

# Depression and Perceived Stress Among Cash Grain Farmers in Ohio

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## Abstract

The mean level of depressive symptoms among male cash grain farmers in Ohio ( $N = 1388$ ) was compared to that of a representative sample of employed males in the United States ( $N = 1375$ ). An age-adjusted comparison indicated that the farmers reported higher levels of depressive symptoms. Age-specific comparisons indicated that farmers aged 30 to 44 years experienced higher levels of depressive symptoms and a greater likelihood of having a depressive disorder than did their similarly-aged national counterparts. Among the farmers, the elevated levels of depressive symptoms for the younger farmers were due to high levels of perceived stress, whereas the slightly elevated levels among farmers aged 65 years and older were not.

*Keywords:* Depression, Stress, Agriculture.

Employees in certain occupations (e.g., air traffic controllers, teachers, and secretaries) report higher levels of stress and a greater likelihood of exhibiting stress-related mental health problems than workers in other occupations (Eaton et al., 1990; Sayetta and Johnson, 1980; Colligan et al., 1977; Caplan et al., 1980). There are two competing perspectives on the extent to which farmers experience stress and stress-related mental health problems such as depression. One perspective is that farmers work in bucolic settings, free from many of the occupational stressors that are common among employees in hierarchical, bureaucratic organizations (e.g., conflicts with supervisors, unclear job expectations, highly routinized job tasks) (Murray and Keller, 1991). Comparisons of rural and urban dwellers show either similar levels of stress and stress-related problems between the two groups (Kessler et al., 1994), or significantly lower levels in the rural group (Blazer et al., 1986; Chapman, 1992). However, farmers constitute a minority of all rural residents, and thus such comparisons may not adequately reflect the experience of farmers. The competing perspective suggests that farmers are exposed to numerous potent stressors, putting them at elevated risk for problems such as depression. Proponents of this position point to the findings of a variety of studies: those that document a high prevalence of stressors on farms (Kenkel, 1986), those that show that farmers report stress as a major concern (Tevis, 1982), and

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those that found high rates of depressive symptoms and suicide among certain farmers (Chapman, 1992).

Do farmers experience more depressive symptoms than the national average? Are they at an elevated risk for depressive disorder? Existing studies have not adequately addressed these questions because they have either compared urban and rural populations without differentiating between farm and non-farm rural dwellers (Kessler et al., 1994), or they have not included large enough numbers of farmers to get reliable estimates for clearly defined agricultural groups (Eaton et al., 1990; Sayetta and Johnson, 1980). The Ohio Farm Family Health and Hazard Surveillance Program (OFFHHS) provided an opportunity to estimate the levels of depressive symptoms and the prevalence of depressive disorder among cash grain farmers in Ohio. Because the OFFHHS utilized the same measure of depressive symptoms used in the NHANES I Epidemiological Follow-Up Study (NHEFS), the estimates from the OFFHHS were compared with estimates from this national sample.

In addition, the OFFHHS afforded an opportunity to assess the extent to which depressive symptoms among farmers are related to perceived stress levels. There is a general consensus that both biology and social environments play a role in the etiology of depression. Stress arising from overwhelming, uncontrollable demands has been shown to contribute to depressive symptoms (Kenkel, 1986). Examining the strength of the relationship between perceived stress and depression can help guide the development of future prevention efforts in farmers.

## Methods

### Data Sources

The OFFHHS was conducted in June through November, 1993, utilizing a stratified random sample of cash grain farms drawn from the Ohio Agricultural Statistics Service's list of farms. The sample was stratified by farm size. A self-administered questionnaire that included items addressing a broad range of hazards and health issues was mailed to each of the farms in the sample, with instructions that it was to be completed by the farm's principal operator. Farmers who did not return the survey received a second mailing and subsequent telephone follow-up. Seventy-one percent of the respondents ( $n = 2571$ ) answered some portion of the questions, either through return of the self-administered questionnaire or through answering questions over the phone. Fifty percent of the farmers completed the entire questionnaire. Only responses from male principal operators who had complete data on the stress and depressive symptom measures were included in this study ( $n = 1388$ ). Follow up of the non-responders was conducted by a postcard that asked select demographic, health, and exposure questions. A comparison of the male principal operators included in this study with those who were not included because of partial response and with those who were non-responders showed that the study sample was younger than the non-responders, had been in agriculture longer than the non-responders, and were more highly educated than the partial responders (table 1). Because the distribution of farms by size in the OFFHHS sample was found to differ from that of the 1992 Ohio Agricultural Census, weighting was employed so that the OFFHHS sample better represented the Ohio Agricultural Census population (Wilkins, 1994). The sample weight was calculated as the reciprocal of the probability that a farm was sampled and a response was obtained within each farm size strata.

