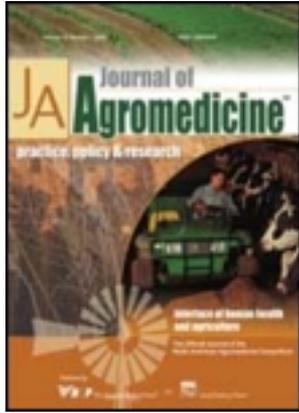


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Determinants of Work Hours Among a Cohort of Male and Female Farmers 50 Years and Older in Kentucky and South Carolina (2002–2005)

Jennifer L. Marcum DrPH^a, Steven R. Browning PhD^a, Deborah B. Reed PhD^b & Richard J. Charnigo PhD^c

^a Department of Epidemiology, College of Public Health, University of Kentucky, Lexington, Kentucky, USA

^b College of Nursing, University of Kentucky, Lexington, Kentucky, USA

^c Department of Biostatistics, College of Public Health, University of Kentucky, Lexington, Kentucky, USA

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ORIGINAL RESEARCH

Determinants of Work Hours Among a Cohort of Male and Female Farmers 50 Years and Older in Kentucky and South Carolina (2002–2005)

Jennifer L. Marcum, DrPH
Steven R. Browning, PhD
Deborah B. Reed, PhD
Richard J. Charnigo, PhD

ABSTRACT. The average age of United States farmers has been increasing for 20 years. The objective is to examine the factors associated with hours worked among farmers age 50 and older. A cohort of Kentucky and South Carolina farmers ($n = 1394$) over age 50 were surveyed annually during 2002–2005. Of those that reported any farm work, males worked 24 mean hours/week and females worked 14 mean hours/week. Greater satisfaction and more experience farming, increased acreage, and presence of animals significantly increased estimated hours farmed, whereas chronic health problems, although prevalent, had a minor role in determining work hours.

KEYWORDS. Aging farmer, farmer work habits, older farmer

Jennifer L. Marcum and Steven R. Browning are affiliated with the Department of Epidemiology, College of Public Health, University of Kentucky, Lexington, Kentucky, USA.

Deborah B. Reed is affiliated with the College of Nursing, University of Kentucky, Lexington, Kentucky, USA.

Richard J. Charnigo is affiliated with the Department of Biostatistics, College of Public Health, University of Kentucky, Lexington, Kentucky, USA.

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Address correspondence to: Jennifer L. Marcum, DrPH, Division of Public Health, Nebraska Health & Human Services, 301 Centennial Mall South, PO Box 95026, Lincoln, NE 68509, USA (E-mail: Jennifer.Marcum@Nebraska.gov).

INTRODUCTION

The fastest-growing age group of workers in the United States is those at the typical retirement age. The Bureau of Labor Statistics (BLS) reports the employment of workers 65 years and older in the past 30 years increased 101%, compared with a much smaller 59% increase in total employment for workers 16 years and older.¹ This trend is especially evident among farmers. The National Agricultural Statistics Service (NASS) reports that the average age of principal farm operators in the United States increased from 50 years old in 1978 to 54 years old in 1997 and, most recently, 57 years old in 2007, with 30% of the nation's principal operators over the age of 65.²

Farmers in western Illinois were found to be twice as likely to continue working past the age of 65 as workers in other industries.³ Nationally, only 13% to 14% of workers are 65 years and older, whereas 25% of the sample of 1700 Illinois farmers were in this age group.³ The decision to continue working beyond typical retirement ages may be less dependent on economic considerations among farmers. Garkovich et al.⁴ and Reed and Claunch⁵ suggest that farmers' personal satisfaction with work and identification with the agrarian lifestyle may be important influences. Continuation of the work of multiple previous generations of their family and attachment to the land may influence the continued work of farmers during their later years.^{4,6} In a qualitative study of farmers over age 50 from Kentucky and Iowa, Reed and Claunch found only those farmers with severe physical limitations had completely retired from the physical tasks involved in farming.⁵ The authors identified liking the work and generational passage of the farm, in addition to their physical stamina, as factors influencing farmers' continued labor.

