Occupational fatalities: self-employed workers and wage and salary workers

Although making up just 7.4 percent of the U.S. civilian workforce in 2001, self-employed workers incurred almost 20 percent of workplace fatalities that year; even in the same industry or occupation, they faced risks different from those of their wage and salary counterparts

Stephen M. Pegula

Almost 20 percent[1] of all the workplace fatalities in the United States in 2001 were incurred by self-employed workers, a group that accounted for only 7.4 percent[2] of the U.S. civilian workforce that year. This article explores the reasons self-employed workers face a greater risk of fatal occupational injuries than that confronted by wage and salary workers. Self-employed workers are commonly employed in industries and occupations with high fatality rates. Even when working in the same industry or occupation, however, self-employed workers face risks different from those of their wage and salary counterparts, as is evidenced by the different events and activities associated with their respective workplace fatalities. In addition, self-employed workers tend to have other characteristics, such as working longer hours and being older, that put them at a heightened risk of suffering a fatal work injury.

Two methods for examining the differences between workplace fatalities of the self-employed and those of wage and salary workers are utilized in the analysis that follows. First, the data are examined in a traditional manner: fatalities and fatality rates by industry and occupation, and fatalities by event,[3] worker activity, and other factors, are calculated. Second, a new statistic, the impact magnitude of exclusion, is used to illustrate how some occupations affect the self-employed and wage and salary fatality rates differently. For example, excluding the occupation of farmers, except horticultural, from the calculations substantially decreases the disparity between the self-employed and wage and salary fatality rates, while excluding truckdrivers from the calculations increases the disparity.

Stephen M. Pegula is an economist in the Office of Safety, Health, and Working Conditions, Bureau of Labor Statistics, Washington, DC. E-mail: pegula.stephen@bls.gov

Methods

Each year, the BLS Census of Fatal Occupational Injuries (CFOI) releases data on workplace fatalities. The census, which began in 1992, was developed to produce accurate, comprehensive, descriptive, timely, and accessible counts of fatal workplace injuries that occur during a given year. To meet these goals, and to ensure the validity of the data, the CFOI program utilizes a number of safeguards.[4] To be counted in the CFOI, the decedent must have a verifiable work relationship.[5] Once a fatality has been confirmed to be work related, information about the decedent and the fatal incident is gathered. For the purpose of the analysis presented in this article, workers will be broken down into two categories—self-employed workers and wage and salary workers—as follows:[6]

Self-employed workers consist of individuals who are self-employed; self-

Table 1. Number and rate of fatal work injuries, self-employed workers and wage and salary workers aged 16 and older, private sector, 1995–2001

Year	Total fatalities	Fatalities among self-employed workers	Fatality rate of self-employed workers	Fatalities among wage and salary workers	Fatality rate of wage and salary workers
Total	38,027	8,286	11.4	29,741	4.2
1995	5,457	1,183	11.1	4,274	4.5
1996	5,563	1,203	11.3	4,360	4.5
1997	5,582	1,251	11.7	4,331	4.3
1998	5,411	1,228	11.8	4,183	4.1
1999	5,453	1,132	11.1	4,321	4.1
2000	5,316	1,170	11.6	4,146	3.9
2001	5,245	1,119	11.2	4,126	3.9

employed contractors; partners or owners of an unincorporated business, professional practice, or farm; and family members working in a family business.[7]

Wage and salary workers comprise all other workers who are working for pay or for other compensation and owners and employees of an incorporated business.

Employment figures are derived from the BLS Current Population Survey (CPS).[8]

Data limitations

Before proceeding with the analysis, some important data limitations must be noted. First, the CPS is a survey, so some degree of sampling error will be incurred. Next, the fatality rates presented are not completely accurate, because of the difficulty in definitively classifying workers as self-employed or as wage and salary workers. Therefore, at best, the fatality rates presented illustrate general magnitudes and trends.

Third, certain occupations with a small number of self-employed workers were excluded from the analysis. Two occupations that stand out in this regard are construction laborers and pilots. During the period studied, self-employed construction laborers had a fatality rate of 1,210.0, wage and salary construction laborers a rate of 35.4. Similarly, self-employed pilots incurred a fatality rate of 983.3, wage and salary pilots a rate of 66.1. In both occupations, self-employed workers' recorded employment over the period studied was very small: 10,000 for construction laborers and 12,000 for pilots. Using such small numbers is problematic because small employment figures can result in large shifts in the fatality rate.[9]

Finally, CFOI categorizations can be misleading. For example, a farmworker can die in a car crash and be counted among the fatalities in the *agricultural, forestry, and fishing industry*, even if the event was only tangentially associated with a typical activity carried out in that industry. To deal with this problem, industries have been examined by occupation, and important occupations have been further subdivided by event or exposure.

