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Older Farmers: What's New With Certified Safe Farm

Michelle L Umbarger-Mackey PhDc, MSN, RN ¹

Kelley J. Donham DVM, MS, DACVPM ^{2,3}

Risto Rautiainen PhD ^{2,3}

Aaron Kline BA ^{2,3}

[1] University of Iowa College of Nursing

[2] University of Iowa College of Public Health

[3] Institute for Rural and Environmental Health

Abstract

The purpose of this paper is to discuss two current innovations of the Certified Safe Farm (CSF) program. The CSF is a program designed to improve the health and safety of farmers and their families. First, the most recent development from the CSF research team is the addition of a research project to specifically address the at-risk population of older farmers; *Certified Safe Farm: Improving the Health and Safety of Older Iowa Farmers*. Within this project, the CSF program has been refined so that the special needs of aging farmers may be addressed. Second, another research project on the CSF horizon is a retrospective cohort study to explore the association between medication use and agricultural injury among older farmers; *Older Farmers: Medication Use and Risk for Agricultural Injury*. This study will analyze existing data from the original CSF study that was prospectively collected from September of 1999 through August of 2003 and addresses the following specific aims: 1) describe and compare agricultural injuries that are prevalent for older vs. younger CSF farmers; 2) describe and compare medication use of older vs. younger CSF farmers; 3) identify and describe potential confounders, and include them in the multivariate models evaluating the association between medication usage and agricultural injury; and 4) examine the association/relationship between medication usage and agricultural injury. Progress on these two projects will be discussed.

ODLER FARMERS: WHAT'S NEW WITH CERTIFIED SAFE FARM

Introduction

The Certified Safe Farm (CSF) is an innovative incentive-based intervention program to reduce farm-related injuries, illness, and fatalities. Since its inception in 1996, it has been expanded and evaluated in a series of research projects. The CSF research team continually explores new ways to improve and diversify this important agricultural intervention program. The purpose of this paper is to discuss two current innovations of the Certified Safe Farm program. First, this paper will explore how the CSF program has evolved to meet the needs of a population of aging farmers in Iowa. Second, this paper will describe a new effort to study the association of medication use and injury among the older farmer population.

CSF Background

In 1996, Iowa's Center for Agricultural Safety and Health (I-CASH) developed the Certified Safe Farm, an innovative incentive-based intervention program to reduce farm-related injuries, illness, and fatalities. This program evolved from previous programs, including the Swine Respiratory Disease Prevention program (Donham, 1990; Ferguson, Gjerde et al., 1989; Gjerde, Ferguson et al., 1991) and the AgriSafe Network (Gay, Donham et al., 1990). CSF incorporates a clinical occupational health and wellness screening, occupational health and wellness promotion, occupational health education, and an on-farm safety review where a score of 85% is required for certification of the farm. The long term goal of the program is to reduce occupational illnesses and injuries in farmers and farm workers and to create value to the farm operation and insurance and farm input agribusinesses through lowered claims and preservation of human resources. The details of the program have been described elsewhere (Donham & Thelin, 2006; Rautiainen, Lange et al., 2004; Schneiders, Donham et al., 2001; Thu, Pies et al.,

1998; Von Essen, Thu et al., 1997). The need for effective and sustainable prevention programs in farming has been recognized for many years (Donham, 1989) However, published reports of successful and sustainable preventive programs are very rare. Multifaceted, incentive-driven programs appear to provide the best chance for sustainability (DeRoo & Rautiainen, 2000; Donham & Thelin, 2006; Scharf, Kidd et al., 1998). The CSF is a multi-faceted, incentive driven program which has shown great promise and continues to evolve to meet the needs of the farmers it serves.

