Attempted Suicide Among Vietnam Veterans: A Model of Etiology in a Community Sample

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Objective: *Data from the National Vietnam Veterans Readjustment Study, conducted from 1986 to 1988, were used to develop an etiological model of attempted suicide among a community sample of 1,198 male Vietnam veterans.* *Method:* *In a three-step process, the authors used structural equation modeling to develop a model that they refined, cross-validated, and then specified in terms of its replicable paths.* *Results:* *The final model possesses highly satisfactory fit and parsimony. General psychiatric disorders were the sole factors contributing directly to attempted suicide. General psychiatric disorders were in part products of both nonmilitary and military traumas, most specifically participation in abusive violence. Posttraumatic stress disorder (PTSD) and substance abuse were related to attempted suicide bivariately but not when considered in conjunction with general psychiatric disorders. Among premilitary risk factors, family instability contributed to attempted suicide indirectly through its influence on general psychiatric disorders.* *Conclusions:* *The etiology of attempted suicide among Vietnam veterans remains largely unexplained. A partial explanation is that the predominant and direct causes spring from general psychiatric disorders rather than from traumatic exposure, PTSD, or substance abuse. Traumatic exposure contributes directly to the development of PTSD and general psychiatric disorders but only indirectly to making a suicide attempt.*

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Since the early 1980s, reports of extraordinarily high rates of suicide among Vietnam veterans have appeared in both the professional literature and the mass media. Although the frequent assertion that as many Vietnam veterans have committed suicide since the war as died in combat has been demonstrated to be a substantial overestimation, the suicide rate among those who served in Vietnam may still be somewhat greater than the rate for a matched comparison group (1). Although an elevated rate would suggest a relationship between suicide and war zone stress, Farberow et al. (2) failed to find any military service factor, including combat exposure, to be associated significantly with suicide among Vietnam veterans. Limitations to the assessment of combat exposure and the small number of subjects in their study led these authors to caution that their results should be considered tentative.

Although the suicide rate among Vietnam veterans may not be as high as originally thought, there is now abundant evidence that exposure to war zone stress in Vietnam led to sustained posttraumatic stress disorder (PTSD), along with a host of other psychological disorders, in a substantial number of veterans (3, 4). In view of the personal tragedy represented by suicide and the high level of public concern for the welfare of Vietnam veterans, an examination of suicidal behavior and its etiology in this population is of pressing clinical and social significance.

Elsewhere, we used structural equation modeling to develop etiological models of PTSD in treatment-seeking (5) and community (6) samples of Vietnam veterans. Structural equation modeling is a statistical and conceptual extension of multiple regression analysis. Statistically, the extension involves the simultaneous solution of all equations and the use of all information in deriving each of the parameter estimates in the model (7–9). The percentages of total effects that are attributable to different blocks of variables can be ascertained. Conceptually, the extension involves the specification of a model of causation that serves as a map to the theoretical selection of variables to be included in each equation. Although structural equation modeling is not designed to test actual causation experimentally, it is a powerful tool for evaluating the probability that causal propositions are valid within the limits of nonexperimental data. Previous models supported the etiological

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primacy of both traumatic war zone experiences and the homecoming reception in contributing to the development of PTSD, as well as the indirect effects of premilitary risk factors.

Many of the elements of those models have been reported to be associated with attempted and/or completed suicide. Specifically, higher rates of suicide have been reported for people who, during their childhood or adolescence, were physically and/or sexually abused (10, 11), engaged in antisocial behavior (12, 13), or were raised in an unstable family (14, 15). In addition, higher rates of suicide have been reported for whites (16, 17), for those lacking social support (18, 19), for those psychiatrically distressed (20, 21), and for those abusing alcohol (20, 22) and/or drugs (23, 24).

In this paper, therefore, we used these elements to develop a model for the etiology of attempted suicide in a community sample of Vietnam veterans. We examined attempted suicide rather than completed suicide. Although it has been suggested that the two might differ in some respects (25), a previous suicide attempt has been found to be one of the most powerful predictors of a completed suicide (20, 26).

We sought to answer two general questions. First, what were the relative contributions of different categories of experiences to attempting suicide? Of particular interest were the comparisons between nontraumatic and traumatic factors and between military and nonmilitary traumatic factors. Another focus of interest was the relative contributions of postmilitary factors to attempted suicide, particularly the veteran's homecoming reception, general psychiatric disorders, PTSD, and substance abuse.

The second question that we addressed was what were the major pathways mediating causation among variables across the historical time intervals of the model. Although the data were collected retrospectively, the sets of variables were chosen for their clear historical ordering. Of particular interest were the etiological roles of PTSD and the homecoming reception, the latter because of its prominent role in the development of PTSD.

