

Suicide Rates Among Male Farmers and Construction Workers in Minnesota

AN ANALYSIS USING THE MINNESOTA VIOLENT DEATH REPORTING SYSTEM (2015–2021)

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Introduction

In 2023, more than 49,000 people in the U.S. died by suicide. Among individuals aged 10-34 years, suicide was the second leading cause of death. In Minnesota, the suicide rate was 13.8 per 100,000 in 2023, with firearms accounting for 47% of cases. Suicide was 3.7 times more common among males than females, a pattern that was also present nationally (1).

Research also shows differences in suicide rates by occupation and industry. National research has shown particularly high rates among construction workers and workers in agriculture-related fields (2, 3). A 2023 study found males and females working in construction had suicide rates of 56.0 and 10.4 per 100,000, respectively (4). In agriculture-related fields, the suicide rate for males was 47.9 per 100,000 and for females was 10.9 per 100,000. Compared to the suicide rates across all industries of 32.0 and 8.0 per 100,000 for males and females respectively, rates among construction workers were between 1.3 and 1.8 times higher (4). Recent analyses in Minnesota indicate the agriculture estimates in previous studies may have been underestimated (3).

The U.S. construction industry is one of the most hazardous, recording the highest number of work-related injuries and fatal injuries in 2010 (5). Moreover, construction workers suffer from chronic musculoskeletal pain, which, if untreated, can lead to mental distress. A study in Australia examining male-dominated industries found that construction workers tend to have a notably higher number of mental health problems (6). Stigmatization, unsafe work environment, and alcohol use have been cited as the main barriers preventing construction workers from seeking mental health help (7).

For farmers, environmental factors, particularly extreme weather events, can have significant impact on their livelihood, their physical health, and mental health. In 2019, the director of the USDA's farm service agency in Minnesota announced that crop insurance payments for summer losses exceeded \$2.56 billion (8). Over the past decade, changes in weather patterns have reshaped Minnesota's agricultural landscape. Climate change is altering the state's growing season, likely affecting crop production (9). Additionally, increased precipitation levels may lead to a decrease in soil and water quality (8,9). Farmers' health is strongly tied to the environmental factors mentioned, as well as social isolation, which can increase the risk of psychosocial problems such as depression, stress, and burnout (10). Given that farmers often work outdoors, they face greater risks of heatstroke, dehydration, and skin cancer (10). Cultural shifts, such as increased use of technology, reduced reliance on farm help, and changing social norms have led to heightened isolation and stress in the farming industry (11). Additionally, rural areas lack access to mental health services and have lower numbers of mental health professionals, while access to firearms is higher compared to urban and suburban areas (12). Many of these factors may contribute to higher suicide rates among farmers.

The demographic composition of people working in construction and agriculture varies. In the U.S., 6.2% of workers in the construction industry are female, and 93.8% are male, with an average age of 38 years (13). Regarding the race of construction workers, 52.9% are white, 27.7% Hispanic, 11.1% Black, and 4.0% Unknown (13). Among farmers, 36% are female, and 64% are male, with a mean age of 58.1 years. Most farmers (95.4%) are white, while 3% are Hispanic and 1.2% are Black (14).

Methodology

This analysis used data from the Minnesota Violent Death Reporting System (MNVDRS) from 2015 to 2021 (15). Industry classifications were based on 2018 Census Industry codes (16). These codes were assigned using the Industry and Occupation Computerized Coding System (NIOCCS) from the National Institute for Occupational Safety and Health (NIOSH). Industry codes were assigned to all cases of suicide in MNVDRS. Cases are included in MNVDRS if the injury that led to a death occurred in Minnesota. For this study, individuals were considered “farmers” if they were classified as having worked in the animal production and agriculture industry (code 0170) or crop production industry (code 0180), while individuals were considered “construction workers” if they were classified in industry code 0770 (16).

Based on these classifications, 137 farmers and 624 construction workers were in the dataset. Of these, 9 farmers and 8 construction workers were female. Therefore, only male workers were included in the analysis. All ages were included. Age categories were created based on the number of individuals who died by suicide in each age group and the standard age groups available in industry estimates (17).

Suicide rates per 100,000 workers were calculated using population estimates from the Employed Labor Force website (17). To compare suicide rates between farmers and construction workers, rate ratios (RRs) with 95% confidence intervals (CIs) were obtained from OpenEpi, with age adjustment applied using the Mantel-Haenszel method (18). Data cleaning and statistical analyses were conducted using Microsoft Excel and OpenEpi. This study utilizes secondary data from the Minnesota Department of Health and did not require Institutional Review Board approval.