Preliminary studies show that CSF is well accepted by farmers, feasible to deliver, and effective in reducing farm-related injury and illness costs. The total combined costs (out-of-pocket + insurance costs) of occupational illness and injuries were 27% lower among intervention farmers compared to control farmers. Those costs covered by insurance were reduced by as much as (45%) per person per year. Seven hundred eighty-seven occupational health screenings and 751 on-farm safety reviews were performed during the original CSF program. During the five project years, a total of 1,292 on-farm safety improvements were reported, at an estimated total value of \$69,000 (\$130 per farm per year). Safety scores improved over the years, from 82% passing in project year one, to a passing rate of 97% in project year five. Within the cohort of intervention farmers, annual occupational injury and illness cost savings were directly associated with the farm safety scores as determined from the on-farm safety reviews. Self-reported health care costs were \$237 per farmer in the safest farms (those farms scoring in the highest tertile) vs. \$485 per farmer in the least safe farms (those farms scoring in the lowest tertile). Past CSF supporters include Iowa Pork Producers Council, National Pork Producers Council, Pioneer Hi-Bred International, Inc., Monsanto, Iowa Farm Bureau, and Wellmark Foundation.

One current evolution of the CSF program is a research study currently in progress to address the specific safety and health needs of older farmers in Iowa. How this study has evolved from the original CSF study will be discussed.

***CERTIFIED SAFE FARM: IMPROVING THE HEALTH AND SAFETY OF OLDER
IOWA FARMERS***

The goal of this project is to translate the Certified Safe Farm to specifically address farm hazards of an at-risk special population: elderly farmers. Through this voluntary CSF program, we aim to reduce the number and the cost (physical, financial, emotional, and social) of injuries and illnesses to older farmers (\geq age 60) in the United States. CSF was initiated in 1996 and has grown through public and private sector investments into a well-recognized prevention model with potential to become widely implemented in the farming community. The current CSF program is applicable to the general farming community. However, due to age-related changes, elderly farmers are at increased risk for injuries on the farm. Through this project, we will design, test, and evaluate a more refined and specific CSF program that meets the needs of farmers age 60 and older.

Evaluation of the original study has indicated the need to expand the program to include older farmers. The original CSF research study focused primarily on providing health and safety services to the principal farm operator, which in most cases excludes the older farmer who also works on the farm. Translation of the CSF program to meet the special needs of older farmers is expected to positively impact their health and safety. Through this two year translation project we refined the CSF program so that it can be used as a model service program throughout the

nation. The CSF program includes an on-farm safety review with performance standards, a clinical screening, and individual and group education.

Through this program, Iowa farmers aged 60 and older are recruited to receive CSF services. In addition, Iowa Easter Seals Rural Solutions, which is affiliated with Iowa AgrAbility, will provide collaboration and will visit the farms of those with disabilities to provide recommendations for occupational rehabilitation and assistive technology. This will help the farmers continue their work on the farm, while reducing their risk of injury. Iowa Easter Seals and Area Agencies on Aging (AAA) will provide services which will complement the CSF program and strengthen the ability to provide the program to older farmers.

The main research questions addressed in this project include:

- What are the primary occupational health and safety hazards for older Iowa farmers?
- How can the CSF program be translated to more thoroughly address the agricultural health and safety needs of older farmers?
- Can a CSF program tailored to older farmers successfully engage them in the process of improving health and safety on the farm?

Modifications to the CSF: Occupational Health Clinical Screening

The occupational health clinical screening is designed to address health risks from agricultural exposures, and is conducted by a trained and certified nurse at an AgriSafe Network clinic. The nurses complete our 40-hour Agricultural Occupational Health Training program and are certified by examination (Donham & Venzke, 1997). The CSF research team has refined the original CSF health screening to better address the health and safety issues that may affect older farmers. The nurses were also educated regarding what issues need to be emphasized for older farmers during the screening and the education of the older farmers. Modifications to the occupational health screening can be found in Table 1.

During the health screening at the AgriSafe clinic, farmers are assessed to determine whether they should be referred to the Easter Seals Rural Solutions program for services. Rural Solutions program staff conducts onsite visit(s) to address the psychological and technological needs of farm families affected by a disability. On-site home modification and agricultural worksite consultations promote the safe adaptation of agricultural technology to decrease the risk of injuries and increase independence for the affected older farmer. A Mobile Rural Assistive Technology Unit allows Rural Solutions to construct modifications on-site. The services provided by Rural Solutions include adaptive equipment, home and farm modifications, and equipment loans.