METHOD

Subjects

The National Vietnam Veterans Readjustment Study includes a national sample of 1,198 male Vietnam veterans who were selected from a computerized military personnel registry. All of these veterans served in Vietnam or its surrounding waters or airspace for some period of time from 1964 to 1975. Black and Hispanic Vietnam veterans were deliberately oversampled in the National Vietnam Veterans Readjustment Study to ensure stable values for prevalence estimation. The veterans in the study averaged 40.1 years of age (SD=5.3) and had a mean of 13.4 years of education (SD=2.4). Ethnically, 585 (48.9%) were white, 320 (26.8%) were black, 274 (22.9%) were Hispanic, and 17 (1.4%) were of other ancestry. In terms of their marital status, 854 (71.3%) were married, 256 (21.3%) were divorced or separated, and 81 (6.8%) had never been married. The rate of attempted suicide was 3.7% (N=44) up to the time of the survey, conducted from 1986 to 1988.

For analytic purposes, the sample was divided into two random subgroups of 599 veterans each. The subgroups did not differ significantly on any of the background or model variables. Because of the complexity of the model, we elected to include only veterans with complete data in the analyses. This resulted in subgroups of 567 and 573 veterans.

Measures

Premilitary risk factors and traumas were represented by five variables. The first, childhood physical or sexual abuse, is a dichotomous variable that was determined from the list of traumatic events and explicit physical abuse. Any event that the veteran characterized as "physical assault, torture, rape, abuse, mugging or similar assault (not war-related)" that involved him as a victim and that occurred before he was 18 years of age was coded positive for abuse. In addition, a veteran's report that as a child he had been spanked or hit "hard enough that [he] had marks or bruises, had to stay in bed, or see a doctor" was coded positive for abuse. This variable was endorsed by a mean of 0.22 (SD=0.41) of the 1,140 veterans.

The second and third variables for premilitary risk factors were being black (mean=0.27, SD=0.44) and being Hispanic (mean=0.23, SD=0.42). For the fourth premilitary risk variable, conduct disorder, 11 behaviors indicative of a conduct disorder before the age of 15 were taken from the list compiled by Helzer et al. (27, 28). These behaviors were 1) in trouble with the law or school officials, 2) playing hooky, 3) suspended or expelled from school, 4) doing poorly academically, 5) arrested or sent to juvenile court, 6) running away from home, 7) lying, 8) drinking or using drugs, 9) stealing, 10) destroying property, and 11) starting fist fights. The conduct disorder variable was the number of these behaviors endorsed as having been engaged in frequently (mean=1.77, SD=1.85).

The fifth variable for premilitary risk factors, family instability, was measured by using the Family Stability Scale (29). The variable is the sum of 11 dichotomous items covering experiences before the age of 18, such as parental separation, divorce, or death; living in a foster home or orphanage; father out of work; family income below the poverty level; getting into trouble with authorities; and having less than a high school education at the time of entry into the military (mean=2.66, SD=1.76).

War-related traumatic exposure and adjustment to the military were represented by three variables. The first, combat, was measured by two scales: the Revised Combat Scale (3) (mean=7.71, SD=4.38) and the Combat Exposure Scale (30) (mean=19.45, SD=11.97). These scales measure traditional aspects of warfare that have been considered necessary and appropriate to the legitimate goals of war. They correlated highly with each other in the present study (r=0.83). Therefore, a latent variable of combat was created in the model to represent this category of traumatic exposure.

The second variable for war-related traumatic exposure and adjustment to the military was participation in atrocities, determined from several questions asking whether the veteran participated personally in situations in which American or South Vietnamese troops terrorized, wounded, or killed civilians; tortured, wounded, or killed prisoners or hostages; or mutilated enemy or civilian bodies. Because of the overlap among these questions, we coded participation as a dichotomous variable (mean=0.32, SD=0.47).

The third variable for war-related traumatic exposure and adjustment to the military was having received a disciplinary action, which was coded dichotomously from questions asking whether the veteran ever received any disciplinary actions while in the military, including restriction to quarters, loss of pay, demotion, an Article 15, or a court-martial (mean=0.36, SD=0.48).

Non-war-related traumatic exposure during the veteran's military service was coded dichotomously according to the noncombat traumas that the veteran reported having experienced as a victim and that occurred between the age of 18 and the time of his discharge from the military (mean=0.16, SD=0.37). These experiences consisted of serious accidents, fires, or explosions not related to combat; a natural disaster; or seeing someone mutilated, seriously injured, or killed in a noncombat setting.

The homecoming reception was represented by two variables.