Voaklander and colleagues⁷ recently concluded that time spent working by older farmers is not influenced by present health conditions. However, Brackbill et al.⁸ proposed that farm work has been shown to increase risk for cardiovascular disease, skin cancer, hearing loss, and amputations as compared with other work. Continued work among older farmers with

chronic conditions and impairments may limit their ability to execute physically demanding tasks and safely operate machinery, consequently elevating their risk for work-related injuries. Older farmers are more likely to be hospitalized for their injuries and more likely to sustain permanently disabling or fatal injuries than younger farmers.⁹⁻¹⁴

Little research has been dedicated to characterizing exposure to farm work among older farmers and none of the studies thus far has described the work habits of this population across time.^{7,14,15} It is important to understand the determinants of work hours among farmers because hours worked are consistently identified as one of the primary predictors of injury.^{14,16-23} This study will describe work among older farmers across time and identify factors associated with number of hours farming per week.

MATERIALS AND METHODS

Sample

A cohort of farmers age 50 years and older from Kentucky and South Carolina was followed between 2002 and 2005. The sample was selected from three different sources: the Kentucky Farm Family Health and Hazard Surveillance Project (KFFHHSP) listing in 1994-1996²⁴ and listings of African American farmers from the Kentucky and South Carolina Agricultural Statistics Services. In brief, farm households, defined as any place from which \$1000 or more of agricultural products from livestock, crop, or specialty operations were produced and sold, with valid telephone numbers from these listing, were eligible. According to the NASS 2007 Census of Agriculture, 1% of Kentucky farms and 8% of South Carolina farms have an African American principal operator.² Since the KFFHHSP sample from Kentucky was 98% Caucasian, African American farmers were oversampled from a listing provided by the Kentucky Agricultural Statistics Service. Recruitment of African American farmers was further enhanced using a listing provided from the South Carolina Agricultural Statistics Service. To identify African American farmers age 50 and older in the listing from

South Carolina, a separate enumeration survey of farm households was conducted by the South Carolina Agricultural Statistics Service and vigorous recruitment efforts were undertaken by the Cooperative Extension Small Farms Project to obtain participation.²⁵ The overall response rate for the surveys at baseline (2002) was 43% with 1422 usable surveys. Observations were excluded from analyses if the participant's age was unknown or less than 50 years; this resulted in 1394 total participants eligible for analyses. Thirteen recruited farmers did not reach the 50-year age requirement until after 2002, resulting in 1381 eligible participants at baseline.

Data Collection

Survey data were collected by mail and computer assisted telephone survey (CATI), according to the respondent's preferred method, during four waves of data collection between 2002 and 2005. The use of the telephone (CATI) version was undertaken primarily to enhance participation in the study. The telephone surveys (approximately 30 minutes in length) were undertaken by the Survey Research Center (SRC) at the University of Kentucky. Telephone interviewers were trained in the administration of the survey, with consideration given to their understanding of the agricultural and medical terms in the questionnaire. Interviewers were monitored over the course of data collection by SRC personnel. Respondent farmers were assured of the confidentiality of their responses. Approval was obtained from the University of Kentucky Institutional Review Board prior to each wave of data collection.

The order and frequency of data element collection is detailed in Appendix 1. For time-dependent variables not collected at each wave, the value was imputed by carrying forward the last observation with the following exceptions: A health condition was only assumed to be present at wave 2 if the condition was reported at both waves 1 and 3 and height and weight values at wave 4 were used to represent height and weight data at each wave.

The number of hours spent doing farm work in the past week was used as a surrogate for average number of hours spent doing farm

work per week. Demographic data collected included age, gender, education, race, marital status, percentage of household income from farming, and state of residence (Kentucky or South Carolina). Participants were asked to report their current health conditions (e.g., heart attack, hearing problems, diabetes, etc.), which had been confirmed by a doctor. Height and weight data were used to calculate body mass index ($BMI = \text{weight [kg]} / \text{height}^2 [\text{m}^2]$).²⁶ Additional health-related data obtained included use of a daily prescription, the overall general health rating, and the number of days of restless sleep in the past week.

