

# Depressive Symptoms Among Colorado Farmers

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## Abstract

Previous studies have reported farmers to be at higher risk of suicide compared to other workers. In order to determine possible correlates of suicide, a study including assessment of depressive symptoms was undertaken in Colorado. The purpose of this article is to describe depressive symptoms among a representative sample of Colorado farm operators and their spouses. A stratified sample of farms in Colorado was selected for study. Detailed questionnaires were administered by telephone interview assessing general health, farm characteristics, demographics, hazards, injuries, behavioral risk factors, safety knowledge, medical care and insurance, mental health using the Center for Epidemiologic Studies Depression Scale, social support, and pesticide exposures. Logistic regression was used to evaluate factors associated with depressive symptoms in this population. A total of 485 farms representing 872 individuals were enrolled in the study. A 9.3% overall prevalence of depressive symptoms was found in the group; 7.9% among males and 11.1% among females. Factors evaluated in relation to depressive symptoms were age, social support, negative life changes, general physical health, changes in income, and alcohol use. Based on backward elimination, overall assessment of health, gender, social support, and negative life changes were significantly associated with depressive symptoms. Overall prevalence of depressive symptoms was lower in this population from that reported in the general population. Characteristics associated with depressive symptoms in other population studies were also associated with depression in this group. Further work is needed to elucidate factors which affect the overall risk of suicide among farmers.

*Keywords.* Mental health, Farmers, Depressive symptoms.

**A** number of studies have reported higher suicide rates among agricultural workers than expected (Guralnick, 1963; Walrath et al., 1985; Stallones, 1990). Although depression is well known to be associated with an increased risk of suicide, there is incomplete information available on the mental health status of agricultural workers. Depressive symptoms have been reported to be higher among agricultural workers than among other occupational groups (Sayetta and Johnson, 1980). The role of economic and social change on the risk of depression has not been studied among agricultural workers.

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Acute neurotoxic effects of pesticide exposure have been well described; they include residual anxiety and depression (Hayes, 1982; Senanayake and Karalliedde, 1987). Cholinesterase inhibitors have been shown to induce depression (Bowers et al., 1964; Levin et al., 1976). Organophosphate compounds and carbamates are commonly used pesticides that are known anticholinesterase substances (Hayes, 1982). Due to chronic exposures to these compounds, there is a need to evaluate the prevalence of depression among exposed workers in agriculture.

More recent population-based data are needed among agricultural workers since there have been many changes in agricultural practices and in social and economic situations for farmers. The purpose of this article is to describe depressive symptoms among a representative sample of Colorado farm operators and their spouses conducted during 1993.

## Materials and Methods

A stratified probability sample of farms in Colorado was selected for study. A telephone survey was conducted on a sample of Colorado farms during February through April, 1993. The sample was identified through the use of the farm truck registration list available from the Division of Motor Vehicle Registration, Colorado Department of Revenue (Motor Vehicle Department, 1991). This list identified each truck in Colorado that was registered as a farm truck in the past two years. The record for each farm truck contained the names of up to three owners of the vehicle, the legal address, and the mailing address for the vehicle. Farm trucks are registered separately from other types of trucks. In order to register a truck as a farm truck, the owner must make 51% of his or her income from farming land that he or she owns or leases. In addition, the owner must sign an affidavit indicating that the truck is used for farm work and no other commercial purposes. Thus, this sampling frame represents principal farm operators. Other categories of truck registration in Colorado include standard trucks and light trucks. The cost of registration is based on the size of the truck as well as the model and year. In general, the cost of registration for larger farm trucks is less than for standard trucks; the registration cost for smaller farm trucks is slightly lower than the cost for light trucks. Thus, it is economically advantageous to register a truck as a farm truck. Crop reporting districts were developed by the Colorado Agricultural Statistics Service and are used as the basis for reporting agricultural practices in the state (Colorado Agricultural Service, 1990). There are six crop reporting districts in the state. During 1990, the number of vehicles registered as farm trucks was 94,707. District 1 had 5.4 registered farm trucks per resident farm operator household; District 2, 5.3; District 3, 5.3; District 4, 5.9, District 5, 3.2; and District 6, 3.8. Table 1 presents the number of farm resident operator households by agricultural district (Census of Agriculture, 1989), the number of farm trucks registered in each district, and the percent of agricultural sales for each district. This table was used to determine whether there was a biased distribution of farm trucks in any district in relation to the overall agricultural sales or the number of farm households.

