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Economic Evaluation and Systematic Review of Publicly Available Workers' Compensation Practice Details and Mod Rate Calculators Applied to Upper Midwest Agriculture

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ABSTRACT

Background: Agricultural employment is one of the most dangerous occupations in the United States. Workers' compensation coverage requirements for agricultural work vary from state to state, and experience modifier rates (E-mods) affecting insurance premiums sometimes vary drastically across state lines and according to claim severities and farm sizes. We proposed to develop an interactive software application that would educate farmers on the impact of employee time loss on annual E-mod factor change specific to their geographic location and farm size.

Methods: We conducted a comparative analysis of workers' compensation formulations, including E-mods among Upper Midwestern states. We performed sensitivity analysis of the formulas to claim amount and payroll to highlight differences related to claim severity and to farm size.

Results: The state to state variation and remarkable complexity of these formulas was confirmed. E-Mod factors are shown to increase substantially across states with both claim size and payroll, though are found to be similar across Wisconsin and Minnesota which were examined in detail.

Conclusions: The findings confirm that creating a nationally applicable interactive educational software tool for farmers and ranchers to view hypothetical rate changes by inputting on-farm injury scenarios represents a significant challenge and that educational outreach coupled with the use of commercial software, especially as less costly options become available, may serve the role of minimizing misunderstandings by current producers as may other informational sources.

KEYWORDS

Workers' compensation; midwest; agriculture; farming; ranching; dairy; pork; economic; E-mod

Introduction

Farm work is physically demanding and requires consistent attention and care. Farming claims the second most fatalities of any US occupation with an annual fatality rate of 23.2 per 100,000 workers.[1] Even with proper working procedures in place, injuries occur and can limit agricultural workers' abilities to perform various tasks. Federal law in the United States renders all legal employees (or their beneficiaries) eligible to receive financial compensation for work-related injuries or death. However, workers' compensation for agricultural workers is quite different from other compensation programs due to variations in agricultural practice (animal husbandry versus horticulture) and size and structure of the agricultural business (family-owned business versus co-operative farming).[2–4] Furthermore, the degree of compensation, employee assistance during the recuperation period, and insurance rate adjustments for employers vary by state.[2]

To alleviate the inherent difficulties in understanding and calculating adjustments to experience modification factor rates, or E-Mods, for agricultural employers (sometimes also referred to as "mod rates" or "mod factors"), the National Farm Medicine Center developed an internet-based platform (www.SafeReturnToWork.org) to aid clinicians and employers in returning injured workers to the job and to educate farmers about the financial ramifications of worker injuries. Existing individual calculators in the Upper Midwest (the four-state region of Wisconsin, Iowa, Minnesota, and Illinois) account for variations in state laws regarding compensation and

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provide estimates for employee compensation as a function of E-Mods calculations for which also differ by state. This article provides an overview of workers' compensation as applied to agriculture, describes how compensation is calculated for non-fatal injuries for a subset of Upper Midwest states, and outlines the program objectives of the Safe Return to Work System with respect to workers' compensation for agricultural workers. We focus on a detailed comparison of Wisconsin and Minnesota's workers' compensation systems, specifically as they relate to the agricultural sector. This comparison provides numerical illustrations of similarities, differences, and complexities that may prevent comprehensive understanding of the systems in both states. The complexity of workers' compensation formulas may be interrelated with the behavioral choices of employers and employees (e.g., the lack of light duty work activities, delaying an injured workers' return to work, and safety management practice more broadly). The Safe Return to Work system is a first step toward addressing these issues and replacing existing learning systems used by producers including some existing calculators.

Workers' compensation

Workplace injuries and occupational diseases cause enormous financial and social burdens in the United States.[3] Leigh et al. (2014) estimated that workplace injuries and occupational diseases cost the United States approximately $67 billion in direct and $183 billion in indirect cost.[3] In addition to the financial impact, workplace injury and disease can have a significant physical, psychological, and social impact at the individual, family, and community levels.[5–8] Individuals on extended injury leave tend to have poorer health outcomes and are less likely to return to work than individuals who received tailored physician recommendations for light duty work tasks during their recovery period.[5]

Workers' compensation provides financial resources to employees injured in the workplace/work site or to the employee's family in the event of a work-related death.[2] State-to-state requirements and implementations of formulas vary.[9,10] Generally, to receive workers' compensation, an injured employee must demonstrate, with greater than 50% probability, that the injury occurred at the workplace while performing a work-related task or as a direct result of their engagement in work-related activities (i.e., in the case of chronic conditions). The evidence for this demonstration is normally provided in a written format, such as an Accident or Incident Report, which provides information of the time, nature, and circumstances surrounding the incident. Depending on the nature of the accident/injury, after a clinical evaluation, the clinician provider produces information given to the employee and his/her employer regarding the nature of the injury, the degree of employee impairment, and any recommendations for modifications or adjustments to the employee's working locations and conditions to re-establish functionality (such as light duty work).[2] Workers' compensation wage replacement payments are generally provided at a rate below the employee's pre-injury wages and may be subject to limitations in terms of duration or maximum amount of benefit payments.[2]