Results

Suicide rates among farmers and construction workers by age group

A total of 126 male farmers and 616 male construction workers died by suicide in Minnesota from 2015-2021. Rates of suicide were higher for construction workers (50.9 per 100,000) than farmers (29.9 per 100,00). The overall crude rate ratio indicated that construction workers had a suicide rate 70% higher than farmers.

Ages under 20 years were excluded due to there being fewer than 10 deaths in each occupational group. The lowest rates of suicide within each industry group were found in workers aged 20-29 years. At the other end of the age spectrum, workers aged 70 years or more had the highest rates of suicide among both farmers (77.5 per 100,000) and construction workers (409.9 per 100,000).

The largest difference in suicide rates was observed in those aged 70+, wherein construction workers (409.9 per 100,000) were more than five times more likely to die by suicide than farmers (77.5 per 100,000). Significant differences were also found in ages 20-29, 40-49, and 60-69 years. Conversely, the smallest difference was observed in the 50–59 age group, where rates were closer and not statistically significantly different.

SUICIDE RATES AMONG MALE FARMERS AND CONSTRUCTION WORKERS IN MINNESOTA

Table 1: Suicide rates and 95% confidence intervals for farmers and construction workers by age group

Age Group	Farmer Suicide Count	Construction Suicide Count	Farmer Rate per 100,000 (95% CI)	Construction Rate per 100,000 (95% CI)	Rate Ratio (95% CI)	Minnesota Male Rate per 100,000*
20-29 years	11	105	19.0 (9.49-34.07)	45.9 (37.61-55.66)	2.42 (1.29-4.49)^	30.5
30-39 years	11	135	25.1 (12.54-45.02)	45.3 (38.04-53.71)	1.80 (0.98-3.33)	27.2
40-49 years	17	125	25.0 (14.6-40.16)	48.1 (40.07-57.35)	1.91 (1.16-3.19)^	29.1
50-59 years	26	108	34.3 (22.41-5.27)	43.9 (36.01-53.00)	1.28 (0.83-1.96)	30.6
60-69 years	24	72	22.8 (14.66-34.04)	52.7 (41.24-66.37)	2.30 (1.45-3.66)^	22.4
70+ years**	34	65	77.5 (53.71-108.4)	409.9 (316.3-522.4)	5.28 (3.49-8.00)^	25.6
All ages	126	616	29.9 (24.93-35.64)	50.9 (47.04-55.18)	1.70 (1.41-2.06)^	27.3

Mantel-Haenszel Age-adjusted rate ratio, Construction compared to Farmer: 2.27 (1.87-2.75)

Table 2: Firearm suicide rates, 95% confidence intervals, and rate ratios for farmers and construction workers by age group

Age Group	Farmer Suicide Count	Construction Suicide Count	Farmer Rate per 100,000 (95% CI)	Construction Rate per 100,000 (95% CI)	Rate Ratio (95% CI)	Minnesota Male Rate per 100,000*
20-29 years	6	56	10.3 (3.8-22.6)	24.5 (18.5-31.8)	2.36 (1.02-5.48)^	14.7
30-39 years	6	59	13.7 (5.0-29.9)	19.8 (15.1-25.6)	1.45 (0.62-3.35)	11.6
40-49 years	12	48	17.7 (9.1-30.9)	18.5 (13.6-24.5)	1.04 (0.55-1.96)	13.9
50-59 years	19	52	19.7 (11.1-32.6)	21.5 (16.1-28.2)	0.84 (0.48-1.42)	15.3
60-69 years	15	53	14.3 (8.0-23.6)	38.8 (29.1-35.7)	2.71 (1.52-4.81)^	14.2
70+ years**	26	45	59.3 (38.8-86.9)	283.8 (207.0-379.7)	4.78 (2.95-7.75)^	18.9
All ages	82	315	19.4 (15.5-24.2)	26.0 (23.3-26.9)	1.34 (1.05-1.71)^	14.3

Mantel-Haenszel Age-adjusted rate ratio, Construction compared to Farmer: 1.93 (1.53-2.45)

^Statistically significant difference

*Provided for reference

**Elevated rates in the 70+ age group may be partly due to differences in how occupation is measured in NVDRS and the ELF system.

For each age group, construction workers had higher rates of suicide than farmers, even in those groups for which the rate ratio was not statistically significantly greater than 1.00. After adjusting for age, the rate of construction worker suicide was 2.27 times higher for construction workers than for farmers.

