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Perceived Stress, Social Support and Survival: North Carolina Farm Operators and the Farm Crisis*

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The current farm crisis draws attention to the sources and consequences of the stress process among farm operators. Using panel data from statewide surveys of North Carolina farm operators collected during a period of economic and ecological crisis, the relationships among perceived stress, social support, and survival in agriculture are investigated. Analyses reveal that while the level of perceived stress has no relationship with survival, social support has a significant impact upon both social psychological (plans to remain in farming) and behavioral (continuing as a farm operator) dimensions of survival in agriculture. Perceived social support increased plans to remain in agriculture and increased the probability of an operator continuing farming. The results point to the importance of social support and have implications for policy intervention and programs.

The term "farm crisis" is used to describe the negative experiences of farm families in the 1980s (Keating, 1987; Thompson & McCubbin, 1987) which have often been described as the worst since the Great Depression of the 1930s (Harl, 1986). Because the farm crisis places extra demands on farm families, concern with farmers' high levels of stress has become a national issue.

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Evidence exists that some farm families display a diverse set of problems and reactions to stress including depression, anxiety, substance abuse, interpersonal violence, marital disruption, and attempted suicide (Heffernan & Heffernan, 1986; Hargrove, 1986; Bultena, Lasley, & Geller, 1986; Davis-Brown & Salamon, 1987; Weigel & Weigel, 1987). There is also concern that the combination of high levels of stress and economic hardship has caused large numbers of farm operators to exit farming. Farm operators are an occupational group vulnerable to uncontrollable and unpredictable demands or stressors. These include wide seasonal variations in work requirements, substantial financial investment and risk, changes in domestic government policies, shifts in international markets, and dependence upon the forces of nature (e.g., weather, plant and animal diseases) (Rosenblatt & Anderson, 1981; Olson & Schellenberg, 1986). Economic stress and the threat of economic disaster are present in the lives of most farmers in ways people in other occupations rarely experience (Rosenblatt & Keller, 1983). These stressors, specific to farming, have been exacerbated by economic hardship in the agricultural sector (Bultena et al., 1986).

The negative impact of economic difficulties and high levels of stress upon the individual has been documented in previous research (Horwitz, 1984; Ross & Huber, 1985). In addition, work of stress theorists suggest that personal and social resources are especially important in the stress process (Pearlin & Schooler, 1978; Pearlin, Lieberman, Menaghan & Mullen, 1981). Factors such as age, education, and social support create differential reactions to similar conditions (Hinkle, 1974). These differences are the result of the various ways people respond to life problems, and the resources, actions and perceptions they mobilize as they seek to avoid or minimize stress (Pearlin & Schooler, 1978). There are different types of resources people can draw on to help in times of trouble (i.e., psychological resources such as self-esteem and mastery), but of specific interest in this study is the role of social support in reducing the negative effects of stress (Gottlieb, 1981; Lin, Dean, & Ensel, 1986; Thoits, 1982).

Farm families are often stereotyped as having well-developed networks of social and community support. Social support is important because it impacts an individual's appraisal of de-

mands or stressors. However, recent research has shown that the depth of the current farm crisis has severely strained existing social and community support networks (Heffernan & Heffernan, 1986; Wright & Rosenblatt, 1987; Keating, 1987; Jurich & Russell, 1987; Heyman & Salamon, 1988). In response, many public and private organizations have provided social support services (e.g., hot lines, peer groups counseling) to decrease stress levels and to help operators remain in farming.

It is assumed that high levels of perceived stress will have a negative impact upon a farm operator's continuation in farming. No study, to our knowledge, has examined the actual survival of farmers as it relates to levels of perceived stress and social support and to demographic, socioeconomic, and farm structure characteristics. Perhaps because of the lack of panel data, other studies of the consequences of the farm crisis have concentrated upon financial viability, not the actual survival of the farm operation (Murdock, Albrecht, Hamm, Leistritz, & Leholm, 1986). The objective of the present study is to investigate the relationships between perceived stress, social support, farm operator characteristics, and farm operator survival using panel data from surveys of North Carolina farm operators.