Financial ramifications of injuries and the status of workers' compensation and medical provider challenges for the agricultural industry

Agricultural workers are at increased risk for work-related injury and death compared to other occupations. Data from the Bureau of Labor Statistics indicates that workers in the agriculture, forestry, fishing, and hunting industries had the highest fatality rate at 23.2/100,000 full-time equivalent (FTE) workers in 2016.[1] Overall work-related fatality rate was 3.6/100,000 FTE across all industries in the United States. That same year, there were 58,300 employer-reported cases of non-fatal injuries in the agriculture, forestry, fishing, and hunting industries.[11] Isolating data between these industries is difficult, as it is rarely collected in a consistent fashion. However, the true number of non-fatal injuries in agriculture is likely much higher than in the other industries due to variation in workers' compensation coverage, legal exemptions from Occupational Health and Safety Administration (OSHA) regulations for farms with few employees, and underreporting of agricultural workplace injuries and therefore an underestimation by using injury claims.[3,12]

Considerable variation exists in the legal requirements for workers' compensation in the agricultural industry, with only 12 states requiring full coverage for agriculture workers.[13] Depending on the state, employers may not be required to provide workers' compensation to their employees.[12,14] Farmers that are self-employed or run a family farm may not be eligible for workers' compensation, and of the farmers that do have a workers' compensation policy, their policy often does not cover family members and dependents.[3,15] Small family farms (less than $350,000 in annual gross cash farm income) comprised almost 90% of US farms in 2015. Furthermore, injuries and illnesses that occur on a family farm may or may not be covered by workers' compensation, because insurers require proof that the injury/illness happened as a result of work-related activities.[3,15] Part-time, seasonal, or migrant workers, particularly those that work for multiple farms, may also be excluded from receiving compensation benefits because they are not listed on an employer's payroll.[3,15] Finally, foreign-born, undocumented workers may tend to avoid applying for workers' compensation benefits for fear of job loss or deportation, or a poor understanding of claim processes and their own eligibility for coverage.[3,13,16] However, despite these counterexamples, formal exemptions to workers' compensation themselves are limited and hard to understand.[17] This indicates that there are substantial numbers of independent operations for which the technical details of the workers' compensation system are relevant.

Due to the inherent differences in farm size, activities, and workforce, it is difficult to assess the relative impact of lost productivity with respect to individual claims.[18,19] Some types of farm work (especially in crop agriculture) is highly variable and seasonal in nature; therefore, the number of workers employed by some farming operations will change throughout the year.[18] This fluctuation in workforce alone will alter the E-mods (described in the introduction), but there is another underlying component the E-mod does not account for regardless of industry – the relative contribution of each individual to the overall productivity of a company.[20] In companies where many workers are devoted to a particular task, temporarily losing a single employee may not significantly decrease overall productivity. If the company is small and/or if the employee has a specific skill set that cannot be easily covered by the remaining workers or temporarily replaced, then the loss of that employee may have a greater negative impact on overall productivity than the individual's lost wages.[20] Since agricultural work follows a set timetable, however, even the loss of one employee can have a detrimental impact on overall productivity.[18] This negative impact is felt even more acutely in family-run farms, where the uninjured family members not only tend to the injured family member, but also cover that individual's farming duties.[18]

McGwin and colleagues noted that injured agricultural workers in Alabama and Mississippi experienced many negative side-effects after injury, specifically complications and persistent problems related to the injury, decreased work hours, financial hardships due to lost wages and medical expenses, and decreased quality of life (i.e., personal and social activities).[21] These negative consequences of workplace injury can persist for years after the initial injury, and injured workers may have increased mortality as compared to their non-injured colleagues, despite many confounding variables that could alter this relationship.[22] In the case of agricultural-related fatalities, these negative effects on productivity and overall health and well-being are compounded for the remaining workers, and depending on the circumstances, the remaining individuals may choose to leave farming altogether which can, in turn, impose economic and social costs of individuals and/or communities.[23]

Agricultural employers face significant barriers to Return to Work/Light Duty Job Tasks. Owners that employ multiple workers often hire them for one dominant task (e.g., milker, pusher, or driver). Even with seasonal jobs, the entire day may be dedicated to one task (e.g., harvesting, planting, or calving in the beef industry). Many agricultural tasks are labor intensive and performed over long periods of time with little alterations in position.[24–26] These repetitive tasks are of particular concern in the dairy industry, where dairy workers maintain a certain position during milking due to the

engineering setup of the barn (i.e., parallel versus herringbone [Figure 1] versus rotary parlor systems in addition to the stanchion system used by many smaller farms [Figure 2]).[19,27–29] Such systems are useful for milking many cows but are not conducive to worker ergonomics, especially if the worker has sustained a repetitive stress injury related to milking procedures.[19] In these cases, injured workers may have to be temporarily or permanently re-assigned to new job duties or, at the very least, tag-team with another worker to reduce the amount of time that he/she is performing an ergonomically-difficult task. Proper communication of work restrictions and rehabilitation programs among the injured worker, his/her employer, and the healthcare providers treating the injured worker is of utmost importance to ensure the health and safety of the injured worker throughout the healing process and beyond.