First, society's reception was measured as the sum of three questions (alpha=0.79) asking the extent to which the American people made the veteran feel at home again, respected him for having served in the armed forces, and made him feel proud to have served in the armed forces (mean=8.83, SD=3.31). Society's reception was coded in the direction of a rejecting welcome. The second variable, the veteran's family reception, was measured by two scales, both of which were coded in the direction of low support. The availability of help was the sum of four answers (alpha=0.78) to questions asking whether, at the time of homecoming, there was someone he could turn to in times of need, someone from whom he could borrow money in case of an emergency, someone he could count on to help him in case of a serious injury or illness, and someone he could count on to pick up his spirits when he was feeling down (mean=1.55, SD=1.06). The availability of someone to talk to and confide in at the time of homecoming was the sum of three answers (alpha=0.64) to questions asking whether he had anyone in his life that he could talk with, whether there was anyone that he could count on for understanding and advice, and whether there were people with whom he actually did talk to about the war (mean=3.70, SD=0.96). Low ratings for help and for talk were correlated moderately highly with each other (r=0.43), so a latent variable of low support was created in the model.

Postmilitary psychiatric disorders and traumatic experiences were represented by four variables. The first, PTSD, was represented by the predicted probability of being diagnosed with PTSD as computed by the National Vietnam Veterans Readjustment Study. This variable was the best estimate by that study of the probability that each veteran was suffering from diagnosable PTSD at the time of the survey. It was the basis for the estimates of prevalence generally cited from the study. The mean, without sociodemographic adjustment, was 0.21 (SD=0.32).

The second variable for postmilitary psychiatric disorders and traumatic experiences was lifetime psychiatric disorder other than PTSD and was measured dichotomously by using the DSM-III diagnoses obtained by using the National Institute of Mental Health Diagnostic Interview Schedule (DIS) (31). The presence of a major depressive episode, manic episode, dysthymic disorder, panic disorder, obsessive-compulsive disorder, or generalized anxiety disorder was categorized as the presence of a general psychiatric disorder (mean=0.20, SD=0.40).

The third variable for postmilitary psychiatric disorders and traumatic experiences was lifetime substance abuse, measured dichotomously by using the DIS to diagnose alcohol abuse or dependence and drug abuse or dependence (mean=0.43, SD=0.50). The fourth variable, postmilitary trauma, was measured dichotomously from the list of traumas that were reported to have involved the veteran as a victim and to have occurred since discharge from the military (mean=0.41, SD=0.49).

Finally, attempted suicide was measured dichotomously as one or more lifetime suicide attempts (mean=0.037, SD=0.19).

Data Analyses

Although the data used in this study were cross-sectional and the reporting was retrospective, the variables selected for inclusion in the model had a clear historical ordering. This ordering was used as the logical basis for specification of the initial model. In the first subgroup, each historical set of variables was hypothesized to contribute causally to each subsequent set. Within war-related experiences themselves, we hypothesized that combat exposure provided the opportunities for participating in atrocities. In the second subgroup, the model was restricted to specifying only those paths for estimation that were significant in the first subgroup. Finally, a model that specified only those paths which were significant in both subgroups was evaluated for adequacy as the preferable model. Parameters for the final model were estimated from the total sample of N=1,140 to generate the most stable and representative values.

Statistically, the adequacy of a model can be judged from its fit and its parsimony (9, 32). Fit refers to the extent to which the values estimated by the model correspond to the actual values in the data set. In the extreme, where the maximum parameters are estimated (that is, where the degrees of freedom are zero), fit is necessarily perfect and is therefore meaningless. What is desirable, therefore, is to achieve a high degree of fit with the estimation of as few parameters as possible. In this way, the parsimony of the model is optimized. Indexes of parsimony essentially adjust the goodness of fit achieved for the degrees of freedom necessary to achieve it.

Derivation of indexes of fit and parsimony remains an active area of statistical research. Because there is no consensus as yet concerning the superiority of any one index, we have selected two indexes, each of which captures different aspects of the feature under consideration. For fit, we selected the root mean square residual and Bentler's comparative fit index (32). For parsimony, we selected the consistent information criterion (33) and the parsimonious fit index (9).

Each overall model is composed of a measurement model and a structural equation model. The measurement model creates latent variables that are assumed to underlie and to give rise to specific observable indicators that can be measured. In the present model, Revised Combat Scale scores and Combat Exposure Scale scores are specified to be observable indicators of an underlying dimension of combat exposure, and low help and low talk are specified to be manifestations of the underlying dimension of low support.

