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Does the Small Farm Exemption Cost Lives?

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Background *Congress has exempted farms with fewer than 11 employees from enforcement of the Occupational Safety and Health Act. Three states (California, Oregon, and Washington) do not observe the exemption.*
Methods *We compared rates of fatal occupational injury in agriculture, by year, in 1993–2007, in California, Oregon, and Washington (aggregated), and the remaining states (as two aggregated groups): those with, and those without, state-designed occupational safety and health programs.*
Results *Fatality rates were approximately 1.6 to 3 times as high in both groups of states observing the small farm exemption as in the group of three states not observing it. Comparisons excluding the agriculture industry showed weaker differences.*
Conclusions *The three states' opting out of the small farm exemption may have had substantial direct effects. They may also reflect and/or encourage a generally more effective approach to occupational health and safety. Although alternative explanations must be considered, the stakes are high in terms of injury and loss of life; further investigation seems urgently indicated.* Am. J. Ind. Med. 54:461–466, 2011.

KEY WORDS: agriculture; fatalities; injury; regulation; safety; occupational; enforcement; exemption; small farm

INTRODUCTION

Among industry sectors in the United States, agricultural production has consistently had among the highest rates of fatal occupational traumatic injury. For example, in 1992–2002, the industry experienced an average of 806 fatal injuries per year, with rates from 21.3 to 26.5 per 100,000 workers [NIOSH, 2004]. The victims include farm owners and operators, family members and hired farm workers [Myers and Hendricks, 2010]. Studies of the effectiveness of different preventive approaches have been limited, and the rates remain extremely high in spite of the enforcement, consultation, and educational interventions that have been used to date. In an effort to explore possible contributors to these high injury rates, this study examines a possible association of injury rates with the exemption of small farms (those with 10 or fewer hired workers) from enforcement of occupational safety and health regulations.

The Occupational Safety and Health Act of 1970 (OSHA) aimed at mitigating safety and health risks to workers in general, but agricultural production has been exempted from its provisions in some important ways. In 1976, Congress exempted small farms (those with ten or fewer workers, in the absence of a labor camp) from OSHA enforcement [Department of Labor, 2010]. The conceptual and political underpinnings of this national exemption have been described by Kelsey [1994]. There has been relatively little study of the effects of workplace safety laws in the agricultural sector; and to our knowledge, the effects of the small-farm exemption have not been studied. However, there are grounds for concern. There is evidence that OSHA enforcement (but not consultation activity) is effective in reducing injury rates [McQuiston et al., 1998; Baggs et al., 2003]. In several industries, injury rates have been found to be substantially higher in small companies or establishments

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than in larger ones [e.g., Mendeloff et al., 2006; Hill et al., 2009]. In agriculture, the frequency of fatal tractor rollovers appears to be associated with the prevalence of small, economically marginal farms [Cole et al., 2009]. On the other hand, farms with no hired workers are not regulated under OSHA.

The three states that have opted to ignore the small-farm exemption, and continue enforcement regardless of farm size, have been able to do so under the aegis of state occupational safety and health (OSH) programs (''state plans''.) (California, Oregon and Washington.) This distinction among states' OSH policies and enforcement provides an opportunity to examine possible effects of the exemption.

States may opt to develop and operate their own OSH programs in place of the federal OSHA, with OSHA generally paying about half the costs. Twenty-four states have chosen this option to date, although three of those (CT, NJ, and NY) have state plans limited to public employees. Thompson and Scicchitano [1985] found that enforcement levels under state plans might be either less than or greater than those in states relying on Federal OSHA for enforcement. Ninety-six percent of these participating states had inspection and citation rates equal to or greater than OSHA's, but 83% imposed monetary penalties at a lower rate, and half the states had fewer compliance officers. Bradbury [2006] found that states with state plans had lower occupational fatality rates than those relying on Federal OSHA for enforcement. Most of Bradbury's regression models showed rates 27–35% lower associated with state plans; the one exception was a model showing a smaller difference, 6%. None of these studies specifically examined the agricultural sector.