Farm Operators: Stress and Survival

Stress, as it is conceptualized in this paper, emphasizes the importance of an individual's perception and evaluation of demands in his/her environment (Cohen, Sherrod, & Clark, 1986). One of the more influential models suggests that the experience of stress is related to a balance between primary and secondary appraisals (see Lazarus, 1966 and Lazarus & Folkman, 1984). Primary appraisal is conceptualized as the evaluation of the stressor and its implications, while secondary appraisal involves an appraisal of the individual's coping abilities and resources. When resources are perceived as plentiful, perceived stress may be minimal. If however, resources are perceived as inadequate and an individual is uncertain of capably coping with a situation that has been appraised as threatening or demanding, the level of perceived stress may be great (Lazarus, 1966). This view of stress implies that people actively interact with their environ-

ments, appraising potentially threatening or challenging events in the light of available coping resources (Kessler, 1979).

Research devoted to agricultural concerns have highlighted the importance of a number of different demands with respect to the stress process. One category of demands identified in the farm literature relates to the structure and organization of the farm operation and includes such variables as farm size, off-farm employment, and level of financial concern (Molnar, 1985; Keating, 1987; Walker & Walker, 1987; Keating, Doherty, & Munro, 1986).

Previous research from the nonagricultural sphere has shown that certain socioeconomic and demographic characteristics can be considered as stressors or demands. Individuals undergoing economic difficulties such as low income are at greater risk of experiencing stress (Ross & Huber, 1985; Catalano & Dooley, 1983). It is also well documented that being a women, or being nonwhite is demanding or stressful (Kessler & McLeod, 1984). One of the most consistent findings in the epidemiological literature is that the married manifest better mental health than the nonmarried (Kessler, 1979; Mirowsky & Ross, 1986; Thoits, 1987; Bachrach, 1975). Household size has been viewed as a potential (economic) stressor, because as household size increases, money is spread over a larger number of individuals in the home (Ross & Huber, 1985).

The general social stress and farm literatures highlight the importance of age as a contributing factor in the stress process (Ross & Huber 1985; Horwitz, 1984; Murdock et al., 1986; Campbell, Heffernan, & Gilles, 1984; Heffernan & Heffernan, 1986). The young are often economically disadvantaged, for not only are their earnings and savings lower, but their economic demands are greater.

With regards to resources, classical anomie theory argues that social integration protects the person against uncertainty and demanding situations (Durkheim, 1951). Studies show that social networks are an important personal resource as evidenced by a positive relationship between the extent of social support and psychological well-being (Berkman & Syme, 1979; Henderson, Byrne, Duncan-Jones, Scott, & Adcock, 1980; Unger & Powell, 1980; Gottlieb, 1981; Husaini, Neff, Newbrough, & Moore,

1982; Bell, LeRoy, & Stephenson, 1982). Other studies present evidence that perceived support is central in reducing negative outcomes of stress (i.e., depression, anxiety, low self-esteem) (Gove, Hughes, & Style, 1983; Wethington & Kessler, 1986).

Examining the sociological needs of farmers facing severe economic problems, Heffernan and Heffernan (1986) found that the vast majority of their respondents felt that having a network of persons who listened and offered moral support in times of trouble helped them to cope more effectively with stress. Linn and Husaini (1987) found social support to be an important correlate of depression among farm respondents. Keating (1987) found resources (both personal and social) were stronger predictors of stress in farmers than were financial demands, which in her analysis were not predictive of stress.

In summary, the general social stress literature and studies of farm operators identify demographic, socioeconomic, farm structure, economic hardship, and social support characteristics as important variables in the stress process for farm operators. It is assumed that high levels of stress and low levels of social support have negative impacts upon farm operator survival. However, there has been no attempt to examine this relationship with data from large-scale samples of farm operators. The problem of analyzing the impact of perceived stress, social support and other exogenous variables upon survival in agriculture requires panel data. After detailing data and measurements, we present multivariate models of survival among North Carolina farm operators.

Data and Method

The data used in this study come from the North Carolina Farm Survey gathered in January and February of 1987 and 1988. A random sample of farm operators was selected from a list provided by a state agency. A total of 977 operators and former operators were contacted during the first set of interviews. Interviews were conducted during the first two months of 1987 and concerned the 1986 agricultural year. Of 883 respondents who completed interviews, 725 operated farms during 1986. Comparisons of demographic data on the 725 farm operators with data from the 1982 Census of Agriculture revealed

that sample and population characteristics were very similar. A second set of interviews with the respondents were conducted in early 1988. Approximately 90% of the original sample completed the second wave of telephone interviews. Screening questions determined if the original respondents were still operating a farm or if they had exited agriculture. Of the original sample of 725 active farm operators, 595 survived in farming and 75 exited farming in 1987 (the remaining 55 were not located or refused to be reinterviewed).¹ Thus the data set for this study consists of the 670 farm operators who completed interviews in both surveys. All respondents operated farms during the 1986 agricultural year and 595 also operated farms during the 1987 agricultural year.

