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Suicide Rates by Occupational Group — 17 States, 2012

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In 2012, approximately 40,000 suicides were reported in the United States, making suicide the 10th leading reported cause of death for persons aged ≥16 years (*1*). From 2000 to 2012, rates of suicide among persons in this age group increased 21.1%, from 13.3 per 100,000 to 16.1 (*1*). To inform suicide prevention efforts, CDC analyzed suicide by occupational group, by ascribing occupational codes to 12,312 suicides in 17 states in 2012 from the National Violent Death Reporting System (NVDRS) (*2*). The frequency of suicide in different occupational groups was examined, and rates of suicide were calculated by sex and age group for these categories. Persons working in the farming, fishing, and forestry group had the highest rate of suicide overall (84.5 per 100,000 population) and among males (90.5); the highest rates of suicide among females occurred among those working in protective service occupations (14.1). Overall, the lowest rate of suicide (7.5) was found in the education, training, and library occupational group. Suicide prevention approaches directed toward persons aged ≥16 years that enhance social support, community connectedness, access to preventive services, and the reduction of stigma and barriers to help-seeking are needed.

CDC's National Violent Death Reporting System (NVDRS) collects information on violent deaths, including suicides, from multiple sources, including death certificates, coroner and medical examiner reports, and law enforcement reports, to monitor trends, understand violent death characteristics and risk factors, and inform prevention efforts (*2*). The most recent NVDRS data set available for analysis (2012) includes data from 17 states.*

NVDRS Occupation Title and Industry Title fields were used to assign each suicide decedent to one of the major occupational groups defined by the national Standard Occupational Classification (SOC) system (*3*). The decedent's usual occupation at the time of death was coded, and each decedent was assigned to only one occupational group. Additional codes for decedents who were classified as homemakers/housewives, students, never worked/disabled (and not working), retired, prisoners, unemployed, and self-employed (unspecified industry) were created by the authors.

Decedents were assigned to SOC codes using three steps. First, the National Institute for Occupational Safety and Health's Industry and Occupation Computerized Coding System (NIOCCS) (*4*) was applied to the 12,312 suicides in the data set, resulting in SOC codes for 5,532 (44.9%) decedents (Figure). NIOCCS matched the industry and occupation text fields to U.S. Census Industry and Occupation codes†; these were mapped to detailed SOC codes, which the authors collapsed into major SOC occupational groups. Next, a computer algorithm (developed based on a review of

* Alaska, Colorado, Georgia, Kentucky, Maryland, Massachusetts, New Jersey, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Utah, Virginia, and Wisconsin.

† http://www.census.gov/people/io/.

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cases for which a SOC code was not provided by NIOCCS) was used to produce codes for an additional 4,572 (37.1%) decedents.[§] Finally, manual coding by the authors was used for the remaining 2,208 (17.9%) decedents (Figure). For 729 (5.9%) decedents, the occupation fields were blank or lacked sufficient information; these were coded as "unknown." Interrater reliability was assessed for a random 5% sample (635 decedents) of the data set, with resulting Cohen's kappa coefficient of 0.87 (554 decedents); the remaining 81 decedents not in agreement were resolved through discussions among the authors.

Descriptive data were analyzed, including the number of suicides and rates of suicide by occupational group. Occupational groups were stratified by sex, and rates of suicide were calculated for each group using denominators derived from the U.S. Census Bureau's Current Population Survey March Supplement (*5*), which includes a question about the person's primary occupation during the previous calendar year. Rates were not calculated for occupation codes created by the authors, because the Current Population Survey data set does not provide denominator data for these groups. U.S. child labor laws prohibit persons aged <16 years from working full-time; therefore, only decedents aged ≥16 years were included. SOC code 55 (i.e., military specific occupations) was not included in the analysis because it was not possible to reliably determine whether these decedents were on active duty or retired, or what occupation they held in the military. If a decedent had a specific coded job and was employed by the military, that decedent was coded according to the occupation (e.g., an engineer working for the military would be included in the "Architecture and engineering" occupational group).

Among the 12,312 suicide decedents included in the 2012 data set, 9,509 (77.2%) were male, and 2,801 (22.8%) were female; information about sex was missing for two decedents (Table 1). Decedents ranged in age from 16 to 102 years; however, 84.5% were aged 16–64 years. Nearly one third of all suicides occurred among persons in the following four occupational groups: construction and extraction (1,324; 10.8%); management (1,049; 8.5%); production (953; 7.7%); and installation, maintenance, and repair (780; 6.3%) (Table 1). The highest proportion (22.7%) of suicides occurred among persons aged 45–54 years, and the lowest proportion (11.6%) occurred among persons aged 16–24 years (Table 1).