**Table 1. Comparison of sample demographics**

Demographic Variables	Study Sample	Partial Responders	Non-responders
Mean age of principal operator ( $\pm$ SD)	52.86 $\pm$ 12.48	52.88 $\pm$ 13.78	55.18 $\pm$ 12.95
Mean years in agriculture	41.46 $\pm$ 17.38	43.86 $\pm$ 17.44	34.10 $\pm$ 14.90
Education			
% less than high school	8.5%	12.6%	10.5%
% high school grad	56.2%	61.7%	55.8%
% some college	17.1%	15.7%	16.1%
% college grad	18.2%	10.0%	17.6%

The NHEFS was conducted from 1982 to 1984, collecting follow-up data from adults who were participants in the first National Health and Examination Survey (NHANES I). NHANES I collected data from a national probability sample of the civilian non-institutionalized population. The sampling and data collection procedures for the NHEFS are described elsewhere (U.S. Department of Health and Human Services, 1987). In order for this nationally representative sample to be more comparable to the OFFHHS sample of male farm operators, only the respondents who were male, employed, not disabled, and not full time students were included in the analysis. When these criteria were applied, 1375 respondents were available from the NHEFS.

The age distributions of the two samples differed (table 2). Since previous studies have demonstrated an association between age and depression (Myers et al., 1984), estimates of mean levels of depression have been age-adjusted, using the age distribution of the national sample as the standard. In addition, age-specific comparisons between the two samples are presented.

### Measures

Depressive symptoms were measured using the 20-item Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977). Respondents were asked how often they had experienced symptoms such as loss of appetite, restless sleep, crying spells, and loneliness during the last week. The four-point response scale ranged from 0 = Rarely or None of the Time to 3 = Most or All of

**Table 2. Age-adjusted and age-specific comparisons between the farm and national samples using the natural log transformed CESD scores and the proportion screening positive for depressive disorder (CESD > 15)**

	Farmer Sample (OFFHHS)			National Sample (NHEFS)			T-test for Means	T-test for Proportions
	Mean (SD)	Proportion Screening Positive	n	Mean (SD)	Proportion Screening Positive	n		
Overall age-adjusted comparisons	1.68 (0.94)	0.08	1367	1.57 (0.97)	0.07	1375	3.01*	1.50
Age-specific comparisons								
30-44	1.78 (0.90)	0.10	369	1.56 (0.95)	0.06	493	3.48*	2.03†
45-54	1.59 (0.98)	0.07	362	1.61 (1.01)	0.09	389	-0.27	-1.01
55-64	1.64 (0.95)	0.08	376	1.53 (0.96)	0.05	378	1.58	1.67‡
65+	1.74 (0.93)	0.08	260	1.56 (0.96)	0.05	115	1.69‡	1.04

\* p < 0.01.

† p < 0.05.

‡ p < 0.10.

the Time. Scores were determined by summing the responses on the 20 items, and could thus range from 0 to 60. The CES-D has been used extensively in community studies, and has shown adequate reliability and validity (Myers et al., 1984; Radloff, 1977). The Cronbach reliability coefficient calculated from the OFFHHS data for this scale was 0.83. A log transformation [ $\ln(\text{CESD} + 1)$ ] was employed to normalize the skewed distribution of the CES-D before analyses were conducted. In addition to use as a continuous measure, the CES-D has been used and validated as a dichotomous screening measure. Scores of 16 and above have been used to screen for individuals at risk for depressive disorder (Radloff and Locke, 1986).