The 1986–1987 period was a particularly difficult time for North Carolina farm operators. In addition to the general aspects of the farm crisis, 1986–1987 was a drought period characterized by reductions in farm production and farm income (North Carolina Agricultural Statistics Division, 1987). Further uncertainty was generated by debate over changes in the federal programs supporting the major field crop, flue-cured tobacco.

Measures of Dependent Variables

Two dimensions of farm operator survival were measured in the present study: a social psychological measure of plans to continue in farming, and a behavioral measure of continuing in farming.

During the first wave of interviews, a question was asked about the farm operator's plans for the future. Responses were coded so that a high score indicates plans to continue in agriculture, while a low score indicates plans to exit or reduce the scale of agricultural operations.² A behavioral measure of survival was constructed using data from first and the the second sets of interviews. This measure assessed whether or not the farm operator was still operating a farm one year after the original interviews (0=exit from agriculture; 1=survival).

Measures of Exogenous Variables

The demographic variables, age, race, gender, marital status, household size, and education were ascertained by direct questions.³ Four measures of farm structure are included. Total acres, a measure of scale, is the total number of acres farmed (both owned and not owned in 1986). Acres owned can be considered a measure of tenure and of the size of the farm resource base. Number of days of on-farm work and number of days of off-farm work are indicators of the extent to which the farm is a full-time effort for the farm operator. They can also be considered measures of the demands of farming as an occupation and of isolation from nonfarm spheres. Two measures of income are included in the analysis: total family income and the percentage of family income from farming. Perceived economic hardship is measured by a question about concerns for the farm's financial future (labeled financial concern). We expect these variables to be related to survival, in addition to being important control variables.

A modified eight-item version of the Perceived Stress Scale (PSS) (Cohen, Kamarch, & Mermelstein, 1983) was included in the survey as a global measure of perceived stress. The level of perceived stress can be viewed as an indicator of the extent to which an individual's environment is appraised as stressful or demanding (Cohen & Williamson, 1988). Items included in the modified version of the PSS are designed to cut across several dimensions found to be central components of social psychological stress. Especially important are items dealing with perceived control over one's life. This scale is sensitive to chronic stress arising from ongoing life circumstances, expectations concerning future events, and events occurring to friends and family. Survival in agriculture is most likely affected by a more global perception of stress (i.e., from perceptions of how things are going in general) in comparison to a specific event.⁴

During the telephone interviews, respondents were asked a series of yes/no questions to determine whether or not they found their lives unpredictable and uncontrollable. For all items, a response indicating stress was scored as one, and all nonstress responses were scored as zero. Missing data responses were replaced with means. Factor analysis of the eight items revealed

one strong underlying factor (Eigenvalues greater than one) and that four items were the best measures of perceived stress (loadings greater than .35; see Table 1). Three of the four items deal directly with control over one's life and environment and the fourth taps general perceptions of stress. We believe these items are particularly appropriate for farm operators, given the lack of control and predictability inherent in farming as an occupation. Thus, the "Perceived Stress Index" is a four item summated index with a mean of 1.39, a standard deviation of 1.26, a range of 0 to 4 and a Cronbach's alpha of .60.⁵

Table 1

Factor Pattern Loadings on Perceived Stress Index

In the last month, have you	
Been upset because of something that happened unexpectedly	.666
Felt nervous and stressed	.685
Felt that things were going your way*	.368
Been angered because of things that were outside of your control	.433
Eigenvalue	1.235

*Item Responses Reversed

The final exogenous variable is social support. Perception of support availability is measured by responses to the questions: "Now, considering your financial situation, do you feel that you and your family are receiving adequate emotional or financial support from: (a) friends and neighbors; (b) church; (c) family members; (d) schools; (e) local voluntary organizations; (f) human service organizations?" Yes responses were scored as one and all other responses were scored as zeroes. Missing data were replaced with means. A factor analysis showed one underlying factor (Eigenvalue=2.199) with all six items having moderately high loadings (ranging from 0.54 to 0.64). Therefore,

the six items were summed to produce a single index of social support. The index has a range of 0 to 6, a mean of 4.26, a standard deviation of 1.69, and a Cronbach's Alpha of .76.