Farm and work characteristics collected were as follows: whether the participant owned the farm, use of custom or contract labor on the farm, number of years and average time per year at an off-farm job, plans to pass on the farm to family, rating of personal satisfaction from farming, whether the participant farmed before age 18, number of years spent farming the land, whether the farm was owned by the participant's parents, number of generations of family that farmed the land, total farm acreage, season, and presence of animals on farm. A farm coded as having animals was defined as a farm with any of the following: cattle, hogs, poultry, sheep, goats, and milk or dairy products.

Data Analysis

All analyses were performed using SAS 9.2 statistical software (SAS Institute, Cary, NC). Descriptive statistics, including frequencies, means, and medians, were calculated to characterize the distribution of hours worked per week and standard deviations were calculated to measure variability. The relation between number of hours worked per week and individual and farm-related factors was assessed using a negative binomial regression model fitted by the generalized estimating equation (GEE) method to account for the nonindependence of repeated measures on the same subjects. The regression analyses were performed to calculate the estimated mean hour ratios (EMHRs) and their respective 95% confidence intervals (CIs). The EMHR was calculated by dividing the mean hours in the exposed category by the mean

hours in the unexposed category while controlling for confounders. Univariate regression analyses were first performed to calculate the effect each factor individually had on the estimated hours worked. The final multivariable model was selected by manual backward elimination using the GENMOD procedure in SAS. Removal from the model was based on the lack of a statistically significant association with number of hours worked at $\alpha = .05$. Analyses were performed on observations with complete data; 75% of the total observations were included in the multivariable model. The majority of excluded observations were due to missing data on the season of data collection, and the backward elimination selection method was performed once with and once without the season variable. Removing the season variable allowed inclusion of 91% of the total observations, and both procedures resulted in selection of the same factors in the multivariable mode, with the exception of the season variable itself, with only minimal differences between the estimates.

RESULTS

Demographics

The demographic characteristics of the 1394 farmers in the study sample by wave of data collection are given in Table 1. At baseline, the mean age of the cohort was 65.7 years old (*SD* [standard deviation] = 8.0 years), nearly a third of the sample was aged 50 to 59 and a third 70 and above. The overall attrition rate for the study was 32%; 945 farmers participated in the last wave of data collection. Reasons for attrition included refuse to participate (52%), unable to contact (42%), and death (5%). Table 1 illustrates that the cohort characteristics changed very little across the four waves of data collection, suggesting that attrition had minimal effect on cohort demographics.

Hours Farmed Per Week

Of those who reported any farm work, males worked an estimated average of 24.0 hours per week and females worked an estimated average of 13.6 hours per week. Of those who reported

TABLE 1. Demographic Characteristics of Farmers by Wave (2002–2005)

	Wave 1 No. (%*)	Wave 2 No. (%*)	Wave 3 No. (%*)	Wave 4 No. (%*)
Age, years				
50–59	405 (29)	287 (26)	221 (23)	179 (19)
60–69	569 (41)	469 (43)	414 (42)	390 (41)
70–79	362 (26)	309 (28)	301 (31)	321 (34)
80+	45 (3)	32 (3)	40 (4)	55 (6)
Total	1381 [†]	1097	976	945
Gender				
Female	670 (49)	536 (49)	477 (49)	454 (48)
Male	711 (51)	561 (51)	499 (51)	491 (52)
Education, years				
0–12	967 (70)	760 (69)	671 (69)	649 (69)
13+	414 (30)	337 (31)	305 (31)	296 (31)
Race				
White	1089 (79)	874 (80)	780 (80)	763 (81)
African American	268 (20)	202 (19)	176 (18)	167 (18)
Other [§]	17 (1)	15 (1)	14 (1)	9 (1)
Marital status				
Not married	123 (9)	111 (10)	98 (10)	95 (10)
Married	1254 (91)	986 (90)	877 (90)	848 (90)
% income from farming				
<50%	939 (75)	748 (71)	677 (73)	646 (73)
≥50%	318 (25)	304 (29)	249 (27)	244 (27)
Residence				
Kentucky	1188 (86)	954 (87)	850 (87)	830 (88)
S. Carolina	193 (14)	143 (13)	126 (13)	115 (12)

*Percentages may not add to 100 due to rounding.