Overall data

From 1995 to 2001, the annual number of fatal occupational injuries to workers aged 16 and older in the private sector ranged from a high of 5,582 in 1997 to a low of 5,245 in 2001.[10] Because of differences in the scope of the CFOI and the CPS, the latter of which counts only workers aged 16 and older, all fatalities involving workers under the age of 16 are excluded from the analysis. In addition, because self-employed workers exist only in the private sector, the analysis is restricted to private-sector fatalities. Therefore, all occupational fatalities incurred by government workers (which totaled 4,374 from 1995 to 2001 for all workers 16 years and older) are excluded from the analysis.[11]

Table 1 shows workplace fatalities from 1995 to 2001[12] for self-employed workers and wage and salary workers in the private sector. Although wage and salary workers suffered more than 3 times as many fatal occupational injuries as did self-employed workers, there were 9 times as many workers in the wage and salary group than in the self-employed group. To account for this disparity in employment, the fatality *rate* is a better statistic to use than the number of fatalities. The fatality rate is the number of workplace fatalities per 100,000 workers in a given industry, occupation, or other group over a specified period.[13] When fatality rates are compared, it becomes evident that self-employed workers were 2.7 times more likely to be victims of fatal work injuries than their wage and salary counterparts.

Fatalities among workers by industry

Some industries have inherently higher fatality rates than others, regardless of whether the worker is self-employed or working for a wage or salary. A worker in the agriculture, forestry, and fishing industry, for example, is more likely to suffer a fatal work injury than is a worker in the finance,

insurance, and real estate industry. The reason is that the typical activities performed in the agriculture, forestry, and fishing industry are more hazardous than those performed in the finance, insurance, and real estate industry. With that in mind, it is important to determine whether being a self-employed worker means that one is more likely to work in certain industries than if one were a wage and salary worker.

As illustrated in table 2, self-employed workers were more prevalent in industries with high fatality rates. Almost one-third of the self-employed workforce was employed in industries with high overall fatality rates (greater than 10). By contrast, only 16 percent of the wage and salary workforce was employed in industries with high fatality rates. Most of the disparity comes from the large presence of self-employed workers in the agriculture, forestry, and fishing industry and in the construction industry. Notably, self-employed workers were 7 times more likely to be a member of the agriculture, forestry, and fishing industry than were wage and salary workers. Because the self-employed are more likely to work in "dangerous" industries (industries with a fatality rate of 10 or more), self-employed workers are more at risk for fatal workplace injuries.

Not only do the figures in table 2 underscore the large percentage of self-employed workers in the agriculture, forestry, and fishing industry, but also, table 3 shows that this industry was the only one to have more occupational fatalities from the self-employed category (3,231, which made up 39.0 percent of all self-employed fatalities) than from the wage and salary category (2,190, which accounted for 7.4 percent of all wage and salary fatalities).

Fatalities among workers by occupation

Self-employed workers had higher fatality rates than wage and salary workers had in every industry except for construction. Much of the variation within industry was due to the different occupations that wage and salary workers and self-employed workers held in those industries. Table 4 shows the 10 occupations with the most occupational fatalities to self-employed workers, along with the percentage of total employment that each occupation constituted for both self-employed and wage and salary workers.

Self-employed workers are more likely than wage and salary workers to be employed in occupations with high fatality rates, including farmers, except horticultural; construction trades; timber-cutting and logging occupations; and fishers, including captains and officers of vessels. Each of these occupations has a high overall fatality rate, and the self-employed were at least twice as likely as wage and salary workers to be employed in such occupations.

Collectively, the 10 occupations in table 4 accounted for 6,472 (78.1 percent) of the total private-sector self-employed

Table 2. Fatality rate and employment distribution by industry division, self-employed workers and wage and salary workers aged 16 and older, private sector, 1995–2001

Industry	Overall fatality rate	Percent of self-employed workers	Percent of wage and salary workers
Mining	26.0	0.2	0.6
Agriculture, forestry, and fishing	23.2	13.7	1.9
Construction	13.9	14.8	6.5
Transportation and public utilities	12.4	4.1	7.1
Wholesale trade	4.7	2.8	4.7
Manufacturing	3.4	3.9	19.4
Retail trade	2.8	13.4	20.1
Services	2.0	40.8	32.3
Finance, insurance, and real estate	1.2	6.3	7.5

Table 3. Number and rate of fatal work injuries by industry, self-employed workers and wage and salary workers aged 16 and older, private sector, 1995–2001

Industry	Fatalities among self-employed workers	Fatality rate of self-employed workers	Fatalities among wage and salary workers	Fatality rate of wage and salary workers
Agriculture, forestry, and fishing	3,231	32.5	2,190	16.3
Retail trade	1,229	12.7	3,005	2.1
Construction	1,220	11.4	6,709	14.5
Services	1,048	3.5	4,218	1.8
Transportation and public utilities	698	23.3	5,956	11.7
Manufacturing	453	16.0	4,395	3.2
Wholesale trade	183	8.9	1,495	4.5
Finance, insurance, and real estate	134	2.9	566	1.1
Mining	52	42.3	1,010	25.5

Table 4. Overall fatality rate, number of fatal work injuries, and employment distribution over occupations with the most fatalities among the self-employed, self-employed workers and wage and salary workers aged 16 and older, private sector, 1995–2001

Occupation	Overall fatality rate	Fatalities among self-employed workers	Percent of self-employed employment	Fatalities among wage and salary workers	Percent of wage and salary employment
Farmers, except horticultural[1]	29.6	2,300	9.3	82	.2
Sales occupations	2.7	1,096	16.5	1,877	13.7
Managers and administrators, n.e.c.[2]	2.9	717	9.3	777	6.2
Construction trades	11.1	648	10.7	3,487	4.1
Truckdrivers	28.0	525	2.5	5,218	2.6
Farmworkers, other[3]	23.6	348	.6	997	.7
Managers, food-serving and lodging establishments	5.0	239	2.0	242	1.1
Timber-cutting and logging occupations	140.1	216	.3	476	.04
Vehicle and mobile equipment mechanics, repairers	7.5	192	2.1	697	1.4
Fishers, including captains and officers of vessels	132.7	191	.3	255	.02

[1] Excludes horticultural farmers and farm managers.
[2] n.e.c. = not elsewhere classified.
[3] Includes other farmworkers and other supervisors of farmworkers.