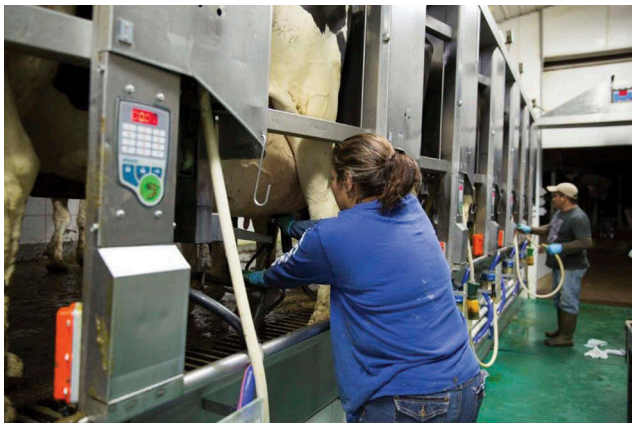

Figure 1. Farmworker milking dairy cows in a herringbone parlor.

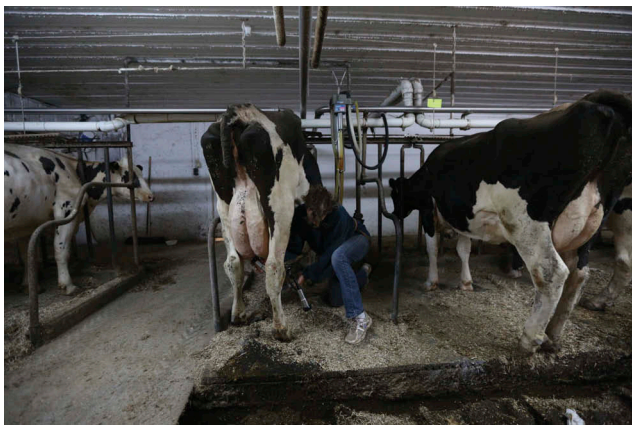

Figure 2. Farmworker milking dairy cows in a stanchion barn.

Healthcare providers play a multifaceted role in workers' compensation claims.[7,8] Providers evaluate claimants to confirm the injury/illness is occupationally related, diagnose and treat the injured worker, develop a timeline for work restrictions and modifications for the worker and his/her employer, and interact with the insurance company.[7,8] Unfortunately, many healthcare providers lack the time and training to adequately assess the workplace physical demands of injured workers and these may be beyond the scope of these providers' formal responsibilities, especially those in the agricultural sector where the capacity to work may be misinterpreted by medical professionals lacking information of worker duties and possible substitutions. As a consequence, workers are often told to stay at home until they fully recover or may do so out of their own misunderstandings of medical recommendations. This situation has many unintended negative consequences for the worker, the worker's family, their colleagues, and the farmer/owner, especially if the injury is severe enough to cause permanent impairment.[5–8]

Economic background pertaining to experience rating in the context of health and safety

Experience rating (ER) is a common system applied to private and social insurance systems worldwide. In the case of workers' compensation, ER is generally designed to create incentives for employers to reduce occupational health and safety risks in the workplace by being a function of injury outcomes realized by employers. Employers with more frequent and/or more severe claims to workers' compensation (regardless of who is at fault) have increases in insurance premiums via the ER mechanism, whereas those with less frequent and less severe claims see decreasing premiums (discounts) as a result. These patterns suggest that employers are economically incentivized to operationalize policy and programs that strive to reduce employee risk within their organization.

The general ER framework operates across industries and occupations and provides a mechanism

under which the insurer can offer differential prices depending on perceived risk factors. Mandates for workers' compensation effectively create a system of "community rating," since the mandates generate a larger pool of participants over which to smooth risk. The practice of ER should induce employers to reduce risk even if these reductions are financially costly, since premiums (which are also costly) are an increasing function of the ER factors associated with past claims and a function of expected future claims. In the context of health and safety, the prediction would be that workplace safety investments (and ultimately outcomes in terms of claims) would be an increasing function of the degree of link between past claims and premium values. A reduction in claims in this context is financially helpful to the insurer but has the greater impact of being related to increases in social value associated with a healthy workforce.