The structural equation model specifies the causal paths that are posited to exist between exogenous and endogenous variables and among the endogenous variables themselves. In the present model, the five premilitary variables were exogenous variables whose causation lay outside the scope of the model. These variables were posited to affect war-related and non-war-related war zone experiences, the homecoming, psychiatric disorders, postmilitary traumatic exposure, and attempted suicide. Noncausal associations among the exogenous variables were included in the statistical evaluation of the model, but, in the interests of clarity of exposition, these associations are not diagramed in figure 1. They can be found, however, as components of the correlation matrix in table 1. War zone experiences, the homecoming, psychiatric disorders, postmilitary traumas, and attempted suicide were endogenous variables that were posited to have been caused by the exogenous variables and the antecedent endogenous variables.

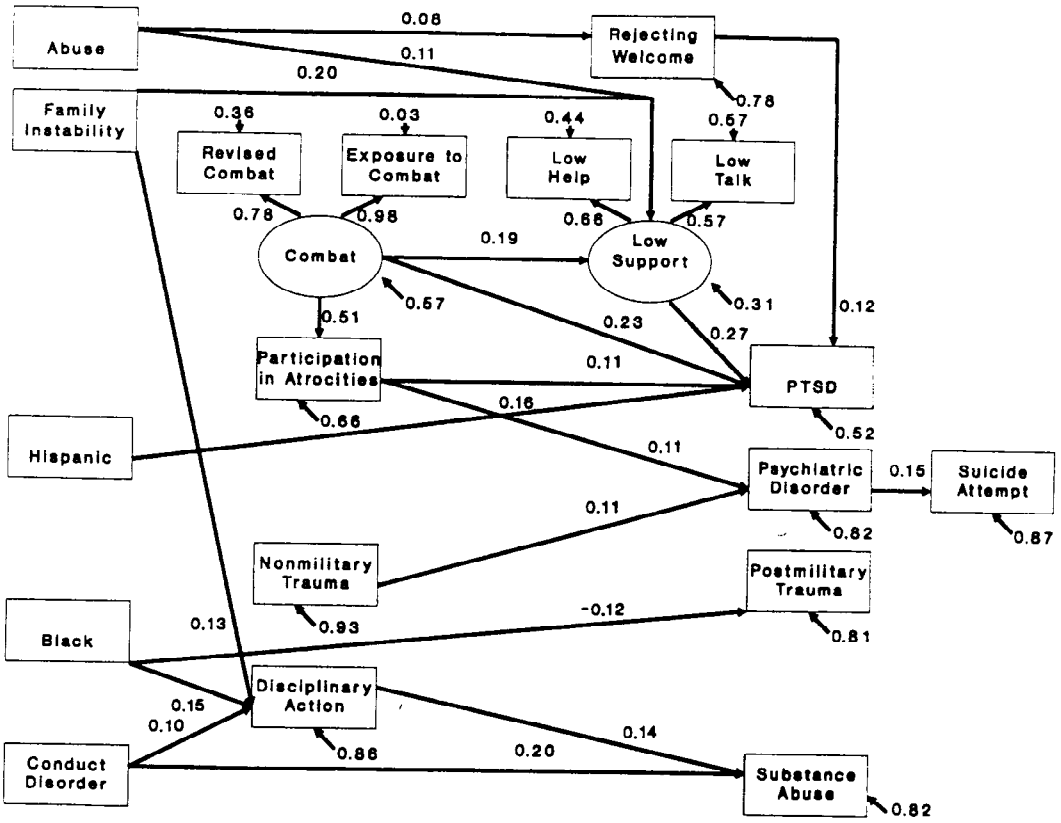
Before estimating the models' parameters, we checked the data for outliers. One case with extreme values was detected in the first subgroup and was dropped from further analyses. The kurtosis was also examined for each variable. (Kurtosis refers to the peakedness or flatness of a distribution relative to the shape of a normal distribution.) Logarithmic transformations were performed on each variable where its kurtosis could be made to approach normality more closely. The variables thus transformed were childhood conduct disorder, combat exposure as measured by the Revised Combat Scale, and a rejecting societal welcome. Examination of the multivariate kurtosis (34) of each of the subgroups revealed that each was substantially more peaked than normal, thereby making an assumption of multivariate normality unjustifiable for analytic purposes. Therefore, we selected generalized least squares for the method of model parameter estimation because it does not depend on such an assumption. For model parameter estimation we used the CALIS procedure of the SAS software package (35).

Bivariate correlations among the variables in the model are presented in tables 1 and 2 for the two subgroups. The final model is diagramed in figure 1. The small arrows that are attached to each variable but do not proceed from another variable indicate the disturbance associated with each variable (that is, the proportion of variance unaccounted for by the model). All significance levels were based on two-tailed tests.