Detailed questionnaires were administered by telephone interview assessing general health, farm characteristics, demographics, hazards, injuries, behavioral risk factors, safety knowledge, medical care and insurance, mental health using the Center for Epidemiologic Studies Depression (CESD) scale, social support, and pesticide exposures.

**Table 1. Percentage of rural farm households, registered farm trucks, and agricultural sales by crop reporting district in Colorado**

District	Farm Households (%)	Registered Farm Trucks (%)	Agricultural Sales (%)
1	28.1	31.4	48.3
2	23.7	26.2	22.8
3	13.6	15.2	16.0
4	5.7	7.0	4.3
5	21.0	14.0	5.0
6	7.9	6.2	3.6

Interviews were designed to take approximately 20 min for the farmer and for the spouse of the farmer.

The CESD scale contains a series of 20 questions and has been used in numerous studies (Radloff, 1977; Comstock and Helsing, 1976; Frerichs et al., 1981; Roberts, 1980; Vernon and Roberts, 1982; Murrell et al., 1983; Weissman et al., 1977). The scale scores range from 0 to 60. The CESD scale has been shown to be a valid screening tool for detecting depressive symptoms in general populations and in psychiatric populations (Weissman et al., 1977). The scale is valid, reliable, and internally consistent (Roberts, 1980; Vernon and Roberts, 1982). A score of 16 or higher has been used by other investigators (Frerichs et al., 1981; Goldberg et al., 1985) to indicate high depressive symptoms and was used in the analysis of this survey. Variables which were assessed in relation to depressive symptoms were gender, age, social support, negative life events, involvement in farm work, general perception of health status, alcohol use, and race. Univariate analyses were conducted to identify important variables for inclusion in the regression model. Logistic regression was used to evaluate factors associated with depressive symptoms in this population. Backward elimination was used to model the relationships between exposure and outcome.

## Results

A total of 485 farms representing 872 individuals were enrolled in the study. Table 2 contains the sampling distribution by agricultural region. Table 3 shows the distribution of selected characteristics of the study population.

A 9.3% overall prevalence of depressive symptoms was found in the group; 7.9% among males and 11.1% among females. The overall mean score for the CESD scale in this population was 6.1 with a range of scores from 0 to 52 and a standard deviation of

**Table 2. Number of rural farm households and sample size by crop reporting district**

District	Farm Households in which a Principal Operator Resides (No.)	Target Sample Size	Actual Sample Size
1	5,578	170	159
2	4,713	117	112
3	2,709	68	67
4	1,567	33	33
5	4,176	90	77
6	1,131	28	28
<b>TOTAL</b>	<b>19,874</b>	<b>500</b>	<b>485</b>

Table 3. Selected characteristics of the study population, Colorado 1993

Characteristic	Males (%) (n = 470)	Females (%) (n = 402)
<b>Depressed</b>		
Yes	7.9	11.1
No	92.1	88.9
<b>Race</b>		
White	98.5	98.8
Hispanic	0.43	0.25
Asian	0.64	0.50
American Indian	0.43	0.50
<b>Region</b>		
1	31.9	34.1
2	24.9	23.4
3	14.3	13.9
4	5.7	5.5
5	15.1	14.9
6	8.1	8.2
<b>Income</b>		
< \$40,000	44.0	45.8
\$40,000-\$99,000	23.6	20.9
> \$99,000	29.4	30.6
Unknown/Refused	3.0	2.7
<b>Marital Status</b>		
Married	52.4	71.0
Not Married	47.6	29.0
<b>Years of Education</b>		
8 or less	5.3	1.2
Some high school	3.2	4.2
High school graduate/GED	39.6	37.0
Some technical school	2.5	3.7
Technical school graduate	3.0	3.0
Some college	23.2	23.4
College graduate	16.4	18.4
Post graduate	6.8	8.7
<b>Involved in Farm Work</b>		
Yes	99.4	77.6
No	0.6	22.4
<b>Perceived Health</b>		
Excellent	30.0	34.8
Very good	37.9	37.6
Good	23.8	22.1
Fair	6.2	3.5
Poor	2.1	2.0
<b>Income Declined</b>		
Yes	23.7	78.0
No	76.3	22.0