Meta-analyses of ER in the broader literature find mixed evidence as to whether economic benefits of ER insurance practice exceed economic costs associated with complicated administration, but provide general support for positive associations between ER and health and safety outcomes.[30,31] Case studies, for example, confirm that ER works through premiums to incentivize employers to decrease injuries by increasing safety practices.[32] Removal of ER features is associated with increased claims and decreased outflow from disability insurance,[33] and ER increases are related to decreases in both time loss and various medical claims, suggesting that learning about ER may be imperfect especially when details of ER are complex.[34] Furthermore, authors have found that the effect of wage replacement increases on injuries decreases in the extent of ER (which tends to increase with firm size),[35] that increased ER is associated with claims of shorter duration,[36] and that interrelationships with other programs such as unemployment insurance, health insurance, and sick leave policies may be important considerations for understanding complete impacts of workers' compensation programs.[37]

Few reports exist about ER as an economic policy applied to agriculture. Rautiainen et al.[38] provide a case study of agriculture in Finland. There, the authors found the introduction of a workers' compensation premium discount program was associated with decreases in injury claims across several categories of severity. However, institutional details in this international context may differ from those in the United States. Other literature on agricultural labor and workers' compensation focuses on summaries of claims without details regarding experience modification.[15,19]

E-mod calculators

Many factors influence the total monetary amount received by an injured employee. The following section will define terminology used by insurers and individuals who specialize in workers' compensation. Insurance companies group claims by industry, business size (determined by the total number of employees on the employer's payroll), and nature of the compensation, such as medical costs, lost wages, etc.[39] Industry classification codes differ by state and do not always take into account occupational variations within a company.[39]

Claim activity has an effect on premiums faced by employers through a numerical value E-Mod.[39] The E-Mod is a function of the actual employer cost for claims relative to the anticipated cost of a claim in employer's industry and takes into account the total number and costs of claims (i.e., severity) submitted by a particular employer over a set period of time (the rating period).[39] The total number of claims submitted (injury frequency) has a greater impact on E-mods than the total cost of these claims (injury severity), because injury frequency is on average correlated with the success (or failure) of company occupational health safety policies.[40]

Depending on the structure of the workers' compensation system, an individual company's premiums may be adjusted at the beginning (prospective) or end (retrospective) of the fiscal year as defined by the insurance company.[41] Prospective adjustments to the E-mod alter the premium cost for an individual company throughout the current year based on the number and cost of claims over previous year(s) and do not account for variations in the number and cost of claims over the current year. Retrospective adjustments to the E-Mod alter the premium cost (i.e., discounts and surcharges) for an individual company based on the number and cost of claims over the current year and are less dependent on historical trends in the number

and cost of claims.[41] Tompa and colleagues determined that both program structures provide employers with incentives to reduce work-related injuries, but note that retrospective adjustments to a company's compensation cost (premium) tend to produce more immediate effects in reducing claims outcomes than prospective adjustments.[34,41] In contrast, prospective adjustments to a company compensation premiums correlate with decreases in claims outcomes over a longer period of time than retrospective adjustments; therefore, prospective and retrospective E-mod adjustments utilize different approaches (immediate return versus long-term gain) to incentivize companies to reduce worker injury.[41] By altering premium rates based on current or historical trends in workplace claims at the company level, workers' compensation insurance attempts to "level the playing field" between large and small companies with respect to workers' compensation costs within various industries.

Since the E-Mod is adjusted based on the number of claims received as well as the type of claim, companies can artificially decrease their yearly premiums by underreporting the number of injuries they have per year or only focus on reducing the incidence of high-cost injuries.[3,14,18,31] If employers minimize their own premiums as an economic goal, then they may strategically choose between these possible responses by aiming to decrease the number of claims first, as frequent losses are more heavily weighted in the E-mod calculation. In some cases, the underreporting is unintentional or is a function of employee behavior. Employees, particularly those from outside the United States for example, may not understand workers' compensation laws or may choose not to report a work-related injury because they fear reprisal or losing their job.[3,18] At other times, the underreporting is more intentional on the part of the employer. Companies that wish to decrease their insurance premiums may coerce their injured employees into remaining silent, may willfully neglect to submit claims, only submit low-cost claims, or contest the injured employee's claim to compensation benefits.[3,14,18] Employers may also selectively target workplace safety efforts to reduce high-cost claims and neglect to address persistent health and safety issues such as repetitive stress injuries.[31,34] Such employer practices produce initial gains in terms of reduced claims but can be ineffective and detrimental over time for the company, company employees, and society as a whole.[3,18,31] On the other hand, employees or employers may err in the other direction, where return to work may happen later than what is optimal either from a personal standpoint or a social one. For example, employees that do submit claims may feel pressured to return to work too early or risk losing wages.[6] This may be due to the complexity of formulas and of the system as a whole, due to unclear state-to-state differences in practice and policy, or due to the lack of a formal return to work program by agricultural businesses. Enhanced informational resources, therefore, may better allow employers and employees to determine their own best responses in terms of choosing appropriate levels of workers' compensation. This is particularly relevant when farm sizes and other individual circumstances differ.