RESULTS

Summary results of the steps in model development are presented in table 3. The first step was to determine the adequacy of the initial model in the first subgroup (χ^2=83.0, df=37, p<0.0001). The comparative fit index of 0.993 for this relatively unrestricted model indicates that it achieved a very high degree of fit. Concomitantly, the consistent information criterion of −189

FIGURE 1. Final Model of Etiology of Attempted Suicide for a Community Sample of 1,198 Vietnam Veterans[a]



[a]Values for the arrows connecting variables are standardized regression coefficients. All are significant at $p<0.05$. Values for the small arrows attached to only one variable are disturbance terms indicating the proportion of variance of each of the variables that was not accounted for by the model.

and the parsimonious fit index of 0.239 reveal that the parsimony of the fit was quite low. The second step was to refine the model by restricting the specified paths to those which were significant in the initial model and then to cross-validate this more restrictive model in the second subgroup ($\chi^2=273.57$, df=104, $p<0.0001$). The root mean square residual increased somewhat, but there was very little erosion of the goodness of fit as measured by the comparative fit index. Moreover, there was a major improvement in the parsimony with which this same level of fit had been attained, with a consistent information criterion of –491 and a parsimonious fit index of 0.655. The third step was to restrict the model even further by specifying only those paths which were significant in both subgroups. This replicated model was then evaluated for its adequacy on the total sample ($\chi^2=405.57$, df=113, $p<0.0001$). The root mean square residual and comparative fit index indicated virtually no change in goodness of fit. The parsimony indexes showed a small improvement in the parsimony of the fit.

The replicated model is diagramed in figure 1. The disturbance term for suicide attempt is 0.87, indicating that the model accounted for 13% of the variance in attempted suicide. This has been classified by Cohen (36) as a medium-sized effect. Noncausal associations among premilitary risk factors were included in the statistical evaluation of the model, but, in the interests of clarity of exposition, they are not diagramed.

The measurement model within the final model indicated that the latent variable combat was highly saturated with the variance from both combat scales; its loadings of 0.78 and 0.98 indicated a highly internally consistent representation of the underlying dimension. The latent variable low support was moderately saturated with variance from its manifest indicators; its loadings of 0.66 and 0.57 indicated an acceptable but less highly internally consistent representation of this underlying dimension.

The structural equation model within the final model indicated that a psychiatric disorder was the only factor to contribute to a suicide attempt directly. In turn, psychiatric disorders were affected by participation in atrocities and experiencing nonmilitary trauma during military service. Hispanic ethnicity, combat exposure, participation in atrocities, rejecting welcome, and low support contributed directly to the development of PTSD. Antisocial behavior (conduct disorder) during childhood and disciplinary problems in the military were direct contributors to substance abuse. Black eth-

TABLE 1. Bivariate Correlations (r) Among Variables in a Causal Model of Attempted Suicide for a Subgroup of 567 Vietnam Veterans in a Community Sample[a]

	Variable						
Variable	Hispanic	Black	Abuse	Conduct Disorder	Family Instability	Revised Combat Scale Score	Combat Exposure Scale Score
Premilitary							
Hispanic							
Black	−0.32						
Abuse	0.04	−0.09					
Conduct disorder	0.10	−0.09	0.20				
Family instability	0.09	0.15	0.20	0.46			
Military							
Revised Combat Scale score	−0.01	0.05	0.07	0.03	0.07		
Combat Exposure Scale score	0.02	0.07	0.09	0.11	0.11	0.78	
Participation in atrocities	0.00	0.02	0.14	0.16	0.14	0.40	0.51
Nonmilitary trauma	0.01	−0.05	0.09	0.04	0.04	0.03	0.03
Disciplinary action	−0.13	0.18	0.06	0.17	0.25	0.09	0.11
Homecoming							
Rejecting welcome	−0.02	0.07	0.15	0.06	0.11	0.07	0.09
Low help	0.08	−0.04	0.22	0.13	0.20	0.20	0.21
Low talk	0.01	−0.05	0.14	0.11	0.15	0.19	0.23
Postmilitary							
PTSD	0.18	0.00	0.18	0.18	0.26	0.33	0.41
Psychiatric disorder	0.03	−0.06	0.16	0.12	0.17	0.17	0.17
Substance abuse	0.09	−0.06	0.14	0.25	0.15	0.04	0.07
Postmilitary trauma	0.08	0.13	0.18	0.11	0.10	0.10	0.12
Suicide attempt	0.03	−0.02	0.06	0.05	0.09	0.02	0.04

[a]r=0.09 significant at $p<0.05$.