Table 5. Number and rate of fatal work injuries, selected occupations, self-employed workers and wage and salary workers aged 16 and older, private sector, 1995–2001

Occupation	Fatalities among self-employed workers[1]	Fatality rate of self-employed workers	Fatalities among wage and salary workers	Fatality rate of wage and salary workers
Farmers, except horticultural[2]	2,300	33.9	82	6.5
Sales occupations	1,096	9.2	1,877	1.9
Managers and administrators, n.e.c.[3]	717	10.6	777	1.8
Machine opertators, assemblers, and inspectors	83	6.1	1,446	2.8
Technicians and related support occupations	132	24.6	915	3.6
Managers, food-serving and lodging establishments	239	16.5	242	3.0
Fishers, including captains and officers of vessels	191	91.8	255	199.2
Farmworkers, other	348	81.5	997	18.9
Timber-cutting and logging occupations	216	118.0	476	153.1
Precision production occupations	74	5.6	597	2.5

[1] Pertains only to occupations with at least 35 workplace fatalities from 1995 to 2001.
[2] Excludes horticultural farmers and farm managers.
[3] n.e.c. = not elsewhere classified.
[4] Includes other farmworkers and other supervisors of farmworkers.

fatalities for workers aged 16 and older. By contrast, those occupations made up 14,108 (47.4 percent) of the private-sector wage and salary fatalities for workers in the same age group. In addition, workers in those occupations constituted more than half of the self-employed workforce, but only three-tenths of the wage and salary workforce. Hence, self-employed workers were more likely than wage and salary workers to work in those occupations and also were more likely to be fatally injured while working in them.

Not all of the variation in fatalities and fatality rates between wage and salary workers and the self-employed can be explained by the fact that the two groups tend to be employed in different industries and occupations. Table 5 shows that, of the occupations listed, self-employed workers, except those employed as fishers or timber cutters, are more likely than wage and salary workers to have higher fatality rates when working in the same occupation.[14] In some occupations, the difference in fatality rates is substantial.

Examining in more detail some selected occupations with much higher self-employed fatality rates than wage and salary fatality rates highlights the differences in risks faced by the two categories of workers.

Farmers, except horticultural. The occupation with the most self-employed fatalities was farmers, except horticultural.[15] The self-employed outnumbered wage and salary workers in overall employment in this occupation by a ratio of more than 5:1. From 1995 to 2001, 82 wage and salary workers in the occupation died from work-related injuries, while 2,300 self-employed workers in the occupation were killed at work. Thus, self-employed farmers had 28 times as many occupational fatalities, but only 5 times as many workers. In addition, the occupation accounted for less

than half of 1 percent of the total wage and salary fatalities, but for more than one-fourth of the total self-employed fatalities, from 1995 to 2001.

Looking at both the characteristics of the decedents and the fatal incidents themselves, one sees that self-employed farmers who died at work were 4 times[16] more likely to be victims of an overturned vehicle in a nonhighway area than were wage and salary farmers. Workers 55 and older made up two-thirds of the self-employed fatalities, but only two-fifths of the wage and salary fatalities.

Sales occupations. Wage and salary sales workers outnumbered self-employed sales workers by a ratio of more than 8:1 from 1995 to 2001. During that period, 1,877 deaths were recorded for wage and salary sales workers, and 1,096 self-employed sales workers were fatally injured. This occupation accounted for 6.3 percent of the fatalities to wage and salary workers, and 13.2 percent of the fatalities to self-employed workers, from 1995 to 2001.

Self-employed sales workers who were killed at work were more likely than wage and salary sales workers to be victims of workplace violence. Homicides accounted for 707 (64.5 percent) of the deaths of the self-employed and 930 (49.5 percent) of the deaths of wage and salary workers. Whereas 36.1 percent of the murdered self-employed workers in sales occupations were age 55 and older, only 14.4 percent of the wage and salary workers killed in that manner were in that age range. Self-inflicted injuries totaled 86 (7.8 percent) for the self-employed and 85 (4.5 percent) for wage and salary workers.

Managers of food-serving and lodging establishments. A total of 242 wage and salary workers died from a fatal occupational injury while employed in this occupation from 1995 to 2001. Self-employed workers incurred 239 fatalities during that time. While the number of workplace fatalities was similar for both self-employed workers and wage and salary workers in the occupation, self-employed workers faced a fatality rate more than 5 times greater than the fatality rate for wage and salary workers.

The events leading to an occupational fatality were similar in both categories, with homicide the cause of death of 161 self-employed workers and 176 wage and salary workers. Self-employed workers who incurred a workplace fatality also were twice as likely as wage and salary workers to take their own lives in this occupation. Workers aged 55 and older made up 38.9 percent of the fatalities of the self-employed and 9.1 percent of those of wage and salary workers.