The outlined complexities above indicate that variations in factors affecting insurance premiums faced by agricultural producers vary drastically across state lines and according to claim severities and farm sizes. We therefore conduct comparative analysis of workers' compensation formulations in what follows.

Methods

We explored the E-Mod calculators for two upper Midwest states, Minnesota and Wisconsin. Access to the Minnesota calculator was public, while a research request granted access to the Wisconsin calculator. We carefully examined both formulas and conducted sensitivity analysis using cases of farms with 100,000, $200,000, and $1 million payrolls. We compared E-Mod values under a variety of claim sizes for both the cases of medical only claims and medical claims coupled with indemnity claims. We highlighted the complexities of the formulas and argued that this complexity greatly limits the ability for employers (and employees) to choose return to work policies optimally.

Results

Comparative analysis of E-mod formulas

Workers' compensation practices vary across states. Employers in non-federal establishments purchase

workers' compensation insurance either from a state-specific plan, or from a private insurance company.[42] Some employers (with the exceptions of employers in North Dakota or Wyoming) also may have the option to self-insure. State-specific funds may be exclusive (4 states) or competitive (18 states).[43] In the case of competitive funds, the state fund is allowed to compete in the market with private insurers. Other states have private insurance as the method of workers compensation delivery though insurance plans are highly regulated. This applies to each of the upper Midwest states (Wisconsin, Iowa, Minnesota, and Illinois).

Of interest in this paper, the Wisconsin Compensation Rating Bureau (WCRB) determines classification of employers and their rates in Wisconsin, and the Minnesota Workers' Compensation Insurers Association, Inc. (MWCIA) does the same for Minnesota. Other Upper Midwest states use the National Council on Compensation Insurance (NCCI) as their licensed rating and statistical organization. WCRB and MWCIA provide details about workers' compensation implementation, which we used in this analysis.

The E-Mod for all risks in Wisconsin is determined from a formula reported by the WCRB[34]

$$\frac{\left(\begin{matrix}Actual\ Primary\\ Losses\end{matrix}\right)+\left(\begin{matrix}Weighting\ Value\ Times\\ Actual\ Excess\ Losses\end{matrix}\right)+\left(\begin{matrix}(1\ Minus\ Weighting\ Value)\ Times\\ Expected\ Excess\ Losses\end{matrix}\right)+(Ballast\ Value)}{(Expected\ Primary\ Losses)+\left(\begin{matrix}Weighting\ Value\\ Times\\ Expected\ Excess\ Losses\end{matrix}\right)+\left(\begin{matrix}(1\ Minus\ Weighting\ Value)\\ Times\\ Expected\ Excess\ Losses\end{matrix}\right)+(Ballast\ Value)} \quad (1)$$

Simplifying the denominator, we can rewrite the formula as:

$$\frac{\left(\begin{matrix}Actual\ Primary\\ Losses\end{matrix}\right)+\left(\begin{matrix}Weighting\ Value\ Times\\ Actual\ Excess\ Losses\end{matrix}\right)+\left(\begin{matrix}(1\ Minus\ Weighting\ Value)\ Times\\ Expected\ Excess\ Losses\end{matrix}\right)+(Ballast\ Value)}{(Expected\ Primary\ Losses)+(\ Expected\ Excess\ Losses\ )+(Ballast\ Value)} \quad (2)$$

In a practical sense, the E-Mod is calculated by dividing the numerator by the denominator in Equation (2) and rounding to two decimal places. The formula is visibly complex with several variable factors. While an experienced human resource officer may have the opportunity to become intimately familiar with the meaning of the variables in this formula it is unlikely that many individual farmers in the state, especially those in smaller operations, whose responsibilities are comprehensive will have the time to decipher how health and safety practices translate into claims which translate into their E-Mods and ultimately their workers' compensation premiums.

Examination of the formula makes it clear that there are limited ways in which an individual can influence the E-Mod, despite how critical the E-Mod is in determining premiums. An individual farmer might have some influence over two elements of the numerator of Equation (2). Specifically, these are the actual losses. For each loss, there is a "split point value" that determines what is considered primary and what is considered excess, where the sum of primary plus excess is the total actual incurred loss. Values less than or equal to the split point value count in the primary category. The split point at the time of the drafting of this article (starting October 1, 2016) was $16,000 (WCRB Circular).[44] This value changes over time, and a farmer would need to frequently check for updates from WCRB to internalize this value to his or her decision-making. Instituting safety precautions can decrease the probability of a loss greater than the split point (and/or any loss), but is unlikely to reduce this probability to zero. The incentive to invest in increased safety from an economic efficiency perspective should be a function of the formula parameters, though uncertainty regarding the workings of the formula likely precludes this.

In addition to the complexity about the split point, medical-only claims are treated differently than those claims with both medical and indemnity payments. In the medical case, excess loss is subject to a 70% reduction and, therefore, has a substantially lower impact on the E-Mod than does indemnity.[44] In most cases the experience rating aspect is based on a 3-year period; therefore, farmers should be aware that recorded claim activity will affect workers' compensation premiums for this extended time period.