The North Carolina farm operators indicated that there was a hierarchy in terms of the perceived adequacy of support received. Results showed that traditional sources of support (e.g., support from family members, church, friends and neighbors) were perceived as more adequate than support from social welfare agencies (i.e., voluntary organizations and human service organizations). The percentage responding yes (i.e., perceiving adequate support) for each of the sources was as follows: family members (89.1%); church (87.6%); friends and neighbors (82.9%); voluntary organizations (63.2%); schools (54.9%); and human service agencies (48.3%).

Findings

What impacts do perceived stress and social support have upon farm operator's plans for the future and upon survival in agriculture? One would hypothesize that higher levels of perceived stress would decrease plans to remain in agriculture and the probability of actually surviving in agriculture across the two waves of the panel. Conversely, perceived social support should show positive relationships with the social psychological and behavior measures of survival.⁶

At the bivariate level, there is essentially no relationship between perceived stress and plans to remain or exit agriculture (Table 2). Regressing the plans for the future variable upon perceived stress and upon the other exogenous variables shows that age, percent income from farming, and social support manifest statistically significant coefficients in the regression model (Table 3).

Older farm operators and farm operators with lower percentages of income from farming were more likely to plan to reduce their farming operations or to plan to exit agriculture altogether. Older operators may be planning to exit agriculture via retirement, and those less dependent upon farming for income may be planning to reduce or exit agriculture for other occupations. In addition, social support increased plans to continue in agriculture.

Table 2

Bivariate Correlations, Means, and Standard Deviations

	Y1	Y2	X1	X2	X3	X4	X5	X6
Y 1. Plans	—							
Y 2. Survival 0 = Exit 1 = Survive	.226***	—						
X 1. Age	-.214***	-.089*	—					
X 2. Race 0 = Nonwhite 1 = White	-.033	.109**	-.098*	—				
X 3. Gender 0 = Female 1 = Male	-.028	.036	-.062	-.044	—			
X 4. Marital Status 0 = Not Married 1 = Married	-.016	-.004	.001	.056	.128***	—		
X 5. Household Size	.109**	.062	-.458***	-.092*	.096*	.223***	—	
X 6. Education	.138***	.003	-.358***	.130***	-.026	.007	.179***	—
X 7. Total Acres Farmed	.052	.057	-.082*	.048	.013	.021	.054	.003
X 8. Acres Owned	.036	.055	-.002	.070	-.062	.026	.001	.083*
X 9. Days On-Farm Labor	.080*	.163***	-.170***	.066	.061	.001	.111**	-.015
X10. Days Off-Farm Labor	.037	-.074	-.272***	.009	.066	.064	.169***	.240***
X11. Total Family Income	.093*	.076*	-.297***	.188***	.050	.122**	.146***	.347***
X12. Percent Income from Farming	.137***	.111**	-.138***	.010	.082*	-.014	.078*	-.052
X13. Financial Concern	.060	.065	-.133***	-.093*	-.058	-.037	.154***	-.053
X14. Social Support	.108**	.091*	-.045	-.004	.056	.007	.032	.084*
X15. Perceived Stress	-.025	.007	-.187***	.049	-.064	-.020	.143***	.021
X	2.78	.888	54.07	.92	.92	.90	2.94	2.89
SD	.728	.316	12.21	.27	.27	.30	1.21	1.26

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

X7	X8	X9	X10	X11	X12	X13	X14	X15
—								
.604***	—							
.167***	.161***	—						
-.099*	-.122**	-.335***	—					
.131***	.154***	.101**	.159***	—				
.155***	.184***	.423***	-.473***	.050	—			
.048	.048	.191***	-.003	-.006	.168***	—		
.016	.007	-.104**	.055	.099*	.055	-.030	—	
.041	.082	.170***	-.052	.025	.043	.190***	-.136***	—
191.54	79.59	3.93	1.74	2.72	40.88	2.89	4.28	1.39
590.21	190.61	1.47	2.21	.90	37.42	1.14	1.67	1.27