Following the exam, the health care provider reviews the results with the farmer. Guidelines based on test results will indicate appropriate action. A summary sheet (Health & Safety Goals Sheet, see appendix A) is prepared and shared with the farmer and will include specific recommendations and goals. The farmer participates in the process of selecting his/her health and safety goals. Recommendations may include use of personal protective equipment, or referral to a weight loss program or a health specialist. As part of this outreach, we will contact the farmers at least once yearly to check on the progress toward their occupational and wellness goals. The occupational health services will not replace physical exams provided by primary care doctors. Rather, these services are complementary to regular exams.

Modifications to the CSF: On-Farm Safety Review

The on-farm safety review is performed by a farm safety consultant twice during the project period. The consultants were trained in a two-day workshop by The University of Iowa staff and tested for comprehension prior to being certificated. The CSF farm reviewer uses the CSF farm safety review checklist and an additional sheet that explains areas to emphasize for the

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health and safety of older farmers. Please see Table 2 for a complete list of farm review items highlighted for older farmers. Farm reviewers were well-informed on items to highlight when completing a farm safety review with an older farmer as well as the reasoning behind why these areas are important in the aging farmer population. These modifications may include engineering controls for slips and falls and animal-related injuries. This comprehensive safety review also addresses safety issues related to structures, machinery, equipment, chemical handling and livestock. The farm must receive an overall score of 85% to pass the farm review. After the review, the farmer receives a summary statement with recommended improvements.

We provide the farm operators with program information and a summary sheet on areas that the auditor will be reviewing prior to the on-farm safety review, which gives them time to make modifications prior to the review. We have found that this enhances the probability of the farm becoming certified. Following the farm safety review, all farmers receive the on-farm safety review booklet that has all areas needing modification highlighted. A corrective action sheet is also given to the farmer so that they may record what changes they have made to reduce farm hazards. The farmer is given three months time to make the recommended corrective actions. A total farm safety score of 85% or higher is one component of becoming a “Certified Safe Farm,” although certification requires that the farmer also completes the occupational health screening and health and wellness education. All farmers are encouraged to make safety improvements throughout the duration of the program.

The Area Agencies on Aging (AAA) has been invited to be a resource for CSF because their trained and experienced staff is well-equipped to provide services to older adults. They are also a source of referrals by promoting the program among farmers in their area. In the initial

planning stages, they participated in local level CSF meetings to assure that AgriSafe staff were informed about their resources and the special needs of older adults.

Conclusions

As a result of participation in the CSF program, study participants may have a safer on-farm working environment, helping the older farmer to continue working on the farm. Data analysis as not yet started. They will receive a free health screening specifically tailored to detect high risk problems associated with farm work, and they will receive agricultural health and safety educational materials suited to their individual farm operation. Participating farmers may be at lower risk for occupational injuries and occupationally-related diseases. Occupational health researchers may benefit by learning key farm hazards for older farmers, thus effectively devising engineering controls that reduce risks to older farmers.

Another study has evolved from the CSF program; it will examine the relationship between taking medication and risk for agricultural injury. This study will use data already collected from the 1999-2003 CSF study to describe and compare injuries and medication use between younger and older CSF farmers.

OLDER FARMERS MEDICATION USE AND RISK FOR INJURY

The hazards of agriculture are well established, making agriculture one of the most dangerous occupations in the United States (Frank, McKnight et al., 2004; McCurdy & Carroll, 2000; NSC, 2004; U.S. Department of Labor, 2003). In 2005, agriculture had the highest occupational fatality rate in the United States with 32.5 fatalities per 100,000 workers; this is a 23% increase from 2004 (CFOI, 2006).

The United States' population is experiencing a significant demographic shift which has resulted in a larger proportion of older individuals in the population. In 2002, there were an estimated 35.6 million people aged 65 and older; and by the year 2030, this older population is expected to more than double and reach an estimated 71.5 million (Aging, 2003). This noteworthy trend in aging has also been prominent in the agricultural sector in the United States (US). Among all occupations in the US in 1998, farming had the highest percentage (68.5%) of workers over the age of 45, which is more than twice the average for all employees in the US combined (33.7%) (Statistics, 2000). The National Agricultural Statistics Service (NASS) reported that 50% of farmers were over the age of 55 in 2002 (USDA, 2002). The National Safety Council found that farmers over the age of 75 had a death rate of 57 per 100,000 making them more than twice as likely to die while farming than younger farmers (NSC, 2003).