A meta-analysis by the Cochrane Collaboration [Rautiainen et al., 2009] focused on studies of injury prevention interventions in agriculture up to June 2006. Out of 8,616 studies, five randomized controlled trials and three interrupted time series studies met the quality criteria, although judged to be of ''less than high'' quality. They provide some evidence for the effectiveness of financial incentives in increasing the use of rollover protective structures (ROPS) on tractors (an effective preventive intervention for tractor rollover fatalities.) They did not show educational interventions to be effective. Legislation to require ROPS on new tractors appeared to be effective.

MATERIALS AND METHODS

Fatality data from the Census of Fatal Occupational Injuries (CFOI) were obtained from the U.S. Bureau of Labor Statistics [U.S. Department of Labor, 2008]. To calculate fatality rates, data on the numbers of workers were obtained from the Current Population Survey (CPS) conducted by the U.S. Bureau of the Census [2008]. For this study, production agriculture was defined through Industry codes in the data, which were based on two different systems during the study period. Data for 1993–2002 were coded to the Standard Industrial Classification (SIC) [U.S. Department of Commerce.] Data for 2003–2007 were coded to the 2002 revision of the North American Industry Classification System (NAICS) [U.S. Department of Commerce.] For 1993–2002 data, agriculture was defined as Crops (SIC 01); Livestock (SIC 02); Agricultural services (SIC 07, excluding Veterinary Services, 074 and Horticultural Services, 078.) For the 2003–2007 data, agriculture was defined as Crops (NAICS 111); Livestock (NAICS 112); Support Activities for Agriculture and Forestry (NAICS 115).

Fatality rates, by year, were calculated for three groups of states. The first group consisted of California, Oregon and Washington. The second group included all other states that have state OSH plans.[1] States whose OSH plans are limited to government employees were not included, since such plans would not be expected to have an effect on the agriculture sector. The third group included all states without state OSH plans, or with state plans limited to government employees.[2]

Ninety-five percent confidence limits were calculated for the fatality rates, using variance parameters obtained from the Bureau of Labor Statistics to take into account the complex sample design used for the CPS. Analyses were also performed on variables from the Occupational Injury and Illness Classification System (http://www.bls.gov/iif/oshoiics.htm): Event or Exposure; and Primary Source of Injury. The purpose was to explore the possible role of causes of injury covered by OSHA regulations, specifically machinery and farm tractor rollovers. For simplicity, these used the largest subset of the data that was homogeneous with regard to the industry classification system (SIC): the 9 years 1993–2002, aggregated.

RESULTS

The comparisons, by year, across the 15-year time period showed notable differences between the group of three West Coast states and both other groups of states (Fig. 1). The agricultural injury fatality rates in both of the latter were higher than in the three West Coast states in every year: approximately 1.6 to 3 times as high. At no point did the 95% confidence intervals for the West Coast states overlap with

[1] Alaska, Arizona, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, North Carolina, South Carolina, Tennessee, Utah, Vermont, Virginia, Wyoming.

[2] Alabama, Arkansas, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Kansas, Louisiana, Maine, Massachusetts, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Dakota, Texas, West Virginia, Wisconsin.

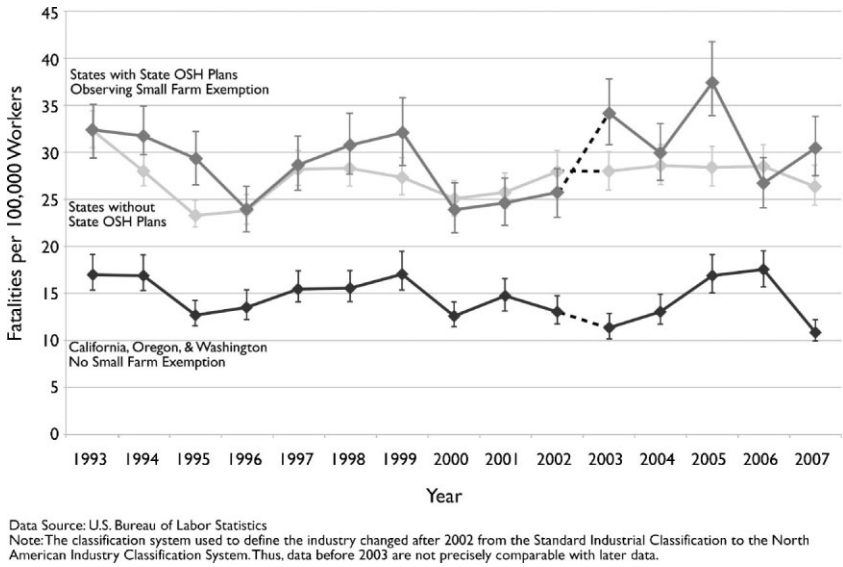

FIGURE 1. Death rates in agriculture, United States by Occupational Safety and Health State Plan 1993–2007.