The 10-item Perceived Stress Scale (PSS) measures how often respondents have found their lives to be unpredictable, uncontrollable, or overloaded during the past month. The five-point response scale ranged from 0 = Never to 4 = Very Often (Cohen et al., 1983). Scores were determined by summing the responses on the 10 items, and thus ranged from 0 to 40 with higher scores indicating higher levels of stress. This scale has been shown to have good validity and reliability (Cohen et al., 1983; Cohen and Williamson, 1988). The Cronbach reliability coefficient for this scale for the farmer sample was 0.82.

Although there is some conceptual overlap between the CES-D and the PSS, there are also differences. The CES-D measures only psychological symptoms. While the PSS includes some items that measure psychological symptoms (e.g., "how often have you felt nervous and stressed?"), the PSS also measures the extent to which the respondent perceives himself to have been able to respond effectively to external demands (e.g., "how often have you been able to control irritations in your life?") (Cohen and Williamson, 1988).

## Results

Comparisons between the farm sample and the national sample are presented in table 2. The age-adjusted mean of the log transformed CES-D score was significantly higher in the farmer sample than in the NHEFS sample. The age-adjusted proportions of respondents in the two samples who screened positive for depressive disorder were not statistically significantly different, although a higher proportion of farmers did screen positive.

The age-specific comparisons show that farmers aged 30 to 44 years reported experiencing significantly more depressive symptoms than their comparably-aged peers in the national sample. These younger farmers were also more likely to screen positive for depressive disorder than were the 30 to 44 year olds in the NHEFS sample. Although not statistically significant, farmers aged 65 years or older tended to report more depressive symptoms than did similarly-aged men in the national sample.

Using only the farmer sample, the relationships of age and perceived stress to depressive symptoms were explored using hierarchical regression analyses. In the first step, dummy variables for the age groups were entered as predictors. Next, perceived stress was added to the regression model. Residual analysis verified the assumptions of the regression model. As indicated in table 3, age was not strongly related to depressive symptoms, explaining only one percent of the variance in depressive symptoms. However, the 45 to 54 year olds and the 55 to 64 year olds did report less symptomatology than the 30- to 44-year-old farmers. As expected given the conceptual overlap in the measures, perceived stress showed a strong positive relationship to depressive symptoms. When perceived stress was entered in the model in Step 2, the differences among the age groups that were described above

**Table 3. Hierarchical regression analysis of the relationship of age and perceived stress with depressive symptomatology among cash grain farmers in Ohio\***

Independent Variables	Step 1		Step 2	
	b	SE	b	SE
Intercept	1.78	0.05	0.56	0.06
Age group b				
45-54 yrs	-0.19	0.07‡	-0.12	0.05§
55-64 yrs	-0.13	0.07	0.00	0.05
65 or older	-0.04	0.08	0.11	0.06
Perceived Stress			0.10	0.00#
R <sup>2</sup>	0.01		0.41	
F-score	2.98§		239.38#	

\* Table entries, except for the R<sup>2</sup>s, are unstandardized regression coefficients.

† Omitted category is 30-44 yr olds.

‡ p < 0.01.

§ p < 0.05.

|| p < 0.10.

# p < 0.001.

were lessened. In addition, a marginally significant difference between the oldest farmers and the 30 to 44 year old group became apparent.

These results suggest that the elevated levels of depressive symptoms among the younger farmers were due in part to high levels of perceived stress, whereas the elevated levels of depressive symptoms among the farmers aged 65 years and older were due to factors other than the components of perceived stress measured by the PSS (i.e., overload, unpredictability, and uncontrollability). Indeed, the age-specific perceived stress levels of farmers are consistent with this conclusion (table 4). The youngest farmers reported the highest levels of perceived stress and also reported the highest levels of depressive symptoms. The oldest farmers, who reported the second highest level of depressive symptoms, did not have elevated perceived stress levels. The correlations between perceived and depressive symptoms calculated for each age group clearly indicate a stronger association between these variables for the younger farmers than for the older farmers.