The numerator of the E-Mod calculation also includes one of the expected value terms associated with the particular classification for the job as well as weighting and ballast value parameters. Expected primary losses equal "expected losses" times the "discount ratio," where expected losses are specific to each classification group. For this study, the focus was on the classification that corresponds to "farm products" in Wisconsin. The calculation for this item is based on the expected loss rate (ELR) times payroll divided by $100. The ELR is published as part of the WCRB annual rate revision circular. For farm products, ELR was 2.13 as of October 1, 2016. Total expected losses for the risk are obtained by adding the expected losses for each classification. This value is then multiplied by the discount ratio, which is also published by the WCRB in the annual rate revision circular (published as the "D-Ratio"). For farm products, the D-Ratio was 0.36 as of October 1, 2016. Expected Excess Losses are the difference between expected losses and expected primary losses, as defined above. Individual farmers cannot strategically influence these rates alone, as they are functions of claims activity in these groups overall and are set by the Rating Bureau.

The weighting value in the numerator is designed to increase as expected losses increase and therefore to put more weight on excess losses in the E-Mod factor calculation. The "Ballast Value" in the denominator is designed to decrease the effect of a single claim on the E-Mod factor.[45] Neither of these values is specific to the class group. Rather, they are applied based on claim values only across groups. The WCRB publishes both of these values annually in their circular. These parameters are functions of claims activity overall and are not specific to agriculture, so there are few channels of influence on these factors by individual farmers.

Following these base calculations, there are some other adjustments to the E-Mod for special circumstances, but these generally seem to be exceptions as opposed to common practice. Exceptions relate to intrastate and interstate considerations, variations in the experience period length, limitations associated with losses counted in a rating such as those associated with multiple claimants in an accident, and other limitations or special circumstances beyond the scope of this paper.

Review of the Wisconsin formula indicates that actual losses effectively represent the *only* area that an individual farmer could adjust on his or her own. Adjustment mechanisms theoretically could be to adopt safer workplace practices to decrease the probability of an event and/or the magnitude of the loss in case an event occurs. Another adjustment could be to alter production inputs overall (e.g., the balance between capital and labor in the production process). Although we can envision an internal cost-benefit analysis focused on achieving optimality through insurance, it is highly unlikely that individual farmers (or others) understand the details of the E-Mod calculation and how it translates into workers' compensation insurance premiums. Therefore, there is likely a high degree of mismatch between practical experience and what might be considered optimal from an economic perspective. This could be substantial in terms of economic efficiency.

The E-Mod formula used in Minnesota is found equivalent to (2) above with the exception of labeling (MWCIA, 2008).[45] For Minnesota, the E-Mod is determined by the following equation:

$$\frac{\left(\begin{array}{c}\textit{Weighting Value Times}\\ \textit{Actual Incurred Losses}\end{array}\right)+\left(\begin{array}{c}(1\ \textit{Minus Weighting Value})\ \textit{Times}\\ (\textit{Actual Primary Losses Plus Expected Losses Minus Expected Primary Losses})\end{array}\right)+(\textit{Ballast Value})}{(\textit{Expected Losses})+(\textit{Ballast Value})} \quad (3)$$

Or, equivalently:

$$\frac{\left(\begin{array}{c}\text{Weighting Value}\\ \text{Times}\\ \text{Actual Incurred Losses}\end{array}\right)+\left(\begin{array}{c}(1\text{Minus Weighting Value}) \text{ Times}\\ (\text{Actual Primary Losses})\end{array}\right)+\left(\begin{array}{c}(1 \text{ Minus Weighting Value})\\ \text{Times}\\ (\text{Expected Losses Minus Expected Primary Losses})\end{array}\right)+\left(\begin{array}{c}\text{Ballast}\\ \text{Value}\end{array}\right)}{\left(\begin{array}{c}\text{Expected}\\ \text{Losses}\end{array}\right)+\left(\begin{array}{c}\text{Ballast}\\ \text{Value}\end{array}\right)} \quad (4)$$

Assuming that "expected primary losses" plus "expected excess losses" in Wisconsin is the same concept as "expected losses" in Minnesota, then the denominator across the two formulas is the same. The numerator is also the same if "Actual Incurred Losses" in Minnesota equals "Actual Primary Losses" in Minnesota plus the equivalent to the concept of "Actual Excess Losses" in Wisconsin. Although these equivalencies are not formally stated, descriptions of the variables suggest they are based on the same underlying concepts. Actual Incurred Losses in Minnesota are those ultimately reported. MCWIA[45] reports that in Minnesota, "expected losses" are the multiplication of payroll divided by $100 times the ELR, which is determined as part of the Pure Premium Base Rate Schedule in the current Minnesota Ratemaking Report. This document, however, was not publicly available. "Total expected losses" come from adding up all expected losses for each classification that matches an employers and rounding to the nearest whole number. As in Wisconsin, these expected values are determined as a baseline to compare employers to expected levels within classification for the state. The Discount Ratio, or D-Ratio, is also reported in the Pure Premium Base Rate Schedule in the current Minnesota Ratemaking Report, which also was not available via public access. Finally, "expected primary losses" are the multiplication of the D-Ratio and expected losses, rounded to the nearest whole number.[45] The weighting value increases with expected losses and was reported to vary between 0.04 and 0.8 in the 2008 manual, which was the most recent available. Finally, the Ballast value increases with expected losses. Both of these values are updated in a confidential report that was not available to us.

