



Original article

An estimate of the U.S. government's undercount of nonfatal occupational injuries and illnesses in agriculture

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ABSTRACT

Background: Debate surrounds the accuracy of U.S. government's estimates of job-related injuries and illnesses in agriculture. Whereas studies have attempted to estimate the undercount for all industries combined, none have specifically addressed agriculture.

Methods: Data were drawn from the U.S. government's premier sources for workplace injuries and illnesses and employment: the Bureau of Labor Statistics databanks for the Survey of Occupational Injuries and Illnesses (SOII), the Quarterly Census of Employment and Wages, and the Current Population Survey. Estimates were constructed using transparent assumptions; for example, that the rate (cases-per-employee) of injuries and illnesses on small farms was the same as on large farms (an assumption we altered in sensitivity analysis).

Results: We estimated 74,932 injuries and illnesses for crop farms and 68,504 for animal farms, totaling 143,436 cases in 2011. We estimated that SOII missed 73.7% of crop farm cases and 81.9% of animal farm cases for an average of 77.6% for all agriculture. Sensitivity analyses suggested that the percent missed ranged from 61.5% to 88.3% for all agriculture.

Conclusions: We estimate considerable undercounting of nonfatal injuries and illnesses in agriculture and believe the undercounting is larger than any other industry. Reasons include: SOII's explicit exclusion of employees on small farms and of farmers and family members and Quarterly Census of Employment and Wages's undercounts of employment. Undercounting limits our ability to identify and address occupational health problems in agriculture, affecting both workers and society.

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Introduction

The federal government's undercount of nonfatal occupational injuries and illnesses for all industries combined has received considerable research and popular press attention [1–3]. A U.S. General Accounting Office report addressed undercounting and suggested remedies for all industries combined [4]. This study extends previous research by focusing on agriculture, an industry that merits special attention for several reasons. First, although estimates vary, agriculture employs roughly 2–4 million people and includes the highest share of self-employed persons in any industry [5,6]. Second, agriculture is among the most hazardous industries, especially for the self-employed [7–9]. Third, agriculture employs many undocumented workers; for example, the most recent analysis from the National Agricultural Workers

Survey (NAWS) estimated 53% of all hired crop workers were undocumented [10]. Contentious debate surrounds whether undocumented workers should be granted citizenship and the impact this may have on workers' subsequent use of Medicaid and workers' compensation [11,12]. Fourth, many farm workers are migrants; the NAWS estimated 42% of crop workers annually traveled 75+ miles to obtain jobs [10]. Fifth, and most importantly, agriculture poses the greatest challenge of any industry for generating estimates of undercounting because of the seasonal nature of employment and predominance of small, family-run operations [13].

We measured the injury and illness undercount as the difference between estimates from the Bureau of Labor Statistics (BLS)'s Survey of Occupational Injuries and Illnesses (SOII) and our own estimates. Unlike the SOII, we accounted for the self-employed and workers on small farms as well as willful and negligent underreporting by both employees and employers. We believe our estimates are conservative, in part because we use the same criteria as the BLS to qualify a case as an occupational injury or illness. We do not include, for example, estimates of job-related cancers, chronic

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obstructive pulmonary disease, and circulatory disease that far exceed those recognized by the SOII [14,15].

The undercount has institutional and behavioral causes. Institutional causes pertain to deliberate reasons for excluding persons. Two of these institutional causes are the exclusions of self-employed farmers on all farms and workers on farms with less than 11 employees from the SOII. A third institutional cause is the government's undercount of employment of farm workers in virtually all government data sets. This employment undercount is widely recognized owing to the fluid and part-time nature of farm work [7]. BLS readily acknowledges the employment undercount and estimates its magnitude in supplements to the Quarterly Census of Employment and Wages (QCEW) [16].

There are two behavioral causes: negligence (e.g., employer inadvertently fails to record qualifying injuries in the OSHA log) and willful underreporting (e.g., employer purposefully fails to record qualifying injuries or employees do not notify employers for lack of knowledge regarding reportable injuries or fear of reprisal) [1,2].

Despite the undercount, the SOII is widely cited by researchers and journalists, in part, because it has been providing the only annual national estimates of nonfatal workplace injuries and illnesses for 40 years. There are three additional data sets with relevant information, but none as comprehensive as the SOII. The National Health Interview Survey provides information on injuries, but not illnesses nor estimates within industries. The Census of Fatal Occupational Injuries provides information within agriculture but only for injury fatalities. The NAWS contains data on injuries but only for crop, not animal farms.