those of the other groups. The trend lines for the other states (with state plans, vs. without) crossed each other at several points, and their 95% confidence intervals frequently overlapped.

In the years 1993–2002 (aggregated), differences between state groups, parallel to those mentioned above, were seen for fatalities in non-highway transportation, from contact with machinery or equipment, or caused by tractors or machinery; but not for fatalities in highway transportation, from exposure to harmful environments, or caused by highway vehicles or trucks (Figs. 2 and 3).

Additional comparisons (Fig. 4) show similar differentials for all fatalities excluding ''Non-Highway Accident, Non-collision Accident, Overturned'' (OIICS code 4233; see Endnote 1). Only the years 1993–2002 are shown in this comparison, for simplicity.

Finally, for exploratory purposes, the period 2003–2007 was examined with a focus on fatal occupational injuries in all other industries; i.e., excluding production agriculture (Table I). The differentials between the West Coast states and others are consistent with, but weaker than, those in agriculture.

DISCUSSION

The above analyses show substantial overall differences in fatality rates, on average, between those states observing the small farm exemption (California, Oregon and Washington) and those not doing so, in every year, from 1993 through 2007. Similar patterns are seen in fatalities from off-highway overturn and contact injury events, and from machinery and tractors as injury sources. Injuries

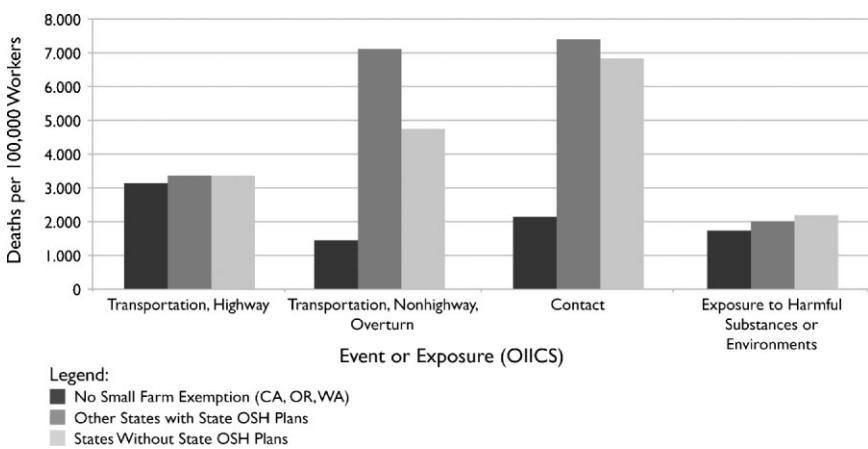

FIGURE 2. Fatality rates in agriculture for specific injury events by OSH State Plan 1993–2002.

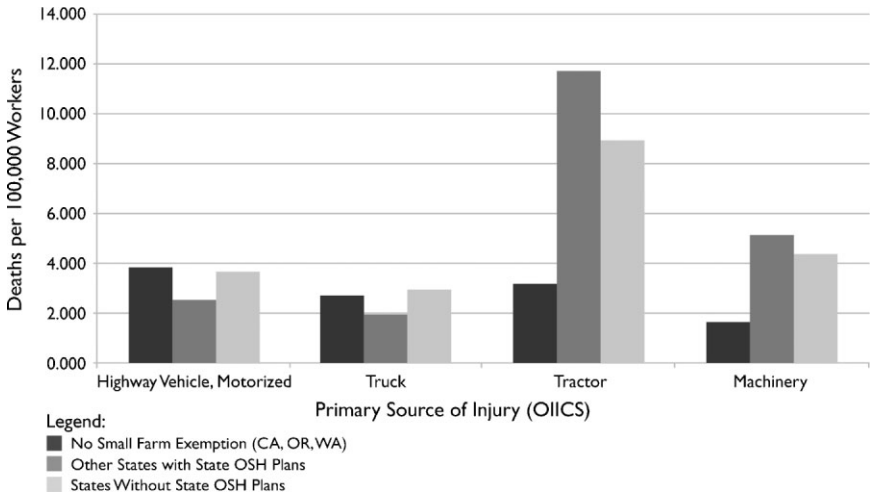

FIGURE 3. Fatality rates in agriculture for specific sources of injury by OSH State Plan 1993–2002.