6.8. The mean age for the study population was 47.5 years with a range from 20 to 84 and a standard deviation of 12.9 years. Unadjusted odds ratios for perceived health, comparing fair and poor assessments to those who reported they were in excellent health, very good health, or good health for gender, for farm work, for decreased income, for age, and for marital status are shown in table 4. Those characteristics which were associated with high depressive symptoms were perceived poor health, being a female, having a decrease in income, being unmarried, and younger age. Being involved in farm work was associated with a lower likelihood of being depressed.

Variables which were entered into the model to assess high depressive symptoms were age, race, gender, marital status, farm income, use of alcohol, reduction in income, involvement with farm work, and perceived health status. Based on backward elimination, overall assessment of age, perceived health status, marital status, being involved in farm work and a reduction in income were significantly associated with depressive symptoms (table 5). Younger age was associated with higher depressive symptoms. Poor perception of health was associated with higher depressive symptoms. Being unmarried and having had a significant reduction in income were associated with higher depressive symptoms. Being involved in farm work was associated with lower depressive symptoms.

## Discussion

Overall prevalence of depressive symptoms was lower among farm residents (8% for males; 11% for females) than among the general U.S. population (11% for males; 21% for females) (Sayetta and Johnson, 1980). Characteristics which have been found to be associated with high depressive symptoms in other studies which used the CESD scale include older age, being female, low income, low educational achievement, poor physical

Table 4. Unadjusted odds ratios for selected characteristics associated with high depressive symptoms

Characteristic	Odds Ratio	95% Confidence Interval
<b>Perceived Health</b>		
Excellent	1.00	
Very good	1.21	0.61, 2.41
Good	2.31	1.17, 4.61
Fair	4.17	1.57, 10.93
Poor	5.88	1.45, 20.17
<b>Gender</b>		
Males	1.00	
Females	1.45	0.89, 2.35
<b>Marital Status</b>		
Married	1.00	
Unmarried	2.25	1.09, 4.59
<b>Involved in Farm Work</b>		
No	1.00	
Yes	0.53	0.27, 1.04
<b>Income Declined</b>		
No	1.00	
Yes to no	2.61	1.58, 4.30

**Table 5. Logistic regression analysis of high depressive symptoms (CESD scale > 15) among farm operators and their spouses, Colorado 1993\***

Variable	Regression Coefficient	Chi-square	P-value
Intercept	-1.39		
Age	-0.04	13.9	0.0002
Reduction in income	0.91	12.3	0.0004
Marital status	0.93	6.2	0.0128
Involved in farm work	-0.82	6.0	0.0140
Perceived health	0.53	19.2	0.0001

\* n = 857.

health, and lack of social support (Comstock and Helsing, 1976; Frerichs et al., 1981; Goldberg et al., 1985). In accord with the other studies, the Colorado farm population were more likely to have high depressive symptoms if they were female, in poor physical health, and unmarried. The characteristics associated with depressive symptoms which did not show the same pattern of association as in the general population were educational achievement and age. Younger farmers were more likely to have high depressive symptoms compared to older farmers. Educational achievement and income were not associated with depressive symptoms in this population.

The finding which may be most controversial was that those individuals who live on the farm and are actively involved in farm work were less likely to have high depressive symptoms compared to those who lived on the farm and were not actively involved in farm work. This is contrary to a pervasive belief that farmers are highly stressed and therefore likely to be at high risk for depression and other mental disorders. This is a cross-sectional study and the relationship between farm work and depression may actually be an indication that those who used to perform farm work and are still living on the farm are more likely to be depressed than those who are currently working. The temporal relationship is not clear between the two correlated variables and should be assessed in greater detail in a prospective study.