Farmworkers, other. From 1995 to 2001, 997 wage and salary workers categorized as "farmworkers, other"[17] lost their lives due to workplace injuries. In that same period, 348 self-employed farmworkers were victims of fatal workplace injuries. Fatally injured self-employed farmworkers were approximately twice as likely to be victims of overturned vehicles in a nonhighway area as were wage and salary workers. Self-employed farmworkers also were twice as likely as wage and salary farmworkers to be operating a farm vehicle at the time of their death. Self-employed workers aged 55 and older accounted for 42.2 percent of the total fatalities of self-employed workers in this occupation, while wage and salary workers aged 55 and older constituted 25.8 percent of the total fatalities of wage and salary workers in the occupation.

Factors in intraoccupational variation

Although the disparity in fatalities and fatality rates by industry was largely a result of self-employed workers being employed in occupations (particularly farmers) with higher

Table 6. Number of fatalities and percentage of total fatalities for the most common events or exposures causing a workplace fatality, self-employed workers and wage and salary workers aged 16 and older, private sector, 1995–2001

Event or exposure	Fatalities among self-employed workers	Percent of total fatalities among self-employed workers	Fatalities among wage and salary workers	Percent of total fatalities among wage and salary workers
Homicide	1,396	16.8	3,360	11.3
Nonhighway noncollision accident	1,087	13.1	1,001	3.4
Struck by object	927	11.2	2,813	9.5
Fall to lower level	751	9.1	3,539	11.9
Highway collision between vehicles and/or mobile equipment	514	6.2	3,555	12.0
Self-inflicted	458	5.5	818	2.8
Caught in or compressed by equipment or objects	431	5.2	1,481	5.0
Highway noncollision accident	353	4.3	1,907	6.4
Contact with electric current	338	4.1	1,627	5.5
Worker struck by vehicle or mobile equipment	304	3.7	1,897	6.4

fatality rates than wage and salary workers in those industries, the variations in fatalities and fatality rates by occupation were attributable primarily to self-employed workers having employment characteristics different from those of wage and salary workers. These characteristics are indicative of the different types of workers in the self-employed category and the different risks self-employed workers undertake.

The event that led to the occupational fatality illustrates the different risks faced by wage and salary workers compared with self-employed workers in certain occupations. It is instructive to see how that event and other factors, such as the activity the worker was engaged in at the time of the fatality, the worker's time on the job, and the worker's age, affect wage and salary workers and self-employed workers as a whole. By examining the event that triggered the fatality and the activity the employee was performing at the time of the fatal injury, one can better understand how the risks differ across the two kinds of worker. Table 6 shows the events most commonly associated with workplace fatalities incurred by self-employed workers.

The data show that self-employed workers were more susceptible than wage and salary workers to workplace death by homicide; by a nonhighway, noncollision accident;[18] by being struck by an object; and by self-inflicted injuries. The first two of these causes of death are closely related to the two activities in table 7 that a self-employed worker was most likely to be performing at the time of his or her death: tending a retail establishment and driving or operating a farm vehicle. These activities accounted for 12.1 percent and 12.0 percent, respectively, of the total workplace fatalities of self-employed workers. Those same two activities made up 5.1 percent and 0.8 percent of the total fatalities of wage and salary workers. Although the CFOI does not track statistics related to safety measures in the workplace, one can infer why these percentages differ. Small "mom-and-pop" retail establishments may be more attractive to robbers because security is likely to be less than in other stores. Self-employed farmers might have to make do with unsafe equipment or may simply ignore safety concerns in order to stay competitive. In both cases, increased safety measures, more commonly associated with larger businesses (which employ primarily wage and salary workers), would likely decrease the number of workplace fatalities. In one study by Martin E. Personick and Janice A. Windau, the authors wrote, "[S]elf-employed individuals typically earn less than their wage and salary counterparts and, thus, appear to have few extra resources to spend on safety education and equipment that often are provided by employers at little or no cost to their wage and salary workers."[19]

Another characteristic that differs between wage and salary workers and self-employed workers is the time spent at work. The self-employed work longer hours than their wage and salary counterparts, and longer hours translate into prolonged exposure to workplace hazards. Personick and Windau also looked at the difference in workweeks for the two classes of workers. Data from 1993 show that self-employed workers typically had a workweek that was 7 hours longer than that of wage and salary workers in the agriculture industry and 5 hours longer in the nonagricultural industries.[20] Data from 1999 indicated that the self-employed still worked longer hours than workers in the wage and salary category, but the differences had fallen to 2.2 hours per week longer in agricultural industries and 0.6 hour longer in nonagricultural industries.[21] As for the expanded workweek's effects on self-employed workers, Personick and Windau wrote, "Thus, the average self-employed worker is exposed to work hazards for a longer period of time and also may be more subject to the effects of fatigue while operating a vehicle or hazardous machinery."[22] Self-employed workers in agriculture might be

Table 7. Number of fatalities and percentage of total fatalities for the most common activity performed at the time of the fatality, self-employed workers and wage and salary workers aged 16 and older, private sector, 1995–2001

Worker activity[1]	Fatalities among self-employed workers	Percent of total fatalities among self-employed workers	Fatalities among wage and salary workers	Percent of total fatalities among wage and salary workers
Tending a retail establishment	1,003	12.1	1,509	5.1
Driving or operating a farm vehicle	993	12.0	228	.8
Repairing or maintaining	690	8.3	2,148	7.2
Driving a truck	650	7.8	4,744	16.0
Constructing, assembling, or dismantling	413	5.0	2,946	9.9
Logging, trimming, or pruning	373	4.5	659	2.2
Driving an automobile	273	3.3	1,768	5.9
Operating farm machinery	265	3.2	87	.3
Flying a plane	209	2.5	619	2.1
Caring for or tending to an animal	153	1.8	82	.3

[1] The categories "physical activity, not elsewhere classified" and "activity, not elsewhere classified" are excluded. These categories had, respectively, 414 and 715 fatalities from 1995 to 2001 and are excluded because they refer, not to any specific activity, but to a diverse set of activities that do not fall into any of the other categories.