Table 3

Multiple Regression of Plans for Future on Exogenous Variables

Exogenous Variables	Unstandardized Coefficient	Standardized Coefficient	T	Sig
Intercept	3.15			
Age	-.010	-.163	-3.303	.0010
Race	-.167	-.062	-1.569	NS
Gender	-.165	-.061	-1.567	NS
Marital Status	-.024	-.010	-.243	NS
Household Size	.002	.004	.081	NS
Education	.043	.075	1.743	NS
Total Acres Farmed	.00003	.023	.481	NS
Acres Owned	-.00001	-.004	-.078	NS
Days On-Farm Labor	.017	.035	.792	NS
Days Off-Farm Labor	.013	.041	.828	NS
Total Family Income	.007	.009	.214	NS
Percent Income from Farming	.002	.120	2.513	.0122
Financial Concern	.011	.018	.441	NS
Social Support	.037	.084	2.173	.0301
Stress	-.035	-.060	-1.511	NS

R² = 0.838

F Ratio = 3.988

Prob > F = .0001

The bivariate relationship between perceived stress and survival in agriculture is also nonsignificant (Table 2). Because survival is a dichotomous variable and because the split between the two categories is not even (11% exited), ordinary least-squares regression can result in errors in inference (Aldrich & Nelson, 1984). Logistic regression was utilized to calculate maximum-likelihood estimates for the regression of survival on perceived stress, social support, and the other exogenous variables. The logistic regression coefficients express the incremental effect of the exogenous variables on the logarithm of the probability of surviving in agriculture.

Table 4 presents the results of the logistic regression. The model with perceived stress and the other exogenous variables is statistically significant as compared to the intercept only model. Race, number of days of on-farm labor, and social support show statistically significant net effects on the log-odds of survival in agriculture. Being white and working more days on the farm increases the log-odds of survival. The direction of the effect between perceived stress and survival is negative, but the relationship is not statistically significant at the multivariate level. However, social support has a significant positive impact on the log-odds of survival.

Table 4

Logistic Regression of Survival in Farming on Exogenous Variables

Exogenous Variables	Logistic Coefficient	CHI-SQ	PROB
Intercept	.1832		
Age	-0.018	1.55	NS
Race	1.012	6.52	0.11
Gender	0.270	0.38	NS
Marital Status	- 0.343	0.54	NS
Household Size	0.138	1.05	NS
Education	-0.122	1.13	NS
Total Acres Farmed	0.0001	0.02	NS
Acres Owned	0.001	0.19	NS
Days On-Farm Labor	0.214	5.39	.02
Days Off-Farm Labor	-0.108	2.14	NS
Total Family Income	0.149	0.83	NS
Percent Income from Farming	0.0004	0.01	NS
Financial Concern	0.124	1.15	NS
Social Support	0.186	6.30	.012
Stress	-0.092	0.76	NS

- 2 Log Likelihood 430.59

Model Chi-Square

Compared to Model

with Intercept Only 35.15/15 D.F. PROB = .0006

We expected perceived stress to have negative impacts upon survival in agriculture as operationalized by both social psychological (plans for the future) and behavioral (continuing as a farm operator) measures. At the bivariate and multivariate levels, perceived stress showed no relationship with either survival measure. In other words, when demands and resources are controlled, perceived stress does not impact survival. Further, the various indicators of economic hardship or uncertainty also showed no relationship with the measures of survival. On-farm labor increased the probability of an operator continuing to operate a farm. The results imply that levels of perceived stress and farm operator survival may be relatively separate phenomenon: life on the farm may be appraised as stressful, but this does not appear to be sufficient cause to plan to exit from, or to actually leave farming. This underscores the importance of farming as a valued "way of life," despite the demands and uncertainty inherent in farming. However, the time span of the North Carolina panel may be too short to capture the causal chain between stress and survival. The regression analyses did show that social support had significant positive impacts upon plans to continue farming and the actual behavior of staying in agriculture. Given that social support was measured in the first wave of panel interviews, there is little doubt that it precedes farm operator survival.

Discussion

Data from statewide surveys of North Carolina farm operators were used to examine the relationship between levels of perceived social stress and two dimensions of survival in agriculture, controlling for the influence of demographic, farm structure, socioeconomic, and social support characteristics. Multivariate analyses revealed that perceived stress did not have significant impact upon either social-psychological plans to stay in agriculture or the behavioral dimension of survival in agriculture. However, perceived social support had a statistically significant impact upon both survival measures: social support increased plans to continue in agriculture and increased the probability that a farm operator survived in farming.