Rates of suicide were highest in the following three occupational groups: farming, fishing, and forestry (84.5 suicides per 100,000 persons); construction and extraction (53.3); and installation, maintenance, and repair (47.9) (Table 2). Rates of suicide varied by sex, with higher rates among males than females in all occupational groups (Table 2). Among males, the highest suicide rates were among persons in the following three occupational

[§] In cases for which NIOCCS provided a U.S. Census occupation code but did not provide an SOC code, the algorithm recoded the U.S. Census occupation codes to SOC codes and author-created codes. The algorithm also was used to code many of the remaining decedents not assigned a detailed SOC or U.S. Census occupation code by NIOCCS using the industry and occupation text fields. Because the algorithm coded only to SOC major groups, it was able to record more decedents than NIOCCS.

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FIGURE. Procedure for assigning National Standard Occupational Classification (SOC) system codes for decedent occupations in suicide cases from CDC's National Violent Death Reporting System (NVDRS) — 17 U.S. states, 2012

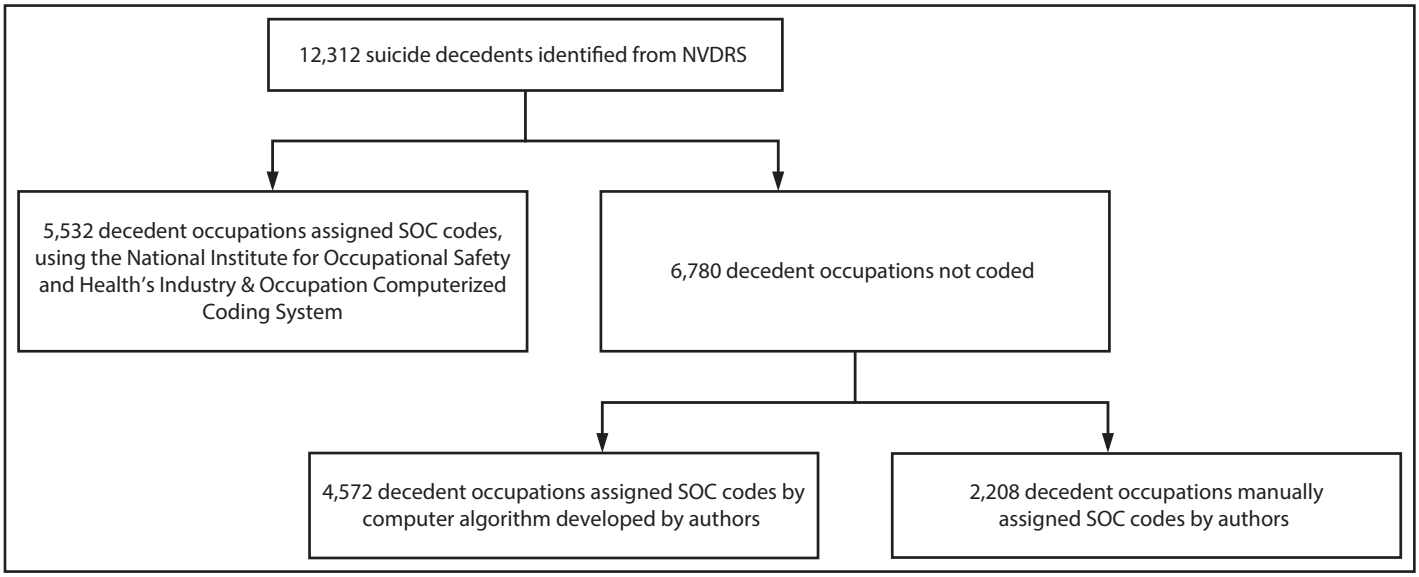

TABLE 1: Number of suicide decedents (N = 12,312) assigned to national Standard Occupational Classification (SOC) groups, by sex and age group — 17 states, 2012