Like in Wisconsin, medical-only claims are reduced by 70%. Actual primary losses are the part of this calculation used at full-value in the E-Mod calculation, and the distinction between the two concepts is based on how actual primary losses are capped at a maximum (in 2008, this was $16,250 in Minnesota). This is effectively what was described as the switch point for the Wisconsin case, though reported for a different year due to information availability differences between states. As in Wisconsin, there are various additional adjustments for multi-state operations and other exception factors that are beyond the scope of this paper.

Numerical illustrations

The Wisconsin and Minnesota calculations are effectively different in practice due to the parameter values and other calculation that are set by the respective boards. WCRB has an E-Mod calculator online, for which we received research access.[1] With the calculator, we were able to perform example calculations for illustration purposes regarding factors influencing the E-Mod rates experienced by farmers in the state. We focused on the farm products class code.

Table 1 presents E-Mod factors generated by the WCRB calculator for farms of payroll size $100,000, $200,000, and $1 million. In each case, several loss scenarios are considered. Particularly, the categories are no loss, $5,000 medical-only loss, $10,000 medical-only loss, $20,000 medical-only loss, $50,000 medical-only loss, and $100,000 medical-only loss. These are followed by losses in enumerations with the assumption that the total is medical plus indemnity, as opposed to medical alone. The calculations were done using pre-October 1, 2016 formula values.

The results show, for example, that a $10,000 medical-only claim for a farm with a current payroll of

Table 1. Sensitivity of E-mod to claim size and characteristics, Wisconsin.

		Medical only					Medical plus indemnity				
Payroll	No loss	$5,000	$10,000	$20,000	$50,000	$100,000	$5,000	$10,000	$20,000	$50,000	$100,000
$100,000	0.97	1.03	1.09	1.17	1.18	1.2	1.18	1.2†	1.2†	1.2†	1.2†
$200,000	0.94	0.99	1.05	1.12	1.14	1.17	1.13	1.3†	1.3†	1.3†	1.3†
$1,000,000	0.8	0.84	0.87	0.91	0.93	0.96	0.92	1.03	1.17	1.22	1.32

†Cases where the E-Mod was generated by the alternate "limited" formula, which is designed to limit the effect of claims on the E-Mod of smaller payroll establishments.

Source: WCRB Experience Modification Calculation and author's calculations. (https://www.wcrb.org/WCRB/Membership/ExpModCalc/ModCalc.aspx)

$100,000 would lead to an E-Mod of 1.09. This would also be true if this same farm experienced two $5,000 claims (or four $2,500 claims). This is not true, however, when multiple small claims compare to one equivalent size larger claim, but the larger claim falls above the "switch-point" in the E-Mod formula. For example, one $20,000 medical-only claim for a -$1 million payroll farm leads to an E-Mod of 0.91 in the table, but four $5,000 medical-only claims for this same farm would lead to an E-Mod of 0.94. In this case, the firm would be penalized in the form of a higher E-Mod for repeat claims, yet for these smaller scope claims the E-Mod remains below one. Mathematically, this pattern is due to the switch point value acting as a cap on the excess loss.

Employers with no claims are assessed E-Mods less than one and given a credit towards their premium. This credit increases with payroll, as indicated in Table 1. An E-Mod equal to one corresponds to the case that actual losses equal expected losses by the rating bureau's calculations. In those cases, there is no premium adjustment. E-Mods that exceed 1 result in additional premium. Since the formula translating E-Mods into premiums vary across insurers, we are unable to extend the numerical simulation to the monetary terms most relevant to the insured.

Table 2 shows the sensitivity of the E-Mod calculation to claim size and characteristics for Minnesota by reproducing this exercise as it was done for Wisconsin in Table 1. The table utilizes the public use calculator on the MWCIA website. Unlike the Wisconsin calculator, which requires a login and was available only as a research account, Minnesota's calculator is publicly available. Although the values entered in the formula are hidden from the research view, the calculator provides the results of several sample calculations. Despite the differences in parameter values and the switch point value, the results for ultimate E-Mod are highly similar across Wisconsin and Minnesota. Overall, the E-Mod formula is only one of the many factors determining premiums and is only a factor for farms that meet eligibility requirements for experience rating. Given that we are unable to provide monetization of these differences ourselves in this paper, this provides further suggestion that the probability that individual farmers would interpret the program's institutional details and their relationships to premiums is low, and the likelihood that return to work is carried out in an optimal way on US farms is likewise low. Furthermore, we find that indirect costs of time loss that are not accounted for by the existing formulas (e.g., worker replacement, decreased productivity, stress on remaining workforce) and the potential for cascading injuries from an overworked workforce may also be substantial and may contribute to non-optimal patterns of return to work which can negatively affect both farm employers and employees.