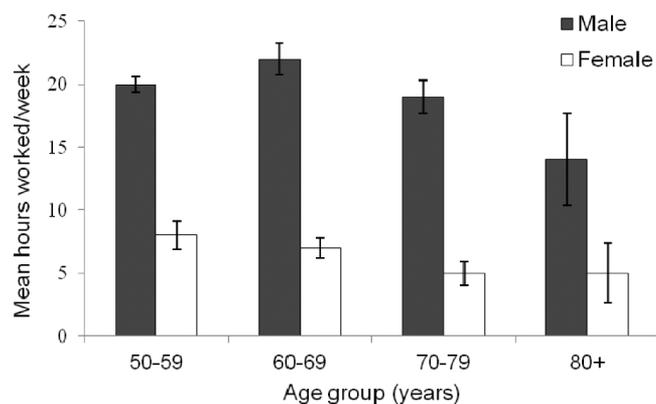
[†]Not all participants were included in wave 1 analyses, as they had not yet met the age 50 requirement.

[§]The "other" race category consisted of 15 American Indians and 2 of unspecified race.

any farm work, an estimated overall average of 20.2 hours per week (*SD* = 17.4 hours) was worked between 2002 and 2005. Thirty-three percent of all observations were from those indicating no farm work in the past week and only 7% indicated farming 40 or more hours per week. Overall, males reported farming more hours per week than females, with both genders followed a similar trend in farming fewer hours per week as age increased (see Figure 1).

Overall, 18% of the observations were from those who considered themselves to be completely retired from farming, 45% partially retired, and 37% not retired. A classification of complete retirement did not necessarily indicate that the individual did not still engage

FIGURE 1. Estimated average number of hours worked per week and 95% CI by age group and gender (2002–2005).



in farm work, however. Farmers who considered themselves to be “completely retired” reported a mean of 2.1 hours worked per week ($SD = 5.9$ hours); a mean of 11.8 hours per week ($SD = 14.7$) was reported among those classified as “partially retired” and 21.9 hours per week ($SD = 19.7$) was reported among those classified as “not retired.”

Regression Analyses

Table 2 displays the frequency of observations in each stratum and the median, mean, and standard deviation of the number of hours doing farm work per week by farm and farmer characteristics. The unadjusted EMHR predicting hours farmed per week for each factor and corresponding 95% CIs are given in Table 2.

Of the demographic factors examined, male gender, younger age, and a greater percentage of income from farming increased the number of hours worked per week (see Table 2). There were no significant differences in work hours per week among the racial groups studied; African American males reported working an average of 18.8 hours/week ($SD = 18.7$), Caucasian males reported working an average of 20.0 hours/week ($SD = 18.6$), African American females reported working an average of 5.7 hours/week ($SD = 9.7$), and Caucasian females reported working an average of 6.8 hours/week ($SD = 12.1$). Marital status and education level

also had no effect on hours of farm work per week (nonsignificant results not shown).

Presence of chronic health conditions did not significantly affect the amount of time the farmers spent working, though use of a daily prescription reduced estimated mean hours worked per week by 20%. The following health conditions had no significant effect on number of hours worked per week (results not shown): vision impairment, arthritis/joint problems, carpal tunnel, back problems, heart attack/other heart conditions, stroke, high blood pressure, diabetes, chronic bronchitis/emphysema, osteoporosis, cancer, incontinence, and prostate problems. Similarly, quality of sleep in the past week and BMI did not significantly influence the hours worked (results not shown). Hearing problems were associated with a significant 11% increase in the estimated mean number of hours worked per week, and those who reported an overall health rating of “poor” worked 41% fewer estimated mean hours than those with an “excellent” rating.