TABLE 2. Bivariate Correlations (r) Among Variables in a Causal Model of Attempted Suicide for a Subgroup of 573 Vietnam Veterans in a Community Sample[a]

	Variable						
Variable	Hispanic	Black	Abuse	Conduct Disorder	Family Instability	Revised Combat Scale Score	Combat Exposure Scale Score
Premilitary							
Hispanic							
Black	−0.29						
Abuse	0.01	−0.10					
Conduct disorder	0.02	0.04	0.24				
Family instability	0.03	0.16	0.19	0.50			
Military							
Revised Combat Scale score	0.05	0.02	0.09	0.09	0.06		
Combat Exposure Scale score	0.02	0.04	0.10	0.11	0.09	0.79	
Participation in atrocities	0.00	0.01	0.11	0.11	0.10	0.46	0.56
Nonmilitary trauma	−0.04	−0.06	0.08	0.05	0.03	0.07	0.08
Disciplinary action	−0.02	0.13	0.09	0.22	0.24	0.08	0.07
Homecoming							
Rejecting welcome	−0.09	0.11	0.15	0.15	0.08	0.11	0.15
Low help	−0.01	−0.01	0.13	0.21	0.21	0.15	0.22
Low talk	0.04	−0.02	0.12	0.06	0.13	0.11	0.14
Postmilitary							
PTSD	0.14	0.00	0.25	0.23	0.28	0.34	0.45
Psychiatric disorder	0.04	0.05	0.19	0.10	0.13	0.19	0.24
Substance abuse	0.07	−0.05	0.16	0.29	0.23	0.01	0.03
Postmilitary trauma	0.00	−0.07	0.17	0.11	0.07	0.15	0.17
Suicide attempt	0.02	−0.04	0.04	0.14	0.09	0.11	0.18

[a]r=0.09 significant at $p<0.05$.

nicity contributed directly to exposure to postmilitary trauma. Childhood abuse contributed to low support from family and friends and to a rejecting welcome from society. Family instability also contributed to low support. Finally, black ethnicity, conduct disorder during childhood, and family instability were directly related to disciplinary problems in the military.

The effects on attempted suicide across all pathways

Variable										
Participation in Atrocities	Nonmilitary Trauma	Disciplinary Action	Rejecting Welcome	Low Help	Low Talk	PTSD	Psychiatric Disorder	Substance Abuse	Postmilitary Trauma	Suicide Attempt
0.14	0.09									
0.15	−0.04	0.10								
0.20	0.03	0.09	0.28							
0.15	0.00	0.13	0.27	0.52						
0.36	0.05	0.15	0.28	0.41	0.34					
0.23	0.11	0.09	0.14	0.18	0.20	0.44				
0.16	0.08	0.18	0.12	0.13	0.09	0.25	0.15			
0.18	0.19	0.01	0.09	0.21	0.10	0.23	0.11	0.10		
0.04	−0.03	0.12	0.06	0.12	0.10	0.20	0.22	0.08	0.01	

Variable										
Participation in Atrocities	Nonmilitary Trauma	Disciplinary Action	Rejecting Welcome	Low Help	Low Talk	PTSD	Psychiatric Disorder	Substance Abuse	Postmilitary Trauma	Suicide Attempt
0.13	0.08									
0.09	0.04	0.07								
0.19	0.07	0.09	0.29							
0.10	−0.04	0.05	0.24	0.44						
0.37	0.13	0.21	0.31	0.38	0.28					
0.21	0.20	0.16	0.16	0.22	0.12	0.53				
0.08	0.13	0.29	0.08	0.18	0.10	0.25	0.14			
0.10	0.13	0.14	0.16	0.16	0.05	0.28	0.24	0.18		
0.15	0.00	0.09	0.13	0.21	0.13	0.34	0.25	0.17	0.08	

can be compared according to the historical period of their occurrence, the military status of the individual at the time of exposure to trauma, and the nature of psychiatric disorder. With regard to the period of occurrence, none of the effects (0.00) was due to premilitary risk factors, 23.8% (0.05) were due to military experiences, none (0.00) was due to the homecoming reception, and 76.2% (0.16) were due to postmilitary symptoms and experi-

TABLE 3. Adequacy of the Models According to Fit and Parsimony

	Fit		Parsimony	
Model	Root Mean-Square Residual	Comparative Fit Index	Consistent Information Criterion	Parsimonious Fit Index
Initial model	0.036	0.993	−189	0.239
More restrictive model—cross-validated	0.120	0.977	−491	0.655
Replicated	0.111	0.977	−503	0.716

ences. With regard to traumatic exposure, 60% (0.03) of the effects were due to military traumas and 40% (0.02) were due to nonmilitary traumas. With regard to psychiatric disorders, all of the effects (0.16) were attributable to general psychiatric disorders.

DISCUSSION

The three-stage process of model development produced a parsimonious model of the etiology of attempted suicide. The final model is robust in that it consists of causal propositions that are both replicable and nonredundant. Three-quarters of the total effects were due to the presence of a general psychiatric disorder. (Overlap among the general psychiatric disorders prohibited us from modeling each of them separately. Bivariately, each general disorder was related significantly to making a suicide attempt.) Both war-related and non-war-related traumatic exposure during the veteran's military service contributed to the development of a general psychiatric disorder.