SOC code	Occupational group	Total	Sex*		Age group (yrs)					
		No. (%)	Male	Female	16–24	25–34	35–44	45–54	55–64	≥65
47	Construction and extraction	1,324 (10.8)	1,306	18	85	247	274	329	211	178
11	Management	1,049 (8.5)	881	167	30	120	174	262	229	234
51	Production	953 (7.7)	866	87	80	149	148	205	172	199
49	Installation, maintenance, and repair	780 (6.3)	764	16	50	110	153	233	130	104
99†	Unknown	729 (5.9)	575	153	86	131	114	172	113	113
69†	Student	665 (5.4)	493	172	530	110	19	4	2	0
41	Sales and related	651 (5.3)	520	131	67	82	98	144	123	137
53	Transportation and material moving	644 (5.2)	618	26	35	97	98	154	152	108
59†	Homemaker, Housewife	534 (4.3)	15	519	21	79	107	150	95	82
43	Office and administrative support	481 (3.9)	240	241	43	88	71	115	99	65
29	Healthcare practitioners and technical	450 (3.7)	187	263	9	59	91	110	105	76
79†	Never worked, Disabled	380 (3.1)	273	107	65	68	62	113	59	13
13	Business and financial operations	353 (2.9)	223	130	10	39	65	96	81	62
35	Food preparation and serving related	358 (2.9)	236	122	66	106	64	73	32	17
15	Computer and mathematical	329 (2.7)	280	49	26	54	78	89	48	34
33	Protective service	295 (2.4)	266	29	15	46	61	71	57	45
17	Architecture and engineering	274 (2.2)	263	11	10	21	35	59	55	94
37	Building and grounds cleaning and maintenance	239 (1.9)	206	33	33	57	37	60	35	17
89†	Unemployed	228 (1.9)	178	50	52	46	50	50	26	4
25	Education, training, and library	216 (1.8)	117	99	5	25	30	56	51	49
27	Arts, design, entertainment, sports, and media	216 (1.8)	163	53	18	47	47	40	37	27
45	Farming, fishing, and forestry	206 (1.7)	194	12	22	36	25	35	25	63
88†	Prisoner	179 (1.5)	167	12	34	57	46	29	10	3
31	Health care support	178 (1.4)	51	127	19	36	40	41	36	6
39	Personal care and service	133 (1.1)	68	65	10	27	28	33	20	15
85†	Retired	118 (1.0)	111	7	0	1	0	4	14	99
21	Community and social service	109 (0.9)	65	44	1	24	21	15	32	16
23	Legal	103 (0.8)	64	39	0	7	20	22	32	22
19	Life, physical, and social science	89 (0.7)	75	14	2	15	16	18	21	17
98†	Self-employed (unspecified)	49 (0.4)	44	5	2	7	5	16	6	13
Total		**12,312 (100.0)**	**9,509**	**2,801**	**1,426**	**1,991**	**2,077**	**2,798**	**2,108**	**1,912**
% of total		—	**77.2**	**22.8**	**11.6**	**16.2**	**16.9**	**22.7**	**17.1**	**15.5**

* Information on sex was missing for two decedents.
† Author-assigned SOC codes.

TABLE 2. Rates of suicide per 100,000 population, by sex, and ranked overall by Standard Occupation Classification (SOC) group — 17 states, 2012*

SOC code	Occupational group	Overall	Male	Female
45	Farming, fishing, and forestry	84.5	90.5	—†
47	Construction and extraction	53.3	52.5	—
49	Installation, maintenance, and repair	47.9	47.5	—
51	Production	34.5	39.5	10.8
17	Architecture and engineering	32.2	36.3	—
33	Protective service	30.5	34.1	14.1
27	Arts, design, entertainment, sports, and media	24.3	32.9	12.4
15	Computer and mathematical	23.3	32.8	12.5
53	Transportation and material moving	22.3	30.2	4.8
11	Management	20.3	27.4	8.4
23	Legal	18.8	24.2	13.9
29	Healthcare practitioners and technical	17.4	31.6	13.3
19	Life, physical, and social science	16.7	23.7	—
13	Business and financial operations	15.9	20.4	10.3
31	Health care support	14.6	32.9	11.8
21	Community and social service	13.6	18.6	8.9
41	Sales and related	13.4	21.0	5.3
37	Building and grounds cleaning and maintenance	13.3	16.5	4.5
35	Food preparation and serving related	12.8	19.3	7.7
39	Personal care and service	8.0	17.2	4.9
43	Office and administrative support	7.9	15.2	5.3
25	Education, training, and library	7.5	15.1	4.7
Total		**20.3**	**39.2**	**12.4**

* Rates were calculated using data from the U.S. Census Current Population Survey March supplement.
† Rates were not calculated where the decedents were fewer than 20 because those estimates might be unreliable.

groups: farming, fishing, and forestry (90.5 per 100,000); construction and extraction (52.5); and installation, maintenance, and repair (47.5). Among females, the highest suicide rates occurred among persons in the following three occupational groups: protective service occupations (e.g., law enforcement officers and firefighters) (14.1 per 100,000); legal (13.9); and healthcare practitioners and technical (13.3) (Table 2).

Discussion

Earlier studies of suicide by occupation type in the United States have examined one occupational group at a time, such as police suicides (*6*), or have studied data from a specific U.S. state (*7*). This analysis includes recent data from 17 states and an analysis by sex. The proportions of suicides among males (77.2%) and females (22.8%) in this analysis were similar to those reported nationally in 2012 (78.3% and 21.7%, respectively) (*1*).