Table 2. Sensitivity of E-mod to claim size and characteristics, Minnesota.

		Medical only					Medical plus indemnity				
Payroll	No loss	$5,000	$10,000	$20,000	$50,000	$100,000	$5,000	$10,000	$20,000	$50,000	$100,000
$100,000	0.96	1.03	1.09	1.17	1.19	1.2	1.17	1.2†	1.2†	1.2†	1.2†
$200,000	0.93	0.99	1.05	1.12	1.14	1.17	1.13	1.29†	1.29†	1.29†	1.29†
$1,000,000	0.78	0.82	0.86	0.9	0.92	0.95	0.9	1.02	1.17	1.23	1.33

†Cases where the E-Mod was generated by the alternate "limited" formula, which is designed to limit the effect of claims on the E-Mod of smaller payroll establishments.

Source: MWCIA Minnesota Experience Modification Calculator and author's calculations. (http://www.mwcia.org/ModCalculator/ModCalculatorSetup.aspx)

Discussion

To address the lack of physician knowledge regarding agricultural work and to facilitate the acceptance of light duty work recommendations for injured agricultural workers, a team at the National Farm Medicine Center focused on rural health informatics developed a device-agnostic, web-based application "Safe Return to Work" (http://safereturntowork.org/). This software application was designed to deliver information in four categories and engage the three main groups of individuals involved in managing an occupational injury in agricultural workers: Assessment (physicians, agricultural workers, and employers); Work Guidelines (physicians, agricultural workers, and employers); Learn More (all users); and Calculator (agricultural employers). The Assessment tool was developed and tested with physician input. The Work Guidelines efforts shifted to provide general information about the high-risk tasks that face agricultural workers on the job. The Learn More page informs users about the system, and points them to additional resources available on NFMC and UMASH websites.

The Calculator tool was put on hold after the thorough assessment reported within this paper was conducted. The team's analysis of formulas and existing calculators identified several significant barriers: 1) complexity of the formulas, 2) variation between states and between insurers, 3) difficulties obtaining access to information, and 4) the challenge of staying current with future updates to formulas. These hurdles were all reasons to halt development on such a tool, though it was determined that some commercial software packages may help fill informational gaps and therefore assist producers in avoiding the economic consequences of a poor long-term injury prevention record. While some software packages may be currently priced in a way prohibitive to some small family farms, larger farms and employers may have more readily accessible access to these packages and to any needed training to use them.

Worker compensation expenses represent a substantial cost to employers in high-risk industries such as farming. With progressive consolidation of the nation's family farms to larger corporate and industrial farms with sizeable workforces, farmer-employers are facing increasingly complex managerial challenges which directly affect profitability. Many do not benefit from the services of a professional human resources department and having themselves only recently emerged from single operators to larger scale employers. More informed management of injured workers represents a potential for substantial cost recovery and loss control. Farmer-employers would greatly benefit from guidance on how to contain these worker compensation costs. Evidence presented in this paper shows a need for readily available, comprehensive, and comprehendible information regarding the financial ramifications of worker injuries on farm and ranch owners in the case study region of the Upper Midwest and more broadly in the United States as a whole. This project also highlighted the many complexities one would face in attempting to develop a tool to automate workers' compensation information delivery to farmers and ranchers. Farmer interviews before during, and after this five-year project further emphasized the need, and topic interest. Detailed findings from those interviews are discussed in a different manuscript.[46]

Additional research is needed to further assess farmer and rancher knowledge and appreciation of the topic and to test different methods of delivering complex and quickly changing information through the intricacy of workers' compensation data discussed above. Additionally, future implementation and dissemination research should explore partnerships with workers' compensation insurers to open opportunities for collaborative programming and educational outreach by experts trained it these methodologies. Insurers often offer services including loss control consultations, analyses, and tutorials (sometimes including access to commercial software) to help clients understand the impact of losses. Further understanding the role of the insurer and how these practices affect the decisions of the insured is left for future research. Stakeholder-engaged research should also explore worker injury prevention financial impact as a prelude to targeted safety intervention applications in agriculture. Coupled with the existence of commercial software options, these approaches have potential to help fill informational needs of agricultural employers and improve occupational injury prevention in the Upper Midwest and beyond.

Note

1. Some online E-Mod calculators are available online publicly. For example, a California-specific calculator is available at: https://www.wcirb.com/estimator.

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Author contributions

All authors participated in the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; drafting the work and revising it critically for important intellectual content; final approval of the version to be submitted/published; and all agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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