Table 8. Impact magnitude of exclusion, number, and rate of fatal work injuries for occupations with the largest negative impact magnitude of exclusion for self-employed workers and wage and salary workers aged 16 and older, private sector, 1995–2001

Occupation	Impact magnitude of exclusion	Fatalities among self-employed workers[1]	Fatality rate of self-employed workers	Fatalities among wage and salary workers	Fatality rate of wage and salary workers
Farmers, except horticultural[2]	–20.2	2,300	33.9	82	6.5
Sales occupations	–4.3	1,096	9.2	1,877	1.9
Managers and administrators, n.e.c.[3]	–3.0	717	10.6	777	1.8
Machine operators, assemblers, and inspectors	–1.5	83	6.1	1,446	2.8
Technicians and related support occupations	–1.3	132	24.6	915	3.6
Managers, food-serving and lodging establishments	–1.2	239	16.5	242	3.0
Fishers, including captains and officers of vessels	–1.2	191	91.8	255	199.2
Farmworkers, other[4]	–1.0	348	81.5	997	18.9
Timber-cutting and logging occupations	–.8	216	118.0	476	153.1
Precision production occupations	–.5	74	5.6	597	2.5

[1] Pertains only to occupations with at least 35 workplace fatalities from 1995 to 2001.
[2] Excludes horticultural farmers and farm managers.
[3] n.e.c. = not elsewhere classified.
[4] Includes other farmworkers and other supervisors of farmworkers.

particularly affected by the longer workweek, and the fatigue that Personick and Windau describe may be a reason that self-employed workers are much more likely than wage and salary workers to be killed while operating farm vehicles and machinery.

Finally, self-employed workers were older. From 1995 to 2001, 11.2 percent of the private-sector wage and salary workforce was aged 55 and older. By contrast, 24.5 percent of the private-sector self-employed workforce was 55 and older. During that same period, 5,183 fatalities were recorded for wage and salary workers aged 55 and older, a figure that represented 17.4 percent of all fatalities of wage and salary workers during that period. Among the self-employed, those aged 55 and older accounted for 3,561 workplace fatalities from 1995 to 2001, a figure that represented 43.0 percent of all fatalities of self-employed workers during the period. Thus, self-employed workers are more likely to be older, and, as a percentage, older workers account for more fatalities among the self-employed than among wage and salary workers.

Another factor to consider is the relationship between self-employment and age. Do self-employed workers have higher fatality rates because they are more likely to be older than wage and salary workers, or do older workers have a higher fatality rate because they are more likely to be self-employed? The following tabulation shows the fatality rates of two age groups of self-employed workers and wage and salary workers from 1995 to 2001:

Age of worker	*Self-employed*	*Wage and salary*
16 to 54 years	8.6	3.9
55 years and older	20.0	6.5

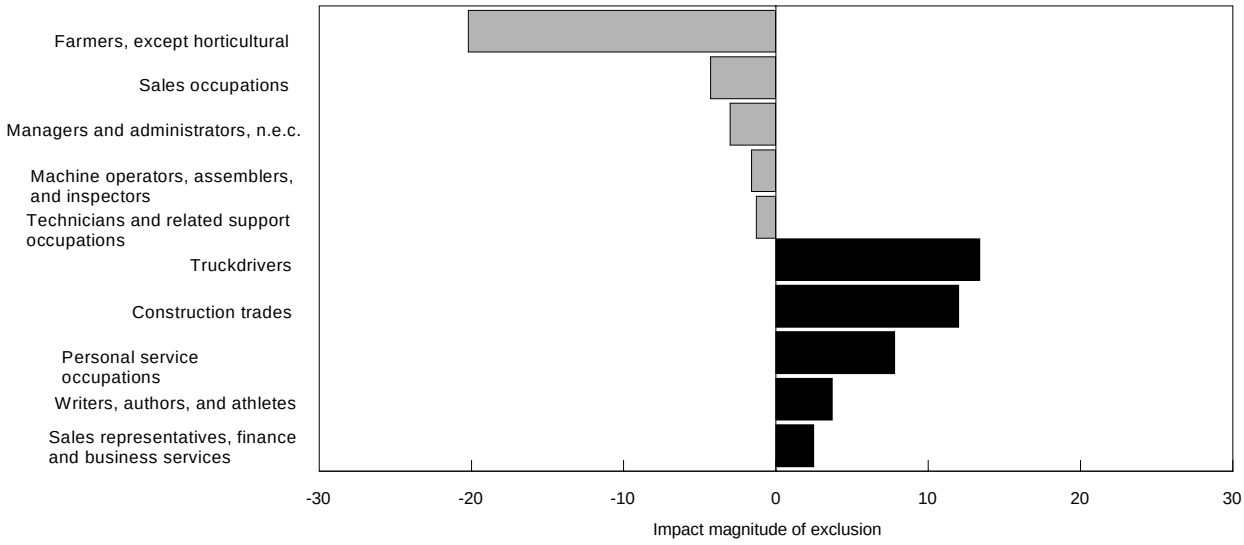
Both the type of worker (self-employed or wage and salary) and the age of the worker seem to affect the fatality rate. Regardless of age, the fatality rate of the self-employed is greater than that of wage and salary workers. Likewise, regardless of the type of worker, the fatality rate of workers aged 55 and older is greater than the fatality rate of workers aged 16 to 54. Further study is necessary to determine the exact nature of this relationship.