Previous studies have established risk factors associated with agricultural injury, such as: livestock (Browning, Truszczynska et al., 1998), hearing difficulties (Browning et al., 1998; Hwang, Gomez et al., 2000; Sprince, Zwerling et al., 2003), use of hearing aid (Sprince et al., 2003) and current/regular medication use (Sprince et al., 2003; Xiang, Stallones et al., 1999). Yet there is a gap in knowledge about how medication use affects an older farmer's safety while farming. There have been studies that found regular medication use or current medication use as a risk factor for agricultural injury, but there have only been a few studies that have examined the use of specific classes of medications as a risk factor for agricultural injury (Pickett, Chipman et al., 1996; Voaklander, Kelly et al., 2006).

The purpose of this study is to conduct a secondary data analysis of the CSF data with the focus of examining the association between the use of specific medications and agricultural

injury in older farmers. This research will address the following hypothesis and its respective specific aims:

Hypothesis: Medication use is associated with agricultural injury among older farmers. *Specific*

Aims related to this hypothesis are to:

1. describe and compare agricultural injuries that are prevalent for older vs. younger CSF farmers;
2. describe and compare medication use of older vs. younger CSF farmers;
3. identify and describe potential confounders, and include them in the multivariate models evaluating the association between medication usage and agricultural injury;
4. examine the association/relationship between medication usage and agricultural injury.

There is limited research in the farming population regarding medication use; this study will address this gap in the current understanding of medication use as a risk factor for agricultural injury in older farmers. Data collected prospectively in the CSF study include a myriad of potential risk factor variables which can provide information for prevention of agricultural injuries in older farmers. This proposal also responds to the National Occupational Research Agenda (NORA) priorities regarding traumatic injuries and special populations at work

METHODS

Design

This study will analyze data that was collected from 1999-2003 for the Iowa Certified Safe Farm (CSF) intervention study (Rautiainen et al., 2004). The CSF study used a prospective cohort design in which the self-selected participants were pair-matched and then randomly assigned to the intervention and control cohorts. CSF data was collected quarterly and annually

and consisted of exposures and outcomes (n=758 person-years of follow-up). The CSF study methods have previously been described (Rautiainen et al., 2004).

Sample/Setting

The sample included farmers from a targeted nine county area in northwestern Iowa. Inclusion criteria for the CSF study included a minimum agricultural production requirement of \$1,000 in sales of agricultural products per year. Participants were recruited via mailings through NASS and were followed up by telephone until a total of 300 farmers were recruited. Additional recruiting in 2000 added an additional 58 farms to replace drop-outs. The CSF study final sample included 316 farmers.

Data Collection

In the CSF study, there were four primary data collection systems used: 1) quarterly phone calls, 2) annual occupational health history forms, 3) annual clinic screening forms, and 4) annual on-farm safety reviews. For this study, the annual occupational health history and the quarterly calls will exclusively be used for the secondary data analysis.

Data Analysis

For descriptive statistics, the farmers were divided into two groups: older farmers (≥ 60 years of age) and younger farmers (≤ 59 years of age). Descriptive statistics have been generated including means, proportions, and rates of agricultural injury per each group (older farmers vs. younger farmers). Chi-square tests were used to compare continuous variables; Fisher's exact test was used when sample sizes were small. Independent sample tests were used in the analysis of categorical data. All tests were two-tailed and a p-value of <0.05 was deemed to be statistically significant. Injury characteristics of each group of farmers, older and younger, are described and include: injured body parts, types of injuries, source of injury, mechanism of

injury, and contributing factors. Injury rates are calculated by dividing the number of reported injuries by the number of person-years of observation. The Chi-Square test will be used to compare the crude injury rates between older farmers and younger farmers.

RESULTS

Table 3 and Table 4 present demographic information for the 316 farmers in the CSF study. In this sample, the majority of farmers are married (older 90%, younger 86%), non-smoking (older 3%, younger 8%), males (older 99%, younger 98%). The average age of all the farmers in the CSF cohort was 50 years old (SD \pm 11.40). In this study, farmers were divided into two groups for comparison; older farmers (60 years and older; n=71) and younger farmers (59 years and younger; n=245). Younger farmers are more educated than the older farmers (p=0.0319). The younger CSF farmers consume more alcohol (p=0.0070) than the older farmers. Younger farmers on average raise more livestock including beef, and hogs. No significant difference between older and younger farmers was found for having poultry, sheep or dairy. Younger farmers were more likely to use agrichemicals (86%) versus older farmers (69%). Older farmers worked significantly less time on the farm than the younger farmers; less weekly hours (p<0.0001) and less average weeks worked per year (p= 0.0001). On average older farmers farmed significantly less acres (512 acres) than the younger farmers (797 acres) (p= 0.0002).