associated with these events and causes are potentially preventable by existing OSH standards. Tractor ROPS and machinery guarding are covered by 29 CFR Part 1928, Occupational Safety and Health Standards for Agriculture. Tractor rollover events are also addressed by further regulation in the state of Washington. Somewhat weaker differences were seen for fatalities excluding rollover events. When specific types of events and sources of injury other than these were examined, the differences between groups of states showed no striking or consistent pattern, and in general were of small magnitude.

The analyses do not suggest a relation between the existence of a state OSH plan per se and fatality rates (see Fig. 1 for the two groups of states observing the small farm exemption.) By law, a state OSH plan must incorporate "safety and health rules at least as effective" as those promulgated by OSHA. However, practically speaking, it is unclear how well this criterion can be applied, unless linked to quantitative assessments of these rules' effectiveness. There has been some evidence of lower occupational mortality, across industries, in state-plan states [Bradbury, 2006]; but there is nothing intrinsic to the existence of a state plan that would consistently lead to such an outcome for a particular industry, absent a specific policy. Potentially, the decision not to observe the small farm exemption may represent such a policy. This study shows that the three states that extend their enforcement to small farms (California, Oregon and Washington) experience far lower fatality rates, on average, than other states. The effect does not appear limited to agriculture: exploratory analyses show parallel, but weaker, differentials for fatalities when production agriculture is excluded (i.e., for all other industries.) Thus, it is not possible for the small-farm exemption itself to account directly for it in its entirety. One possible

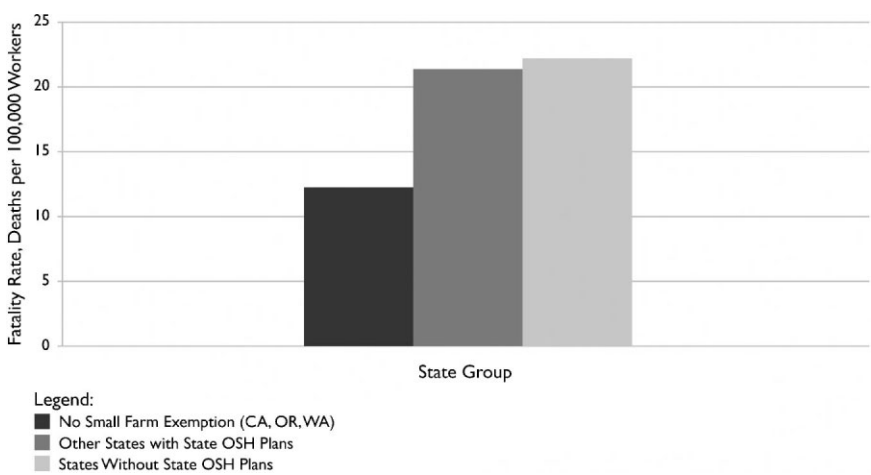

FIGURE 4. Death rates in agriculture, excluding non-highway rollover accidents by OSH State Plan 1993–2002.