Owners of the farm worked significantly more hours per week than nonowners (EMHR = 1.40) (see Table 2). Farming experience, family ties to farming, and level of personal satisfaction from farming were shown to influence hours worked per week in the univariate analyses. The number of years, average number of months per year, and average number of hours per week at an off-farm job did not influence the hours spent farming per week

TABLE 2. Median and Mean Estimated Hours Farmed Per Week and Unadjusted Estimated Mean Hour Ratio (EMHR) from GEE Regression Analysis

	<i>N</i> *	Median	<i>M</i> (<i>SD</i>)	EMHR (95% CI)	<i>p</i> value
Gender					
Female (ref)	2078	1	6.8 (12.1)	—	
Male	2208	16	20.0 (18.6)	2.92 (2.58, 3.32)	<.0001
Age, years					
50–59	1064	8	13.6 (16.7)		
60–69	1796	7	14.0 (17.1)		
70–79	1258	8	13.6 (17.5)		
80+	168	2	10.0 (15.3)		
Increase in 10 years				0.91 (0.85, 0.98)	.0102
% income from farming					
<50%	3045	5	11.3 (14.6)		
≥50%	1118	14	20.6 (21.3)		
Increase in 25%				1.21 (1.16, 1.26)	<.0001
Overall health rating					
Excellent (ref)	458	8	14.9 (17.9)	—	
Very good	1193	8	13.9 (17.1)	0.96 (0.85, 1.09)	.5260
Good	1441	10	14.9 (17.4)	1.01 (0.89, 1.16)	.8312
Fair	862	5	12.7 (17.1)	0.88 (0.76, 1.03)	.1073
Poor	329	0	7.4 (12.7)	0.59 (0.47, 0.74)	<.0001
Daily prescription					
No (ref)	974	10	17.5 (19.3)	—	
Yes	3300	5	12.5 (16.2)	0.80 (0.73, 0.89)	<.0001
Hearing problem					
No (ref)	3207	5	12.7 (16.6)	—	
Yes	797	10	16.8 (18.3)	1.11 (1.02, 1.22)	.0166
Own farm					
No (ref)	197	2	10.2 (15.5)	—	
Yes	4,069	8	13.8 (17.1)	1.40 (1.16, 1.70)	.0006
Personal satisfaction from farming					
Great deal (ref)	2480	10	16.8 (17.8)	—	
Some	1282	4	11.1 (15.7)	0.82 (0.75, 0.89)	<.0001
Very little	249	0	6.8 (13.4)	0.59 (0.50, 0.71)	<.0001
No	110	0	5.2 (14.5)	0.52 (0.37, 0.73)	.0002
Farm prior 18 years					
No (ref)	959	0	6.8 (12.4)	—	
Yes	3320	10	15.6 (17.8)	2.29 (1.91, 2.76)	<.0001
No. of years farmed this land					
0	68	0	1.8 (4.6)		
1–30	2022	6	13.2 (16.7)		
>30	2111	8	14.8 (17.7)		
Increase in 10 years				1.09 (1.05, 1.13)	<.0001
Farm owned by parents					
No (ref)	2633	5	12.6 (17.7)	—	
Yes	1227	10	16.0 (16.6)	1.26 (1.11, 1.43)	.0005
No. of generations farmed					
0	443	1	8.1 (14.1)		
1–3	2091	8	14.0 (17.2)		
>3	1252	10	14.9 (17.2)		
Increase in 1 generation				1.06 (1.04, 1.09)	<.0001
Acres					
≤75	1530	4	9.3 (12.8)		
>76	2705	10	16.2 (18.7)		
Increase in 75 acres				1.08 (1.06, 1.10)	<.0001

(Continued)

TABLE 2. (Continued)