When compared on co-morbid conditions, older farmers had more emphysema [RR 3.41 (95%CI 2.16-5.38)], heart disease [RR 3.20 (95% CI 2.49-4.09)], high blood pressure [RR 2.31 (95% CI 1.81-2.94)], cancer [RR 1.97 (95% CI 1.33-2.93)], other lung problems [RR 2.04 (1.21-3.43)], and arthritis [RR 3.35 (95% CI 2.69-4.16)]. Older farmers had less hay fever than their younger counterparts [RR 0.38 (95% CI 0.16-0.87)].

A comparison of the agricultural injuries sustained by this cohort of CSF farmers is presented in Table 5 which breaks down injuries by number of injuries, body parts affected, types of injury, and source of injury. A total of 316 injuries were reported among the whole cohort during the three-year follow-up. Of the 71 older farmers, there were a total of 72 injuries; 38 older farmers having no injuries, 19 having one injury, and 15 having two or more injuries. Of the 245 younger farmers, there were a total of 244 injuries; 110 had no injuries, 71 had one injury, and 63 had two or more injuries. In this cohort of Iowa farmers, there is not a statistically significant difference between injury rates between older and younger CSF farmers. There were a total of 72 injuries in the older farmer group with a total of 179.25 person years for an injury rate of 0.40 or 40 injuries per 100 person years for older farmers. In the younger farmer cohort, there were a total of 244 injuries with a total of 578.83 person years for an injury rate of 0.42 or 42 injuries per 100 person years for the younger farmers. Using the Chi-Square test to compare the crude injury rates between older farmers and younger farmers, no statistically significant difference was found ($p=0.4421$).

In the older farmer group, injuries to the leg/knee/hip were most prevalent (28%). The next body part hurt most often was the fingers (18%). In younger farmers the most prevalent injuries occurred to the fingers (20%) with the leg/knee/hip next (19%). The most prevalent type of injuries occurring to older farmers were bruises (30%) and cuts (30%), with sprains/strain (18%) being the next most common. The prevailing types of injuries occurring in the younger farmer cohort were sprains/strains (23%) and cuts (19%), with bruises being the third most common type of injury. The three most common sources of injury for older farmers include human error (30%), other vehicle (22%), and other machinery (16%). For younger farmers the

three prevailing sources of injury were other vehicles (24%), human error (20%), and other machinery (15%).

Table 6 compares medical and insurance costs for all farm related problems as well as all farm related injuries. Older farmers had significantly higher average total medical costs for conditions such as back problems, joint problems, skin problems, and agricultural injuries combined; \$2155 for older farmers versus \$817 for younger farmers ($p=0.0205$). The proportion of costs covered by insurance for above mentioned conditions was also higher among older farmers (\$1554 versus \$372, $p=0.0205$). There was no statistically significant difference between older and younger farmers for injury costs ($p=0.4388$).

DISCUSSION

The main hypothesis of medication use as a risk factor for injury in older farmers has not yet been tested. This study is in its beginning stages, and only descriptive statistics have been completed at this time. This study has found similar findings as other studies on injury and older farmers. Legs, knees, and hips being prevailing body parts injured by older farmers. This study did not find machinery or livestock as the main source of injury as other studies have, but rather we found that human error was the main source reported as a cause for injury in our older CSF farmers. This study did not find any statistically significant difference in non-fatal injury between younger and older farmers. No statistical significance was found in the costs of injuries between older and younger farmers. Total medical costs that included back pain, joint problems, and skin problems were significantly different. This may be due to the issues with arthritis and hip/knee joint problems that are often seen in the general aging population.