## Conclusion

The results of this study indicate that male farm operators, particularly those under the age of 45 years, reported experiencing more depressive symptoms than the average employed male in the U.S.. This same group of farmers was also more likely

**Table 4. Perceived stress levels among farmers, by age group**

Age Group	PSS Mean ( $\pm$ SD)	N	Correlation with CESD
30-44 yrs	11.75 $\pm$ 5.79	369	0.69
45-54 yrs	11.10 $\pm$ 6.12	362	0.69
55-64 yrs	10.48 $\pm$ 5.84	376	0.60
65 or older	10.32 $\pm$ 5.47	260	0.56

F value = 4.19\*.

\* p < 0.01.

to screen positive for depressive disorder. These effects are small in magnitude. However, when considered in the context of a documented scarcity of mental health services in rural areas (Murray and Keller, 1991), they indicate that farm populations should be a priority when resources and services that promote mental health are being allocated.

The results of this study must be interpreted cautiously. As with any cross-sectional study, the data represent a "snapshot" of the study population at only one point in time. At the time of the study, the cash grain farmers in Ohio had not experienced a major crisis within the past five years. Indeed, data were collected during a relatively prosperous year. Other studies have documented a rise in depression levels among farm populations during economic recessions or times of natural disaster (Chapman, 1992). Thus, this particular snapshot of Ohio cash grain farmers was likely to capture optimistically low levels of symptomatology. The NHEFS was conducted 10 years prior to the OFFHHS, and thus a secular trend in depressive symptomatology or any changes in respondent willingness to disclose information about depression during this time period may contribute to the differences between the farmers and the national sample. Although there is some evidence that the prevalence of depressive disorders in the United States has risen during the last two decades (Klerman and Weissman, 1989), none of the existing studies have examined trends separately in farming and non-farming populations.

Differences between the two samples in terms of the respondents' willingness to report depressive symptoms might exist because of cultural differences, also. Qualitative studies have noted that, on average, farmers are quite stoic and resist admitting to any kind of ill health (Ellis and Gordon, 1991); thus, if cultural factors biased the self-reports, it is likely that the bias would work against finding higher depressive symptomatology among the farmers than among the national sample.

Although the effects of sex, age, and employment status are controlled in the present study, other demographic correlates of depression such as race, marital status, and socioeconomic status may influence the findings. However, it should be noted that since being White and being currently married have been consistently associated with lower levels of depressive symptoms (Sayetta and Johnson, 1980; Kessler et al., 1994; Eaton and Kessler, 1981), the distributions in the two samples of race (99.5% White in OFFHHS versus 89.9% in NHEFS) and of marital status (92.1% currently married in OFFHHS versus 83.1% in NHEFS) would again bias against finding more depressive symptoms amongst the farmers.

Lastly, although the study sample is fairly representative of Ohio cash grain farmers, Ohio cash grain farmers are not representative of all farmers in the U.S. Previous research has suggested that the prevalence of mental health problems among agricultural workers varies according to many factors, including the type, size, and location of the farm (Chapman, 1992).

This study suggests that the factors related to depressive symptoms among younger farmers may differ from those most relevant for older farmers. Elevated depressive symptom levels in younger farmers seem to be explained by high levels of overload, unpredictability, and uncontrollability, as measured by the PSS. This is not the case for the older farmers; perhaps biological factors and stressors such as the loss of a spouse or the loss of a major life role (e.g., through retirement) play a more important role in the etiology of depressive symptoms for this group. Financial problems such as high debt-asset ratios are prevalent and potent stressors among farmers, particularly younger farmers (Olson and Schellenberg, 1986; Schulman and Armstrong, 1989). The strong relationship between perceived stress and depression found in this study suggests that policies and interventions that reduce exposure to

or vulnerability to financial stressors would likely reduce depressive symptoms, especially among the young farmers.

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## References

Blazer D., B. A. Crowell Jr., L. K. George and R. Landerman. 1986. Urban-rural differences in depressive disorders: Does age make a difference? In *Mental Disorders in the Community: Progress and Challenge: Proc. of the 75th Annual Meeting of the Am. Psychopathological Assoc.*, eds. J. E. Barrett and R. M. Rose, 32-46. New York, 28 February - 2 March 1985. New York: Guilford Press.