Occupational groups with higher suicide rates might be at risk for a number of reasons, including job-related isolation and demands, stressful work environments, and work-home imbalance, as well as socioeconomic inequities, including lower income, lower education level, and lack of access to health services (*7*,*8*). Previous research suggests that farmers' chronic exposure to pesticides might affect the neurologic system and contribute to depressive symptoms. Other factors that might contribute to suicide among farmers include social isolation, potential for financial losses, barriers to and unwillingness to seek mental health services (which might be limited in rural areas), and access to lethal means (*8*). Construction workers might be at higher risk because of financial and interpersonal concerns related to lack of steady employment, and fragmented community or isolation (*9*). It has been hypothesized that one possible factor contributing to higher suicide risk among workers in installation, maintenance, and repair occupations might be long-term exposure to solvents that can cause neurotoxic damage, including memory impairment and depressive symptoms (*8*). Research has suggested that higher suicide rates among police are related to stressors including exposure to traumatic, violent, and lethal situations; work overload; shift work; and access to lethal means (*6*,*8*). Females in protective service occupations might also experience additional stressors in these traditionally male-dominated occupations (*6*). Of note, while management occupations had the 10th highest rate of suicide, they accounted for the second largest percentage of suicide deaths overall; therefore, it is important to target prevention strategies to managers as well.

The findings in this report are subject to at least four limitations. First, for 729 (5.9%) cases, an occupation or workforce status could not be determined. Second, using an automated system such as NIOCCS, a computer algorithm, and human coders to assign occupation codes might introduce errors in categorizing industry and occupation; however, interrater reliability checks suggested a high level of consistency. Third, coding of industry and occupation in NVDRS, which uses open-ended fields, depends on the completeness of information available from the NVDRS data sources and accuracy of information provided by informants to these systems (e.g., coroner/medical examiner and family members). Variations in coding might occur depending on the abstractor's amount of experience. For this reason, CDC provides abstractor training, and states conduct blinded re-abstraction of cases to test consistency and identify training needs. Industry and occupation categories assigned in NVDRS are a decedent's "usual occupation," which might not reflect the decedent's actual position or positions at the time of death. Finally, the 17 NVDRS states examined in this report are not nationally representative. Analyses of forthcoming data from the expansion of NVDRS into 32 states in 2014 might provide more representative findings, and permit examination of occupational trends over time.

Suicide prevention activities directed toward persons aged ≥16 years include enhancing connectedness to family and friends, encouraging help-seeking for persons exhibiting signs of distress or suicidality, and supporting efforts to reduce stigma associated with help-seeking and mental illness. Some potential

Summary

What is already known about this topic?

In 2012, suicide was the 10th leading cause of death among persons aged ≥16 years in the United States, with approximately 40,000 suicide deaths reported among persons aged ≥16 years. From 2000 to 2012, rates of suicide for persons aged ≥16 years increased 21.1%, from 13.3 per 100,000 to 16.1. Understanding suicides by occupational group provides an opportunity for prevention, but such data have not been reported recently for a broad population or examined by sex and occupation classification.

What is added by this report?

Analysis of 2012 National Violent Death Reporting System data from 17 states indicated that workers in the farming, fishing, and forestry occupational group had the highest rate of suicide (84.5 per 100,000), followed by workers in construction and extraction (53.3), and installation, maintenance, and repair (47.9). Among males, farming, fishing, and forestry also accounted for the highest rates of suicide (90.5 per 100,000), whereas the highest rate among females (14.1) was among workers in the protective service occupational group.

What are the implications for public health practice?

Suicide prevention activities directed toward persons aged ≥16 years, particularly male workers in farming, fishing, and forestry occupations and female workers in protective services are needed. Prevention strategies that enhance social support, community connectedness, access to preventive services, and reduction of stigma and barriers to help-seeking are encouraged.

suicide prevention strategies include workplace approaches, such as employee assistance programs, which might serve as gateways to behavioral health treatment. Workplace wellness programs can provide education and training for staff members and supervisors to aid in recognition of suicide warning signs (e.g., withdrawal, increased substance abuse, agitation, and putting affairs in order). Employers also can use technology to provide online mental health screenings, web-based tools for mental health information, and mental health screening kiosks for their employees, as well as ensure that employees are aware of the National Suicide Prevention Lifeline (http://www.suicidepreventionlifeline.org; 1-800-273-8255).

The National Action Alliance for Suicide Prevention (NAASP) Workplace Task Force has developed a Comprehensive Blueprint for Workplace Suicide Prevention that addresses suicide prevention strategies, such as screening, mental health services and resources, suicide prevention training, life skills and social network promotion, and education and advocacy.¶

The NAASP online site has resources targeted specifically to the construction and law enforcement industries. Evidence-based suicide prevention strategies implemented in the workplace have the potential to reduce the number of suicides among all occupational groups.

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¶ http://actionallianceforsuicideprevention.org/comprehensive-blueprint-workplace-suicide-prevention-1.