SUGGESTIONS FOR FUTURE ACTION

Both of these studies provide additional information on risk factors and injuries for older farmers. Agricultural safety and health interventions must be tailored to address the changing health needs of the aging farmer. One specific aspect of this would be to address the chronic health issues that older farmers may have and how their work may be modified so they can continue to work on the farm safely. As farmers age, it is more like that they will require medication for diseases common with aging. These medications may put the older farmer at risk for agricultural injury. It is important to complete a thorough medication review as part of any intervention for older farmers. Along with a medication review, older farmers need to be educated on the potential side effects and issues of polypharmacy. An educational campaign should be launched to better educate rural health care providers on the risks of farming so they can take into consideration farm tasks and activities when prescribing medication and other health regimens.

Future plans are to translate this research into practice. One of the products that we hope will come to fruition is for health care providers to be aware that the medications they provide may create a hazard to the elderly farmer who work on the farm. We aim to produce a medication matrix that provides guidance to primary health care providers in that regard. The matrix would comprise of a decision tree that would incorporate the medications the older farmer is on currently, potential medications that may be added for a newly found condition, work activities that the farmer conducts, analysis for potential adverse drug interactions, and a selection criteria to provide the best drug regimen for the older farmer. The premise of the medication matrix is to enable the farmer to continue to conduct their farm work without the potential safety hazards from the medications they are on.

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Appendices

Appendix A: Health and Safety Goals Sheet

CLIENT HEALTH GOALS

Name: _____	Date: _____
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HEALTH GOALS

NURSING CONCERNS

	Result	Referral	Monitor	No concerns		Referral	Monitor	No concerns
Weight					Musculo/skeletal			
Blood Pressure					Tobacco Use			
Cholesterol					Stress			
Cholinesterase					Drinking Water			
Respiratory					Male General			
Vision					Female General			
Hearing								
Skin								

Health Professional Signature: _____ Date: _____

Client Signature: _____ Date: _____

CLIENT SAFETY GOALS

Name: _____	Date: _____
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SAFETY GOALS _____

Personal Protective Equipment Goals:

PERSONAL PROTECTIVE EQUIPMENT LOG

	Type of PPE Currently Using (provide specifics)	PPE Recommended (note brand & number)	Purchased or Ordered from Clinic (include date)	Fit Demo (Y/N)	Reviewed PPE Storage & Care (Y/N)
Respiratory					
Vision					
Skin					
Hearing					
Chemical					
Other					

Health Professional Signature: _____ Date: _____

Client Signature: _____ Date: _____

Table 1

Occupational Health Screening: Modifications for Older Farmers (in bold)

Screening Components	Modifications
<i>Agriculture-Specific Screening</i>	
1. Occupational Health History	
2. Lung Function test	
3. Hearing Test	
4. Skin Screening	<p><u>Neuropathy</u>: test for superficial pain, light touch, vibration, and stereognosis ability to recognize objects by feel. Refer to physician for complete testing of sensory system in those with neurologic symptoms or that have abnormal findings on the neuropathy screening. Abnormalities include:</p> <ol style="list-style-type: none"> 1) Hypalgesia – decreased pain sensation 2) Analgesia –absent pain sensation 3) Hyperalgesia – increased pain sensation 4) Hypoesthesia –decreased touch sensation 5) Anesthesia – absent touch sensation 6) Hyperesthesia – increased touch sensation 7) Unable to feel vibration. Loss of vibration sense occurs with peripheral neuropathy (diabetes, and alcoholism)
5. Musculoskeletal	<p><u>Proprioception</u>: complete the Romberg test. Positive Romberg sign is a loss of balance that occurs when closing the eyes; the person sways, falls, or widens base of feet to avoid fall. Refer to physician if the Romberg test is positive.</p>
6. Back/Spine fitness and lifting evaluation	
7. Tetanus Immunization	
<i>General Wellness Evaluation</i>	
1. Height-weight evaluation	
2. Blood Pressure	
3. Cholesterol	
4. Vision screening	
5. Mental Health Status	
6. Cholinesterase	
7. Prostate Specific Antigen (PSA)	<p><u>Prostate Specific Antigen (PSA)</u>: educate older farmer on the importance of a PSA test to screen for prostate cancer in older men.</p>
8. Medication Review	Nurse reviews medications and discusses potential safety concerns such as the operation of equipment
9. Disabilities	Referral to Easter Seals Rural Solutions

Table 2

Farm Review: Items to Highlight for Older Farmers

Items to emphasize in the CSF checklist Why important for older farmers?