Methods

We proceed step-by-step through institutional and behavioral causes. We begin with estimates of the numbers of injuries and illnesses and employment from SOII for farms with 11+ employees. SOII figures are then adjusted upward based on the estimates of employment from QCEW that do not restrict to farms with more than 11 employees. We then add estimates for farm owners and family members based on the estimates from the Current Population Survey (CPS). Finally, we adjust estimates to reflect underreporting due to willfulness and negligence.

Employees: SOII

The 1970 Occupational Safety and Health Act requires very high percentages of firms to record qualifying work-related injuries and illnesses, that is, those associated with death, loss of consciousness, lost or restricted work days, or medical treatment beyond first aid [17,18]. Employers use OSHA form 300 to record each incident, including the employees name, job title, date, brief description of the incident, days absent, and other pertinent data. Employers sum the numbers within categories each year. The BLS, Office of Safety, Health, and Working Conditions, surveys roughly 250,000 firms and state and local government agencies, collecting annual OSHA form 300 summaries and compiling them into SOII [17,18]. Based on these data, the BLS Safety Office publishes annual estimates for numbers of nonfatal injuries and illnesses, employment, and incidence rates (cases-per-full-time employee) within detailed industries including crop and animal farms. Our data on injuries and illnesses are drawn directly from SOII. Our employment data are drawn from QCEW. Incidence rates are for full-time equivalent (FTE) workers. The Safety Office estimates FTE workers using numbers of injuries and illnesses from SOII, employment from QCEW (after eliminating small farms), annual work hours from SOII, and a formula that defines full-time employment as 2000 work hours per year [19].

Employees: QCEW

QCEW employment data “are derived from the quarterly tax reports submitted to State workforce agencies by employers, subject to State unemployment insurance (UI) laws” as well as federal agencies [20,21]. QCEW does not explicitly exclude farms with less than 11 employees. Nevertheless, some state laws do not require farms with less than 10 employees to provide UI, and these small farms may not be included in QCEW counts [21,22]. The state with the largest farm worker employment, California, requires UI, even for small farms [22]. QCEW nevertheless recognizes that limitations to its ability to capture all employment within agriculture. QCEW estimates it misses 0.2 million employees in all agricultural industries combined and captures 1.2 million, suggesting it misses 14.3% of farm workers [20].

Employees: combine SOII with QCEW

In 2011, for crop farms in SOII, the estimate for number of injuries and illnesses (“cases”) was 19,700 [19]; the employment estimate was 413,800; the case rate was 5.5 cases per 100 FTE. (Note that the case rate is expressed in terms of FTE and, therefore, not a simple ratio of 19,700/413,800. The denominator, 413,800, is an annual average and includes some workers with less than 2000 hours. FTE estimates combine workers and hours into one metric. One FTE could be two workers who each work 1000 hours or one worker who works 2000 hours.) For animal farms, the corresponding numbers were 12,400 injury or illness cases; 163,600 employed; and 6.7 cases per 100 FTE. The 2011 QCEW numbers for employment (again, not excluding farms with <10 employees) were 531,245 for crop and 230,610 for animal farms.

Our first methodological adjustment was to increase the SOII injury and illness cases estimates in proportion to the difference in the SOII and QCEW employment estimates. For crops, the SOII estimate of 413,800 employed persons must be multiplied by 1.2838 ($=531,245/413,800$) to bring it up to the QCEW estimate of 531,245 employed persons. If we similarly inflate the number of SOII-reported injury and illness cases, the result is 25,291 cases. The same procedure was applied to animal farms and yielded 17,479 cases. The key assumption (altered in the sensitivity analysis) was that the rate of injury and illness was the same on large and small farms.

The second methodological adjustment pertains to the QCEW underestimate of employment in agriculture. The QCEW is likely to underestimate the number of employees in all industries, but especially in agriculture. In all industries, employers have an incentive to underreport numbers of employees because greater numbers will result in higher total (but not per-worker) payments for both unemployment and workers' compensation insurance [23–25]. This incentive is especially strong in agriculture because significant numbers of workers are undocumented—roughly 53% in crop farms [10]. It is likely that undocumented workers are much less likely than documented workers to apply for unemployment compensation. In addition, our estimate of the undercount is likely affected by varying UI statutes across states. Legal requirements on employers are not as strict for farms compared with other industries. In most states, UI only applies to farms with 10+ employees [10]. BLS recognizes that there are limitations for the QCEW in measuring agricultural employment: “the QCEW program does provide *partial* (our emphasis) information on agricultural industries ...” [26].

We, therefore, sought to adjust upward the QCEW estimates to reflect employment undercounting. We could not find QCEW undercounting estimates in agriculture in scientific journals. We used alternative QCEW data that estimated 0.2 million of a total of

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