The results confirm a major assumption underlying social policy and social work practice: that increasing the perceptions of support availability will have positive results for farm operators experiencing stress. The structure of social welfare in rural communities, particularly the small number of agencies and professionals (Ginsberg, 1976), means that the traditional rural social work practice of mobilizing and strengthening natural networks within the community (e.g., family members, friends, churches) may be the most advantageous method for assisting farm operators and their families (Buxton, 1976). Organizations such as the Cooperative Extension have mobilized natural networks through support groups, hotlines, and peer counseling (Keating, 1987).

The number of black-operated farms in the United States has declined at rates approximately double those for whites (USCCR, 1982). The North Carolina farm survey data show that minority racial status decreased the probability of surviving in agriculture, even when all other variables were controlled. The panel data revealed that 11% of white respondents, whereas 23% of nonwhite respondents (blacks and native Americans), exited agriculture. Policies specifically addressed to the problems and conditions of minority farm operators are necessary if they are to remain part of the agricultural structure.

Given continuing occupational, economic and ecological uncertainties in agricultural production, farm operator stress will continue. Therefore, the need for social welfare program development designed to provide farm operators with social support will continue. Programs which combine technical assistance from nonfarm professionals with peers providing services through existing networks are one possible strategy. In North Carolina, the Duke Endowment has organized a rural church network to provide training and resources to rural ministers. The United Farmer's Organization, a multiracial group of North and South Carolina family farmers assisted by professionals from the Rural Advancement Fund, operates a hotline, provides advice for farmers facing foreclosure, and lobbies for political change. The North Carolina Association of Black Lawyers funds a land-loss prevention project to provide legal assistance to minority farmers who lack clear legal titles to their

land. In addition to the specific benefits that these efforts provide to farm operators, they increase the perception that social support is available. While social support cannot eliminate the economic, ecological, and occupational stressors particular to farming, it can have positive outcomes for farm operator survival in agriculture.

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Notes

1. Comparisons of second wave respondents and nonrespondents utilizing first wave data revealed little or no differences in mean education, age, total family income, days of on-farm labor, and days of off-farm labor. Second wave nonrespondents operated smaller scale operations and were more dependent upon farming for total family income than second wave respondents.
2. The specific question was, "Within the next two years, are you more likely to expand your farming operation, reduce your farming operation, keep your farming operation about the same, or leave farming altogether?" Plans to expand were coded as 4, plans to keep the farm the same were coded as 3, plans to reduce were coded as 2 and plans to exit were coded as 1.
3. An appendix detailing the operationalization of exogenous variables is available from the authors.
4. Though it is difficult to distinguish conceptually between perceived stress and psychological distress, it is our contention that the perception of stress itself, as assessed by the Perceived Stress index, is not merely a measure of psychological symptomatology. First, the PSS contains some items that are not typical of psychological disorder scales (i.e., perceived control over one's life). Secondly, situations in life can be appraised as stressful without resulting in various psychological symptoms.
5. A yes/no format for perceived stress was utilized in order to measure whether or not the respondents perceived any stress within the last month. A pretest using a more standard Likert-like set of responses resulted in a large number of no responses and don't know's. Given time limitations for the telephone interviews (approximately ten minutes) and the results of the pretests, it was decided to utilize the yes/no format, even though it may have reduced the variance in responses.

In telephone interviews, a four-item abbreviated version of the PSS was found to have adequate reliability and was a useful measure of perceived stress for situations requiring a short index (Cohen, 1986; Cohen et al., 1983). In a recent article using a large national sample, Cohen and Williamson (1988) compare fourteen, ten, and four item versions of the PSS. Their four item version of the PSS had an alpha of .60 (exactly the same as the four item index in this study). They state that a four item PSS index "demonstrated a moderate loss in reliability, but its factor structure and predictive validity were good...(and)

is appropriate for use in situations requiring a very brief measure of stress perceptions" (Cohen & Williamson, 1988: 61).

6. It is possible that the effects of some of the exogenous variables (stressors) upon the survival measures are really nonlinear. Tests for nonlinearity between both survival measures and age, percent income from farming, and total family income were nonsignificant.