Machinery access, steps, handrails	Older people may have mobility problems. Falls from machinery are common.
ROPS, seatbelt	Older farmers are more likely to be victims in fatal tractor overturns.
Clutter, obstacles, trip hazards, housekeeping	Older people have mobility problems and a greater injury risk from slips and falls.
Slippery floors, wet or icy access areas in buildings	Slip and fall injuries are more common and more serious in older people. Hip, skull and bone fractures can be very serious.
Animal handling areas, escape routes	Older people are less mobile, have slower reaction time, and may have greater risk of being crushed / run over by animals.
Lighting of work areas, walkways, pathways	The need for lighting increases greatly with age, so lighting in work areas becomes more important.
Ladders, steps, unprotected elevations, fall hazards in animal confinements, buildings, storage structures	Falls from elevation are a serious hazard. Older people are slower, less mobile, and have more severe consequences from fall injuries

Item for discussion	Why important for older farmers?
Hearing protection	Older farmers usually have reduced hearing. It is important to preserve what hearing they still have.
Sun protection, including sunscreen, UV protective sunglasses, hats, long sleeves	Older people often have cataracts, which result from UV radiation exposure. Hats, sunglasses, and long sleeve shirts can provide protection against skin cancer and cataracts.
Driving equipment on roads in the dark	Vision problems like cataracts or glaucoma affect night driving
Carry a cellphone or other communication device when working alone	Older people may encounter injuries and health problems more often. It is more important to be able to communicate, in case there is an injury or medical emergency.

Table 3

Demographic Variables (Categorical)

Demographic Variable	No. (%) of Older Farmers with the characteristic	No. (%) of Younger Farmers with the characteristic	RR (95%CI)	P value
Gender (male)	70(99)	238(98)	RR 0.88 (0.15-5.14)	P = 0.8851
Education				P = 0.0319 (F)
Bachelors	18(27)	82(37)		
Some College	16(24)	69(31)		
High School	34(50)	82(37)		
Smokers	2(3)	20(8)	RR 2.54 (0.67-9.68)	P = 0.1819 (F)
Married	65(90)	211(86)	RR 1.35 (0.66-2.73)	P = 0.3938
Alcohol Use				P = 0.0070
None	36(52)	74(31)		
2 or less a week	20(29)	101(43)		
3 or more a week	13(19)	60(26)		
Raise Livestock	29(40)	142(58)	RR 0.57 (0.38-0.87)	P = 0.0103 (F)
Beef	3(4)	38(16)	RR 0.29 (0.10-0.88)	P = 0.0092 (F)
Hog confinement	7(10)	62(25)	RR 0.39 (0.19-0.80)	P = 0.0035 (F)
Poultry	9(13)	55(23)	RR 0.56 (0.30-1.07)	P = 0.0676 (F)
Sheep	3(4)	10(4)	RR 1.01 (0.37-2.79)	P = 1.0000 (F)
Grain	44(61)	172 (70)	RR 0.73 (0.48-1.10)	P = 0.1499 (F)
Dairy	2(3)	5(2)	RR 1.26 (0.38-4.14)	P = 0.6603 (F)
Agrichemical Use	69%	86%	RR 0.50 (0.40-0.61)	P < 0.0001
Back Pain	81(30)	283(33)	RR 0.91 (0.72-1.14)	P = 0.4119 (F)
Co-Morbidities				
Asthma	2(1)	17 (3)	RR 0.44 (0.12-1.64)	P = 0.2730 (F)
Emphysema	4(2)	1(0.16)	RR 3.41 (2.16-5.38)	P = 0.0127 (F)
Hay Fever	5(3)	48(8)	RR 0.38 (0.16-0.87)	P = 0.0114 (F)
Allergies	25(13)	82(13)	RR 0.99 (0.688-1.42)	P = 1.0000 (F)
Lung Cancer	1(0.51)	1(0.16)	RR 2.12 (0.53-8.51)	P = 0.4176 (F)
Other Lung Problems	8(4)	9(1)	RR 2.04 (1.21-3.43)	P = 0.0375 (F)
Heart Disease	28(14)	13(2)	RR 3.20 (2.49-4.09)	P < 0.0001
High Blood Pressure	58(30)	70(11)	RR 2.31 (1.81-2.94)	P < 0.0001
Stroke	4(2)	4(0.63)	RR 2.12 (1.05-4.29)	P = 0.0967 (F)
Diabetes	4(2)	21(3)	RR 0.66 (0.27-1.64)	P = 0.4765 (F)
Kidney Disease	4(2)	5(0.79)	RR 1.88(0.90-3.95)	P = 0.2285 (F)
Liver Disease	2(1)	3(0.48)	RR 1.68 (0.27-4.95)	P = 0.3422 (F)
Cancer	15(8)	18(3)	RR 1.97 (1.33-2.93)	P = 0.0058 (F)
Arthritis	78(40)	57(9)	RR 3.35 (2.69-4.16)	P < 0.0001