Caplan, R. D., S. Cobb, J. R. P. French Jr., R. V. Harrison and S. R. Pinneau Jr. 1980. Job Demands and Worker Health. Ann Arbor, Mich.: The Institute for Social Research, University of Michigan.

Chapman, L. J. 1992. Sources of data and information on stress-related disorders among agricultural workers. Report prepared for NIOSH, Division of Biomedical and Behavioral Science, Motivational and Stress Research Section, 1-32.

Cohen, S., T. Kamarck and R. A. Mermelstein. 1983. A global measure of perceived stress. *J. of Health and Social Behavior* 24(Dec.):385-396.

Cohen, S. and G. M. Williamson. 1988. Perceived stress in a probability sample of the United States. In *The Social Psychology of Health*, eds. S. Spacapan and S. Oskamp, 1-67. Newbury Park, Calif.: Sage Publications, Inc.

Colligan, M. J., M. J. Smith and J. J. Hurrell Jr. 1977. Occupational incidence rates of mental health disorders. *J. of Human Stress*. (September):34-39.

Eaton, W. W., J. C. Anthony, W. Mandel and G. Garrison. 1990. Occupations and the prevalence of major depressive disorder. *J. of Occup. Med.* 32(11):1079-1087.

Eaton, W. W. and L. G. Kessler. 1981. Rates of symptoms of depression in a national sample. *Am. J. of Epidemiol.* 114(4):528-38.

Ellis, J. L. and P. R. Gordon. 1991. Farm family mental health issues. *Occup. Med.: State of the Art Reviews* 6(3):493-502.

Kenkel, M. B. 1986. Stress-coping-support in rural communities: A model for primary prevention. *Am. J. of Community Psychol.* 14(5):457-478.

Kessler, R.C., K. A. McGonagle, S. Zhao, C. B. Nelson, M. Hughes, S. Eshleman, H. Wittchen and K. S. Kendler. 1994. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. *Arch. Gen. Psychiatry* 51(1):8-19.

Klerman, G. L. and M. M. Weissman. 1989. Increasing rates of depression. *JAMA* 261(15):2229-2235.

Murray, J. D. and P. A. Keller. 1991. Psychology and rural America current status and future directions. *Am. Psychologist* (March):220-231.

Myers, J. K., M. M. Weissman and G. L. Tischler. 1984. Six month prevalence of psychiatric disorders in three communities. *Archives of General Psychiatry* 41(10):959-970.

Olson, K. R., R. P. Schellenberg. 1986. Farm stressors. *Am. J. of Community Psychology* 14(5):555-569.

Radloff, L. S. 1977. The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement* 1(3):385-401.

Radloff, L. S. and B. Z. Locke. 1986. The community mental health assessment survey and the CESD-D scale. In *Community Surveys of Psychiatric Disorders*, eds. M. M. Weissman, J. K. Myers and C. E. Ross, 177-189. New Brunswick, N.J.: Rutgers University Press.

Sayetta, R. B. and D. P. Johnson. 1980. Basic data on depressive symptomatology. DHEW Publication PHS 80-1666. *Vital Health Stat* 11(216).

Schulman, M. D. and P. S. Armstrong. 1989. The farm crisis: An analysis of social psychological distress among North Carolina farm operators. *Am. J. of Community Psychol.* 17(4):423-441.

Tewis, C. 1982. Stress. *Successful Farming*, (February):27-42.

U.S. Dept. of Health and Human Services. 1987. *Public Use Data Tape Documentation Interview NHANES I Epidemiologic Follow up Study 1982-1984*, Hyattsville, Md.

Wilkins, J. R. III. 1994. A farm family health and hazard surveillance program for cash grain farmers in Ohio. In *Proc. of the NIOSH Symposium on Efforts to Prevent Injury and Disease Among Agricultural Workers*, 99-102. DHHS (NIOSH) Publication no. 94-119. Cincinnati, Ohio: U.S. Dept. of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.