Impact magnitude of exclusion

Neither the number of fatalities nor the fatality rate can be used exclusively to pinpoint the impact a particular occupation has on overall fatality rates for the self-employed and for wage and salary workers. For example, excluding an occupation with a high fatality *rate* for the self-employed, but with relatively few self-employed *fatalities,* will not, by itself, greatly affect the disparity between the fatality rates for the two groups of workers, because the number of fatalities is too small to produce any meaningful change. Likewise, an occupation with a large number of fatalities incurred by the self-employed will not necessarily affect the disparity between the two groups' fatality rates; the effect that occupation has on the rate for wage and salary workers must also be taken into account.

In this analysis, the impact magnitude of exclusion[23] is used to rank occupations. This statistic shows the impact of excluding an occupation from calculations of the fatality rates of both the self-employed and wage and salary workers. Specifically, the impact magnitude of exclusion measures the percent change in the ratio of the fatality rates if a given occupation is excluded. For example, the ratio of the overall fatality rate of the self-employed to the fatality rate of wage and salary workers is 11.4/4.2, or 2.7:1. If farmers are excluded from the calculations of the fatality rate of the self-employed, then the rate decreases from 11.4 to 9.1. If farmers are similarly

Chart 1. Impact magnitude of exclusion for selected occupations, private sector, 1995–2001



NOTE: n.e.c. = not elsewhere classified.

excluded from the calculations of the fatality rate of wage and salary workers, then the rate decreases from 4.169 to 4.164. The ratio of the two fatality rates once farmers have been excluded is 9.1/4.164, or 2.2:1, a decrease of 20.2 percent from the original ratio. So the –20.2 figure in table 8 means that excluding farmers results in a 20.2-percent decrease in the ratio between the fatality rates of the two categories of worker.

The impact magnitude of exclusion identifies the occupations that drive the disparity between the two fatality rates. Once these occupations are identified, they can be examined to determine why they contribute to the disparity. In this analysis, farmers and truckdrivers are examples of occupations that, if excluded, have a large effect on the disparity between the fatality rates. Interestingly, however, the two occupations affect the disparity in different ways.

With the use of the impact magnitude of exclusion, it is easy to see which occupations have the greatest effect on the disparity between the fatality rates of the two categories of workers. Farmers make up the occupation with the greatest effect: both fatality rates decrease when the occupation is excluded from fatality rate calculations, but the fatality rate of the self-employed decreases at a far greater rate than that of wage and salary workers. Excluding sales occupations from both rate calculations would increase both rates; however, the fatality rate of wage and salary workers increases faster than the fatality rate of the self-employed, decreasing the disparity between the ratio of the two rates. Finally, excluding managers of food-serving and lodging establishments would decrease the fatality rate of the self-employed and increase that of wage and salary workers, decreasing the disparity between the rates.

By contrast, excluding other occupations can actually *widen* the gap between the two fatality rates. The leading occupation that, if excluded, causes the ratio to increase is truckdrivers. This occupation represents 17.5 percent of the total workplace fatalities of wage and salary workers from 1995 to 2001 and 6.3 percent of the total workplace fatalities of the self-employed. The fatality rate for wage and salary truckdrivers (27.9) is more than 6 times greater than the overall fatality rate of wage and salary workers (4.2), while the fatality rate for self-employed truckdrivers is just 2.5 times greater than the overall fatality rate for the self-employed. Excluding truckdrivers increases the ratio of the fatality rates by 13.4 percent. Thus, the impact magnitude of exclusion is an effective means of determining which occupations affect the ratio between the fatality rates of self-employed and wage and salary workers the most—regardless of whether the exclusion of the occupation increases or decreases the ratio. Chart 1 shows occupations that have large positive, and occupations that have large negative, impact magnitudes of exclusion.

Using the impact magnitude of exclusion to rank occupations highlights an interesting point about the types of occupations that contribute to the disparity in fatality rates. For example, self-employed machine operators, assemblers, and inspectors do not have a high number of occupational fatalities, nor do they face a high fatality rate. Yet, excluding

machine operators, assemblers, and inspectors decreases the disparity between the fatality rates of self-employed workers and wage and salary workers, whereas excluding an occupation such as truckdrivers, which has both a high number of fatalities (525) and a high fatality rate among the self-employed in the occupation (29.1), actually increases the disparity.[24] This example shows why it is necessary to look at an occupation's effect on the fatality rates of both kinds of workers in order to gauge its impact on the disparity between those rates.