Chi-square tests were used to compare categorical data.

(F) Fisher's exact test was used when sample sizes were small.

All tests were two-tailed and a p-value of <0.05 was deemed to be statistically significant.

Table 4
Continuous Variables

Continuous Variable	Older Farmers with the variable (Mean)	Older Farmers with the variable (Mean)	P value
Farm Acres	512	797	P = 0.0002
Average Hours Worked			
On farm	37	43	P < 0.0001
Off farm	29	34	P = 0.0206
Average Weeks Worked			
On farm	35	40	P = 0.0001
Off farm	25	30	P = 0.0672

Independent sample tests were used in the analysis of continuous data.

All tests were two-tailed and a p-value of <0.05 was deemed to be statistically significant.

Table 5
Injuries

Variable	No. (%) of Older Farmers with the characteristic	No. (%) of Younger Farmers with the characteristic	P value
Injuries			P = 0.1460
No injuries	38(53)	110(45)	
1 injury	19(26)	71(29)	
2 injuries	4(6)	38(16)	
3 injuries	3(4)	13(5)	
4 injuries	4(6)	6(2)	
5 injuries	4(6)	4(2)	
6 injuries	0(0)	1(0.41)	
10 injuries	0(0)	1(0.41)	
<i>Total injuries</i>	<i>72</i>	<i>244</i>	
Body Part			P=0.5947
Head/neck	5(7)	24(10)	
Eye(s)	2(3)	6(3)	
Chest/trunk	2(3)	6(3)	
Back	6(9)	35(15)	
Arm/Shoulder	6(9)	16(7)	
Finger	12(18)	47(20)	
Hand/wrist	5(7)	28(12)	
Leg/knee/hip	19(28)	44(19)	
Foot	3(4)	12(5)	
Type of Injury			P=0.0337
Bruise	20(30)	42(18)	
Burn	1(2)	15(6)	
Cut	20(30)	44(19)	
Crush	0(0)	15(6)	
Fracture	2(3)	9(4)	
Puncture	0(0)	6(3)	
Sprain/Strain	12(18)	54(23)	
Sources			P=0.2520
Tractor	1(2)	13(6)	
Other Machinery	11(16)	34(15)	
Livestock	9(13)	23(10)	
Hand Tool	1(2)	22(10)	
Pesticide/chemical	2(3)	4(2)	
Plant/tree	2(3)	18(8)	
Working surface	1(1)	3(1)	
Truck/auto	0(0)	1(0.43)	
Other vehicle	15(22)	56(24)	
Human error	20(30)	45(20)	

Chi-square tests were used to compare categorical data

All tests were two-tailed and a p-value of <0.05 was deemed to be statistically significant.

Table 6
Medical and Insurance Costs

Continuous Variable	Older Farmers with the variable (Mean)	Older Farmers with the variable (Mean)	P value
Medical Costs **			
All Costs	\$2155	\$817	P=0.0205
Out of pocket Costs	\$570	\$426	P=0.4634
Insurance Costs	\$1554	\$372	P=0.0205
Costs Per Injury *			
All Costs	\$111	\$179	P = 0.4388
Out of pocket Costs	\$51	\$91	P = 0.4219
Insurance Costs	\$53	\$83	P = 0.6038

*T-test conducted from log transformed data

** Medical costs include all injuries, back problems, joint problems, & skin problems

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