PTSD and substance abuse were related to attempted suicide bivariately, as were other variables in the model, but none contributed to making a suicide attempt over and above the contribution of general psychiatric disorders when all were considered at the same time. Military traumas were somewhat more influential than nonmilitary traumas, but only indirectly to the extent that each contributed to development of a general psychiatric disorder.

The absence of a direct influence of military experiences on making a suicide attempt is entirely consistent with the results reported by Farberow et al. (2). Among the military experiences, participation in atrocities had an indirect influence insofar as it contributed to the development of a general psychiatric disorder. The indirect influence of participation in atrocities was greater than that of combat exposure. This distinction between combat exposure and participation in atrocities supports the contention that the latter constitutes an important additional source of traumatic exposure to that of combat as the latter has been traditionally conceived (37).

It is important to acknowledge two limitations to our efforts. One is the inherent caution that the retrospective nature of the data demands of any interpretations. The historical sequence of each set of variables was used as the basis for causal ordering in the model. There is no temporal ambiguity with regard to the historical ordering of premilitary risk factors, military experiences, the homecoming, and postmilitary adaptation. A temporal separation could not be made unambiguously between postmilitary psychiatric disorders and attempted suicide, however. Although it is possible to envision scenarios in which making a suicide attempt might lead to a psychiatric disorder, we believe that the more likely direction in the great majority of cases was that a psychiatric disorder led to making a suicide attempt.

Even when events could be ordered unambiguously, it is possible that a retrospective bias in the veterans' reporting might have introduced a connection between variables that might have not have existed historically. The extent to which such a connection was likely to be introduced is unclear. For example, McFarlane (38) reported that the absence of symptoms diminished the accuracy with which people reported a traumatic event. On the other hand, Norris and Kaniasty (39) found that people's reports were quite accurate for the most part and that even when reports of trauma were elevated, the rank order of their severity was preserved. In any case, the retrospective nature of the data introduces a caveat to the veridicality of causation as it has been modeled and supported empirically in the present study.

A second limitation is the modest amount of variance in attempted suicide that was accounted for by our model. In large measure, this reflects the rudimentary nature of the extent of knowledge concerning the causes of suicide attempts. Identification of more potent causes still awaits this field of study. We believe that our model has value, however, both as an indication of the indirect role of PTSD and traumatic wartime experiences in contributing to suicide attempts and as a heuristic framework for progressively filling in the missing pieces as more research findings and more inclusive data become available.

REFERENCES

1. Pollock DA, Rhodes P, Boyle CA, Decoufle P, McGee DL: Estimating the number of suicides among Vietnam veterans. Am J Psychiatry 1990; 147:772–776
2. Farberow NL, Kang HK, Bullman TA: Combat experience and postservice psychosocial status as predictors of suicide in Vietnam veterans. J Nerv Ment Dis 1990; 178:32–37
3. Laufer RS, Yager T, Frey-Wouters E, Donnellan J: Legacies of Vietnam, vol III: Post-War Trauma: Social and Psychological Problems of Vietnam Veterans and Their Peers. House Committee Print 14. Washington, DC, US Government Printing Office, 1981
4. Kulka RA, Schlenger WE, Fairbank JA, Hough RL, Jordan BK, Marmar CR, Weiss DS: Trauma and the Vietnam War Generation: Report of Findings From the National Vietnam Veterans Readjustment Study. New York, Brunner/Mazel, 1990
5. Fontana A, Rosenheck R: A causal model of the etiology of war-related PTSD. J Traumatic Stress 1993; 6:475–500
6. Fontana A, Rosenheck R: PTSD among Vietnam theater veter-