Summary and conclusions

The disparity in fatalities and fatality rates between self-employed workers and wage and salary workers is attributable mainly to two factors: (1) self-employed workers are more likely to work in industries and occupations with higher fatality rates; and (2) when the two categories of workers are in the same occupation, self-employed workers have certain characteristics that make them more likely than wage and salary workers to suffer a fatal injury. The former explains much of the variation in overall fatalities and in the overall fatality rate between wage and salary workers and self-employed workers. The latter is more applicable to variations in the intraoccupational fatality rate.

Self-employed workers face a greater risk of suffering a fatal work injury than do wage and salary workers. Compared with a wage and salary worker, a self-employed worker

- is much more likely to be employed in the agricultural, forestry, and fishing industry.
- is more likely to be killed while tending a retail establishment; driving or operating a farm vehicle; performing logging, trimming, or pruning; operating farm machinery; or tending animals.
- is more likely to perish as a result of a homicide; from a nonhighway, noncollision accident; through being struck by an object; or by means of a self-inflicted injury.
- spends more time working.
- is older.

An important factor in the fatality rate difference comes from one occupation: farmers. From 1995 to 2001, farmers had 28 times more fatalities among the self-employed than among wage and salary workers. More than 27 percent of all fatalities suffered by the self-employed were incurred by farmers, while less than one-half of 1 percent of all fatalities among wage and salary workers came from that occupation.

The intraoccupational variation in fatality rates is attributable mainly to the different risks associated with the work activities of wage and salary workers, compared with those of self-employed workers. Differences in the event or exposure leading up to the fatality and in the activity the worker was engaged in at the time of the fatality show that self-employed workers in a given occupation face greater risks than wage and salary workers in the same occupation. These increased risks also could be indicative of lesser safety measures for self-employed workers. Also, the self-employed worked longer hours and therefore may have been exposed to workplace hazards for greater periods. Finally, self-employed workers were older, and older workers had a much higher fatality rate than younger ones. □

Notes

ACKNOWLEDGMENT: The author thanks Dino Drudi, Samuel Meyer, Katharine Newman, Scott Richardson, Peggy Suarez, Bill Wiatrowski, Janice Windau, and Mark Zak for their assistance in the production of this article.

[1] All workplace fatality data are from the BLS Census of Fatal Occupational Injuries (CFOI). Although the CFOI counts all workers, regardless of age, fatality figures in this article are for workers in private industry aged 16 and older. Also, workplace fatalities for which the decedent's age was not known were excluded.

[2] Employment data are from the Current Population Survey (CPS), a survey conducted by the U.S. Census Bureau for the Bureau of Labor Statistics. (See note 8 for more information about the CPS.)

[3] According to the Occupational Injury and Illness Classification System, the event or exposure describes the manner in which the fatal injury was produced.

[4] The program usually requires at least two independent sources to confirm that a fatality is indeed work related. Many different types of sources, such as death certificates, newspaper accounts, workers' compensation reports, and Federal and State agency reports, are used to verify that a fatality occurred during work.

[5] A work relationship exists if an event or exposure results in a fatal injury or illness to a person (1) *on* the *employer's premises* and the person was there to *work* or (2) *off* the *employer's premises* and the person was there to *work* or the event or exposure was related to the person's work status as an employee. The *employer's premises* include buildings, grounds, parking lots, and other facilities and property used in the conduct of business. *Work is* defined as legal duties, activities, or tasks that produce a product as a result and that are performed in exchange for money, goods, services, profit, or benefit.

[6] It is important to note that classifying workers into these two categories is not an easy task, for at least two reasons. First, in many occupations—particularly the agricultural ones—it can be difficult to determine whether the worker is self-employed or working for a wage or salary. Second, it must be determined whether a self-

employed worker, who may be more likely to work out of the home or a car than a wage and salary worker would be, was "at work" when he or she was killed.

[7] The CPS uses a similar definition for *self-employed*. See *Current Population Survey: Design and Methodology*, Technical Paper 63RV, p. 5-4, for more data; on the Internet at **http://www.census.gov/prod/2002pubs/tp63rv.pdf**.

[8] The CPS surveys the civilian noninstitutional population, which includes U.S. residents who are 16 and older. Data are gathered on a monthly basis from a sample of 60,000 households. Individuals in institutions, such as prisons or nursing facilities, and those in the Armed Forces are not counted in the survey. The CFOI, which collects data on military workplace fatalities occurring in the United States, uses resident military employment figures from the U.S. Department of Defense. For more information, visit **http://www.bls.gov/opub/hom/homch1_a.htm**.

[9] For more information about this topic, see Guy A. Toscano, "Dangerous Jobs" *Compensation and Working Conditions*, summer 1997, pp 57–60.

[10] Data for 2001 are preliminary.

[11] Because all those working for a government entity are wage and salary workers, and because some occupations, such as military positions, are inherently governmental, including government workers would skew the analysis. Some industries and occupations are populated predominately with either self-employed workers or wage and salary workers. In each of these industries and occupations, however, a worker can either be self-employed or be a wage or salary worker. This is not possible with government employees, so, because the purpose of the analysis presented herein is to compare and contrast self-employed workers with wage and salary workers, government workers are not included.

[12] None of the figures from 2001 include victims of the September 11 terrorist attacks.

