, Tatum EL: Community patterns of post-traumatic stress disorders. *Journal of Nervous and Mental Disease* 1989;177:681-685.
32. Palinkas LA, Russell J, Downs MA, Petterson JS: Ethnic differences in stress, coping, and depressive symptoms after the Exxon Valdez oil spill. *Journal of Nervous and Mental Disease* 1992;180:287-295.
33. Procidano ME, Heller K: Measures of perceived social support from friends and from family: Three validation studies. *American Journal of Community Psychology* 1983;11:1-24.
34. Resnick HS, Kilpatrick DG, Dansky BS, et al: Prevalence of civilian trauma and post-traumatic stress disorder in a representative national sample of women. *Journal of Consulting and Clinical Psychology* 1993;61:984-991.
35. Hanson RF, Kilpatrick DG, Freedy JR, Saunders BE: Los Angeles County after the 1992 civil disturbances: Degree of exposure and impact on mental health. *Journal of Consulting and Clinical Psychology* 1995;63:987-996.
36. Robins LN, Helzer JE, Cottler LB, Golding E: *NIMH Diagnostic Interview Schedule, Version III, (rev.)*. St. Louis MO: Washington University, 1989.
37. American Psychiatric Association: *Diagnostic and Statistical Manual of Mental Disorders (3rd ed. rev.)*. Washington, DC: American Psychiatric Association, 1987.
38. Davidson A: *In the Wake of the Exxon Valdez*. San Francisco: Sierra Club Books, 1990.
39. Jorgensen JG: *Oil Age Eskimos*. Berkeley, CA: University of California Press, 1990.
40. Palinkas LA: Points of stress and modes of adjustment in southwest Alaskan. *Human Organization* 1987;46:292-204.
41. Kinzie JD, Fredrickson RH, Ben R, Fleck J, Karls W: Post-traumatic stress disorder among survivors of Cambodian concentration camps. *American Journal of Psychiatry* 141;1984: 645-650.