ans: a causal model of etiology in a community sample. J Nerv Ment Dis (in press)
7. Bollen KA: Structural Equations With Latent Variables. New York, John Wiley & Sons, 1989
8. Hayduk LA: Structural Equation Modeling With LISREL. Baltimore, Johns Hopkins University Press, 1987
9. James LR, Mulaik SA, Brett J: Causal Analysis: Models, Assumptions and Data. Beverly Hills, Calif, Sage, 1982
10. Green AH: Self-destructive behavior in battered children. Am J Psychiatry 1978; 135:579–582
11. Rosenthal PA, Rosenthal S: Suicidal behavior by preschool children. Am J Psychiatry 1984; 141:520–525
12. Shaffer D: Suicide in childhood and early adolescence. J Child Psychol Psychiatry 1974; 15:275–291
13. Shafii M, Carrigan S, Whittinghill JR, Derrick A: Psychological autopsy of completed suicide in children and adolescents. Am J Psychiatry 1985; 142:1061–1064
14. Batchelor IRC, Napier MB: Broken homes and attempted suicide. Br J Delinquency 1953; 4:99–108
15. Bruhn JG: Broken homes among attempted suicides and psychiatric outpatients: a comparative study. J Ment Sci 1962; 108: 772–779
16. Buda M, Tsuang MT: The epidemiology of suicide: implications for clinical practice, in Suicide Over the Life Cycle: Risk Factors, Assessment, and Treatment of Suicidal Patients. Edited by Blumenthal SJ, Kupfer DJ. Washington, DC, American Psychiatric Press, 1990
17. Goodwin DW: Alcoholism and suicide: associated factors, in The Encyclopedic Handbook of Alcoholism. Edited by Pattison E, Kaufman E. New York, Gardner Press, 1983
18. Hart EE, Williams CL: Suicidal behavior and interpersonal network. Crisis 1987; 8:112–124
19. Topol P, Reznikoff M: Perceived peer and family relationships, hopelessness and locus of control as factors in adolescent suicide attempts. Suicide Life Threat Behav 1982; 12:141–150
20. Barraclough BM, Bunch J, Nelson P, Sainsbury P: A hundred cases of suicide: clinical aspects. Br J Psychiatry 1974; 125:355–373
21. Dorpat TL, Ripley HS: A study of suicide in the Seattle area. Compr Psychiatry 1960; 1:349–359
22. Robins E, Murphy G, Wilkinson RH, Gassner S, Kayes J: Some clinical considerations in the prevention of suicide based on a study of 134 successful suicides. Am J Public Health 1959; 49: 888–899
23. Miles CP: Conditions predisposing to suicide: a review. J Nerv Ment Dis 1977; 164:231–246
24. Ward NG, Schuckit M: Factors associated with suicidal behavior in polydrug abusers. J Clin Psychiatry 1980; 41:379–385
25. Black DW, Winokur G: Suicide and psychiatric diagnosis, in Suicide Over the Life Cycle: Risk Factors, Assessment, and Treatment of Suicidal Patients. Edited by Blumenthal SJ, Kupfer DJ. Washington, DC, American Psychiatric Press, 1990
26. Robins E, Gassner S, Kayes J, Wilkinson RH Jr, Murphy GE: The communication of suicidal intent: a study of 134 consecutive cases of successful (completed) suicide. Am J Psychiatry 1959; 115:724–733
27. Helzer JE: Methodological issues in the interpretations of the consequences of extreme situations, in Stressful Life Events and Their Contexts. Edited by Dohrenwend BS, Dohrenwend BP. New York, Prodist, 1981
28. Helzer JE, Robins LN, McEvoy L: Post-traumatic stress disorder in the general population. N Engl J Med 1987; 317:1630–1638
29. Kadushin C, Boulanger G, Martin J: Legacies of Vietnam, vol IV: Long Term Stress Reactions: Some Causes, Consequences, and Naturally Occurring Support Systems. House Committee Print 14. Washington, DC, US Government Printing Office, 1981
30. Keane TM, Fairbank JA, Caddell JM, Zimering RT, Taylor KL, Mora C: Clinical evaluation of a measure to assess combat exposure. Psychol Assessment 1989; 1:53–55
31. Robins LN, Helzer JE, Croughan J, Ratcliff KS: The National Institute of Mental Health Diagnostic Interview Schedule: its history, characteristics, and validity. Arch Gen Psychiatry 1981; 38: 381–389
32. Bentler PM: Comparative fit indexes in structural models. Psychol Bull 1990; 107:238–246
33. Bozdogan H: Model selection and Akaike's information criterion (AIC): the general theory and its analytical extensions. Psychometrika 1987; 52:345–370
34. Mardia KV: Measures of multivariate skewness and kurtosis with applications. Biometrika 1970; 57:519–530
35. SAS Technical Report P-200: SAS/STAT Software: CALIS and LOGISTIC Procedures, release 6.04. Cary, NC, SAS Institute, 1990
36. Cohen J: Statistical Power Analysis for the Behavioral Sciences, 2nd ed. Hillsdale, NJ, Lawrence Erlbaum Associates, 1988
37. Laufer RS, Brett E, Gallops MS: Dimensions of posttraumatic stress disorder among Vietnam veterans. J Nerv Ment Dis 1985; 173:538–545
38. McFarlane AC: The longitudinal course of posttraumatic morbidity: the range of outcomes and their predictors. J Nerv Ment Dis 1988; 176:30–39
39. Norris FH, Kaniasty K: Reliability of delayed self-reports in disaster research. J Traumatic Stress 1992; 5:575–588