[13] The fatality rate represents the number of fatal occupational injuries per 100,000 workers. Fatality rates can be calculated for a year or for a number of years. The formula is $R = (N/W) \times 100{,}000$, where R is the fatality rate, N is the number of fatal work injuries in a particular field, and W is the number of workers in that field. For example, 80 self-employed roofers were the victims of fatal work injuries from 1995 to 2001, and there were 311,000 self-employed roofers employed during that period. (The employment figure reflects the sum of each year's employment of self-employed roofers from 1995 to 2001.) So the fatality rate for roofers from 1995 to 2001 was (80/311,000) × 100,000, or 25.7. In effect, the fatality rate standardizes the figures and makes comparisons across different employee populations possible.

[14] Occupations are ranked by impact magnitude, introduced later in the analysis.

[15] Those in this occupation are considered to be operators or managers of a farm. From here on in this section, for convenience' sake, the simple term *farmers* will be used in place of the more cumbersome *farmers, except horticultural*.

[16] To derive this figure, the percentage of nonhighway accidents in which a self-employed farmer was killed in or by an overturned vehicle, relative to all fatalities to self-employed farmers, was divided by the percentage of nonhighway incidents wherein a wage and salary farmer was killed in or by an overturned vehicle, relative to all fatalities to wage and salary farmers. This ratio also is used to derive subsequent similar figures.

In the case at hand, 577 of the 2,300 workplace fatalities to self-employed farmers were due to a nonhighway accident involving an overturned vehicle. In contrast, just 5 of the 82 workplace fatalities to wage and salary farmers were due to a nonhighway accident involving an overturned vehicle. The ratio (577/2,300)/(5/82) yields 4.11, a figure that is rounded to 4 in the text.

[17] The occupation titled "farmworkers, other" consists of nonmanagerial workers on a farm. In what follows, those in this occupation will be called, simply, farmworkers.

[18] A nonhighway, noncollision accident is a transportation accident that occurs off the highway and that does not involve a collision. Two examples of this type of accident are the overturning of a vehicle and a worker's falling from a moving vehicle.

[19] Martin E. Personick and Janice A. Windau, "Self-employed individuals fatally injured at work," *Monthly Labor Review*, August 1995, pp. 24–30; quote from p. 25.

[20] *Ibid.*, p. 25.

[21] Visit **http://www.census.gov/prod/2001pubs/statab/secl3.pdf**; see table 656.

[22] Personick and Windau, "Self-employed individuals," p. 56.

[23] To derive the impact magnitude of exclusion, the overall fatality rates are calculated first. A total of 8,286 fatalities was recorded for the self-employed from 1995 to 2001. The total self-employed employment for that time was 72,656,000. Thus, the fatality rate was 11.4. For wage and salary workers, 29,741 fatalities were recorded from 1995 to 2001. Total wage and salary employment for that period was 713,458,000. Therefore, the fatality rate was 4.169. Dividing the rates yields the fatality ratio: 11.4/4.169 = 2.7:1.

Next, the fatality rates are recalculated after the given occupation is excluded from the fatality rate equations. Excluding the fatalities suffered by farmers (2,300), and excluding employment (6,790,000), from the calculation of the fatality rate for the self-employed yields (5,986/65,866,000) × 100,000, or 9.1. For wage and salary workers, excluding the fatalities from farmers (82), and excluding employment (1,266,000), from the fatality rate calculation yields (29,659/712,192,000) × 100,000, or 4.164.

Next, the new rates are divided one by the other to obtain the new ratio: 9.1/4.164 = 2.2:1. It remains to determine how much the new ratio differs from the previous rate. Here, (2.2 – 2.7)/2.7 = –20.2 percent. (The figures reflect rounding, and a negative result indicates that the difference between the ratios has become smaller.)

The equations for calculating the impact magnitude of exclusion are

$$(FS_t/ES_t) \times 100{,}000 = RS_t,$$

$$(FW_t/EW_t) \times 100{,}000 = RW_t,$$

$$(RS_t/RW_t) = RSW_t,$$

$$[(FS_t - FS_x)/(ES_t - ES_x)] \times 100{,}000 = RS_a,$$

$$[(FW_t - FW_x)/(EW_t - EW_x)] \times 100{,}000 = RW_a,$$

$$RS_a/RW_a = RSW_a,$$

and

$$IM_x = (RSW_a - RSW_t)/RSW_t,$$

where FS_t is the number of fatalities incurred by the self-employed, ES_t is total self-employed employment, RS_t is the total fatality rate of the self-employed, FW_t is the number of fatalities incurred by wage

and salary workers, EW_t is total wage and salary employment, RW_t is the total fatality rate of wage and salary workers, RSW_t is the ratio of the total fatality rate of the self-employed to the total fatality rate of wage and salary workers, FS_x is the number of fatalities among the self-employed in occupation x, ES_x is employment of the self-employed in occupation x, FW_x is the number of fatalities of wage and salary workers in occupation x, EW_x is wage and salary employment in occupation x, RS_a is the adjusted fatality rate of the self-employed, RW_a is the adjusted fatality rate of wage and salary workers, RSW_a is the adjusted ratio of the total fatality rate of the self-employed to the total fatality rate of wage and salary workers, and IM_x is the impact magnitude of exclusion for occupation x.

[24] The impact magnitude of exclusion is negative (1) if the fatality rate of the self-employed decreases at a faster rate than the fatality rate of wage and salary workers or (2) if the fatality rate of the self-employed increases at a slower rate than the fatality rate of wage and salary workers.