Suicide rate ratios, confidence intervals, and firearm-related suicide rates among farmers and construction workers by age group

Firearms were the injury mechanism of 82 male farmer suicides and 315 male construction worker suicides. This represented 65% of the farmer group and 51% of the construction worker group. However, the crude firearm-related suicide rate was higher among construction workers (26.0 per 100,000) than farmers (19.4 per 100,000). The rate ratio was 1.34 (95% CI: 1.05-1.71), with an age-adjusted rate ratios of 1.93 (95% CI: 1.53-2.45). The largest difference was observed in workers aged 70+ years, where construction workers had a firearm-related suicide rate of 283.8 per 100,000, while farmers had a rate of 59.3 per 100,000. In contrast, there was no statistically significant difference in those aged 30-39, 40-49, or 50-59 years. Overall, the analysis points to construction workers having higher firearm suicide rates, especially in older age groups.

Conclusions

This study found that suicide rates among construction workers were significantly higher than those among farmers in Minnesota, contradicting the initial hypothesis. The analysis indicated that the overall suicide rate among farmers was 29.9 per 100,000, whereas construction workers had a significantly higher rate (50.9 per 100,000). Construction workers also had higher suicide rates in all age groups, though the differences were statistically significant only for workers in their 20s, 40s, and aged 60+ years. The largest disparity was observed among workers aged 70+ years. A similar pattern was observed for firearm-related suicides, where again, older construction workers had higher rates. However, the differences between construction workers and farm workers were generally not as large for firearm suicide, which may reflect differences in where these groups live. These findings suggest higher risks among construction workers, especially later in life.

Comparing the general suicide rate per 100,000 citizens in the U.S. and Minnesota, both industry groups revealed higher suicide rates, highlighting the need for targeted mental health support (19). The findings of this study align with previous U.S.-based studies showing higher suicide rates in the construction and farming industries. In contrast, international studies, such as one conducted in Finland, report different conclusions (20, 21, 22). Variations across studies may stem from differences in work environments, data sources, or regional factors such as access to firearms. Prior U.S. research also identifies older farmers as being especially vulnerable, particularly when facing hardships such as limited access to care. These results highlight the importance of industry and suicide-specific prevention strategies.

Limitations

This analysis had several limitations. Beginning with the data source, the analysis is limited to data gathered on deaths that occurred in Minnesota. As such it may not be generalizable to other geographic areas.

In addition, misclassification of information related to a death may introduce error into these results. Determining the intent of a death, unintentional or intentional, can be difficult in some cases. If a person intended to die but left no clear indication of that intent, the death may not be classified as suicide and would not be included in this analysis. Misclassification of someone's industry may also have led to undercounting suicide among farmers (3). Since construction workers may also change work seasonally, it stands to reason that those deaths may be misclassified as well.

This analysis also used industry, rather than occupation, to distinguish between populations. This has implications for suicide prevention at the industry level (i.e., company or organization) rather than the occupation level (i.e., individual person or job type).

Finally, this was a cross-sectional analysis that did not control for the possibility of confounding variables. While the correlations found here are true (within the limitations listed above), there should be no assumption of cause and effect. Other factors that may account for some of these findings include, but are not limited to, geography, mental health history, education level, social connectedness, substance use, financial stressors, family stressors, access to firearms, access to health care, and access to mental health care.

Suggested Citation

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Appendix: Suicide rates for the male working population of Minnesota

For reference in interpreting the results of this study, the suicide rates for the male working/employed population in Minnesota are provide below. The numerator in these rates is the number of males who were recorded in the Minnesota Violent Death Reporting System as having been employed at the time of their death and who died from 2015-2021. Denominators for each age group are the number of male workers in Minnesota, according to the ELF system, for 2015-2021. These years were chosen to match the years included in the analysis of farmer and construction worker suicide.

Table 3: Suicide rates and 95% confidence intervals for male workers in Minnesota by age group

Age Group	Suicide Count	Number of Workers	Suicide Rate per 100,000	Firearm Suicide Count	Firearm Suicide Rate per 100,000
16-19 years	187	473,943	39.5	99	20.9
20-29 years	685	2,021,868	33.9	337	16.7
30-39 years	660	2,324,453	28.4	291	12.5
40-49 years	625	2,146,800	29.1	306	14.3
50-59 years	728	2,219,775	32.8	363	16.4
60-69 years	468	1,237,581	37.8	299	24.2
70+ years*	438	305,492	143.4	320	104.7
All ages	3,791	10,729,912	35.3	2014	18.8

*Elevated rates in the 70+ age group may be partly due to differences in how occupation is measured in NVDRS and the ELF system.