TABLE I. Occupational Fatality Rates and Risk Ratios by State Groups, Deaths per 100,000 Workers, Agriculture, and Other Industries

	2003		2004		2005		2006		2007	
States	**Agriculture**	**Other**	**Agriculture**	**Other**	**Agriculture**	**Other**	**Agriculture**	**Other**	**Agriculture**	**Other**
California, Oregon, and Washington	11.41 (1.00)	2.78 (1.00)	13.11 (1.00)	2.75 (1.00)	16.97 (1.00)	2.54 (1.00)	17.52 (1.00)	2.98 (1.00)	10.84 (1.00)	2.62 (1.00)
Other State Plans	32.40 (3.00)	3.98 (1.43)	29.87 (2.28)	4.17 (1.52)	37.73 (2.22)	3.95 (1.55)	26.60 (1.52)	4.15 (1.39)	30.53 (2.82)	3.84 (1.47)
No State Plan	27.91 (2.45)	3.82 (1.38)	28.61 (2.18)	3.95 (1.44)	28.41 (1.67)	3.87 (1.52)	28.57 (1.63)	3.75 (1.26)	26.36 (2.43)	3.75 (1.43)

Note: Relative risks ore shown in parentheses. Within each column, all relative risks have as their referent (RR = l.00) the rate for California, Oregon, and Washington.

interpretation is that the three states' opting out of the small farm exemption may reflect and/or encourage a proactive approach to occupational health and safety that also affects other industries.

These are intriguing and potentially important findings. The policy implications demand further study, to determine whether the small farm exemption plays a causal role. However, ecologic studies have well-recognized limitations. In this case, alternative explanations for our findings include uncontrolled differences between the groups of states being compared, including differences in terrain, commodities produced, production methods, and workforce characteristics (e.g., age distribution.) Indeed, within each group of states, there are notable differences in fatality rates, presumably due to just such factors. For example, within the group of states not observing the small farm exemption, fatality rates in production agriculture in 2003–2007 ranged from 9.7 per 100,000 (Washington) to 17.1 per 100,000 (Oregon) [United States Department of Agriculture, 2009].

Unfortunately, it was not possible to distinguish cases that occurred on small farms from other cases. The Bureau of Labor Statistics generally does not publish the information on establishment size in the CFOI data, due to the large proportion of unknown values for that variable (U.S. Department of Labor, Bureau of Labor Statistics, personal communication). It is also not known what proportion of the fatal injuries occurred on family farms without any hired workers.

Finally, data limitations must be acknowledged. CFOI has been evaluated in comparison with other surveillance systems for occupational fatalities, and has been found to report higher numbers, due to its use of active surveillance with multiple data sources [Biddle and Marsh, 2002; Layne, 2004]. The use of denominator data from the CPS may introduce a more significant potential for an undercount, since it is based on a survey of residences. Both CFOI and the CPS include paid and unpaid workers, including older and retired farmers. Nevertheless if any undercount in the CPS data (the denominator) were more pronounced in one group of states than in another (without a corresponding undercount in CFOI data, the numerator), a comparison of rates would be biased. This possibility cannot be ruled out.

In summary, our analyses show, on average, lower fatality rates in agriculture in the three states not observing the small farm exemption than across other states overall. However, an adequate explanation cannot be determined from these data. The findings, including the patterns seen for specific causes of injury, are consistent with an effect of the three states' OSH plans and their implementation, including but not limited to the small-farm exemption. This interpretation must be made in context: other uncontrolled differences between the groups of states may contribute as well, but these cannot be adequately investigated with the data used in this study.

As for the practical implications, if the results are attributable to the small farm exemption, it should be noted that OSHA regulations, and therefore the small farm exemption, are not applicable to farms worked only by family members; that is, without hired workers. Thus, the potential impact of these regulations, and of the exemption, may be expected to vary substantially between states and localities, depending on local conditions.

It is possible to calculate a rough estimate of the number of lives that might have been saved nationally over the 5 years if the three states' experience had been replicated across the country. Such an approach will gloss over the differences between states and localities; in a given geographic area, the impact of any solution will depend upon local conditions, staffing patterns and production methods. However, the calculation may indicate, broadly, what is at stake, given the findings presented above. The difference between the agriculture fatality rate (across those years) in the group of three states versus all other states combined was applied to the total U.S. population employed in production agriculture. The estimate thus produced is approximately 1,000 deaths over the 5 years. The practical implications for prevention, including the role of the small farm exemption, depend both on the causes of the ''excess'' fatalities and on the characteristics of the farms on which these injuries occur, including the number of hired workers (if any.) The stakes are high in terms of injury and loss of life; further investigation seems urgently indicated. Unfortunately, existing databases provide limited detail. To address these questions and limitations,

a separate study is being planned by the investigators to review fatality cases in detail in representative states.

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