Further work is needed to elucidate factors which affect the overall risk of depression and of suicide among farm residents. In particular, attention should be paid to work related stress and job stressors, the difference between geographic isolation and social isolation and the function of social support in this population. Studies which are done among other populations of farmers may well yield different results. This study represents a diverse population of farmers who are involved in many types of agriculture. Economic circumstances in agriculture may well affect different groups of farmers at different times. For example, dairy farming may be suffering a recession while other farmers are not. Therefore, it is important to consider such issues in future evaluation of the relationship between farming as an occupation and depression. The variable used in this study was a reduction in income, but there may be better ways to evaluate stress related to income in this population. There is also a need to better define sources of stress in this occupation.

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## References

Bowers, M. B., E. Goodman and V. M. Sim. 1964. Some behavioral changes in man following anticholinesterase administration. *J. of Nervous and Mental Disease* 138(4):383-389.

Colorado Agricultural Statistics Service. 1990. *Colorado Agricultural Statistics*, 1989. USDA, NAS, Colorado Dept. of Agriculture, July (2).

Comstock G. W. and K. J. Helsing. 1976. Symptoms of depression in two communities. *Psychological Medicine* 6(6):551-563.

Frerichs R. R., C. S. Anshensel and V. A. Clark. 1981. Prevalence of depression in Los Angeles County. *Am. J. of Epidemiology* 113(6):691-699.

Goldberg E. L., P. Van Natta and G. W. Comstock. 1985. Depressive symptoms, social networks and social support of elderly women. *Am. J. of Epidemiology* 121:448-456.

Guralnick, L. 1963. Mortality by industry and cause of death among men 20 to 64 years of age: United States, 1950. *Vital Statistics Special Reports* September.

Hayes, W. J. 1982. *Pesticides Studied in Man*. Baltimore, Md.: Williams and Wilkins.

Division of Motor Vehicles, Colorado Dept. of Revenue. 1991. *Motor Vehicle Statistical Report*, Publication 16. July.

Levin, H. S., R. L. Rodnitzky and D. L. Mick. 1976. Anxiety associated with exposure to organophosphate compounds. *Archives of General Psychiatry* 33(2): 225-228.

Murrell S. A., S. Himmelfarb and W. Wright 1983. Prevalence of depression and its correlates in older adults. *Am. J. of Epidemiology* 117(2):173-185.

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.

Robert R. E. 1980. Reliability of the CES-D Scale in different ethnic contexts. *Psychiatry Research* 2(2):125-134.

Sayetta R. B. and D. P. Johnson. 1980. Basic data on depressive symptomatology, United States, 1974-75 DHEW Publication No. PHS 80-1666. Washington, D.C.: GPO.

Senanayake, N. and L. Karalliedde. 1987. Neurotoxic effects of organophosphorus insecticides. *New England J. of Medicine* 316(13):761-763.

Stallones, L. 1990. Suicide mortality among Kentucky farmers, 1979-1985. *Suicide and Life Threatening Behavior* 20(2):156-163.

U.S. Dept. of Commerce, Bureau of the Census. 1989. 1987, *Census of Agriculture*, Vol. 1, Geographic Area Series, Part 6 Colorado.

Vernon S. W. and R. E. Roberts. 1982. Prevalence of treated and untreated psychiatric disorders in three ethnic groups. *Soc. Sci. Med.* 16(17):1575-1582.

Walrath, J., E. Rogot, J. Murray and A. Blair. 1985. Mortality patterns among U.S. veterans by industry and smoking status. DHHS Publication No 85-2747. Washington, D.C.: GPO.

Weissman M. M., D. Sholomskas, M. Pottenger, B. A. Prushoff and B. Z. Locke 1977. Assessing depressive symptoms in five psychiatric populations: A validation study. *Am. J. of Epidemiology* 106(3):203-214.