	<i>N</i> *	Median	<i>M</i> (<i>SD</i>)	EMHR (95% CI)	<i>p</i> value
Animal(s)					
No (ref)	1425	3	9.9 (14.8)	—	
Yes	2861	10	15.5 (17.9)	1.31 (1.17, 1.46)	<.0001
Season					
Winter (ref)	761	4	10.9 (15.2)	—	
Spring	929	8	14.9 (18.7)	1.50 (1.38, 1.63)	<.0001
Summer	281	12	17.9 (19.3)	1.75 (1.57, 1.97)	<.0001
Fall	1656	8	14.2 (17.0)	1.38 (1.28, 1.50)	<.0001

**N* = number of observations 2002–2005.

(results not shown). Farmers working on farms with more acreage or on farms with animals worked more hours. Finally, season affected the number of hours worked per week with the busiest season being the summer and the least busy season being the winter.

The following results from the multivariable model are adjusted for all other factors in the model (see Table 3). Results from the multivariable model indicated males worked

TABLE 3. Adjusted* Estimated Mean Hour Ratio (EMHR) From GEE Regression Analysis

	EMHR (95% CI)	<i>p</i> value
Gender (male vs. female)	2.65 (2.34, 3.01)	<.0001
Age (10-year increase)	0.82 (0.76, 0.89)	<.0001
% income from farming (25% increase)	1.26 (1.20, 1.33)	<.0001
Overall health rating		
Very good vs. excellent	0.95 (0.81, 1.11)	.5356
Good vs. excellent	0.99 (0.85, 1.16)	.9100
Fair vs. excellent	0.81 (0.67, 0.97)	.0209
Poor vs. excellent	0.60 (0.43, 0.83)	.0024
Personal satisfaction from farming		
Some vs. great deal	0.74 (0.66, 0.83)	<.0001
Very little vs. great deal	0.53 (0.40, 0.69)	<.0001
None vs. great deal	0.61 (0.34, 1.09)	.0962
Farm prior age 18 years vs. not	1.25 (1.01, 1.54)	.0389
Time farmed this land (10-year increase)	1.06 (1.01, 1.12)	.0231
Acres (increase in 75 acres)	1.02 (1.003, 1.03)	.0227
Animal(s) vs. none	1.27 (1.12, 1.44)	.0003
Season		
Spring vs. winter	1.54 (1.36, 1.75)	<.0001
Summer vs. winter	1.83 (1.57, 2.13)	<.0001
Fall vs. winter	1.32 (1.18, 1.48)	<.0001

*Estimates adjusted for all factors listed in this table.

an estimated 2.65 times as many hours per week as females. A 10-year increase in age was significantly associated with an 18% reduction in hours spent farming. A greater percentage of total income from farming significantly increased work hours (EMHR = 1.26 for each 25% increase). The only health-related factor remaining in the multivariable model was the overall health rating; those rating their health as fair (EMHR = 0.81) or poor (EMHR = 0.60) worked significantly less hours than those in “excellent” health. Farmers reporting a “great deal” of personal satisfaction from farming also reported significantly more hours worked per week than those reporting “some satisfaction” or “very little satisfaction.” Other individual-level characteristics significantly increasing the number hours worked per week were farming before the age of 18 (EMHR = 1.25) and years of experience (EMHR = 1.06 for each 10-year increase farming this land). At the farm level, increased acreage modestly increased the number of hours worked. An increase in 75 acres resulted in a 2% increase in hours worked per week. Farmers working on farms with animals worked 1.27 times more hours per week than those that did not. Finally, season significantly affected number of hours worked per week. Participants farmed significantly more hours per week in spring (EMHR = 1.54), summer (EMHR = 1.83), and fall (EMHR = 1.32) as compared with winter.

DISCUSSION

Older farmers’ satisfaction and years of experience on the farm, and the demands of the

farm (acreage and presence of animals) were significantly associated with an increase in the time spent doing farm work while presence of chronic health conditions or time at an off-farm job were not. Research continues to demonstrate that farmers are working past typical retirement age.^{5,7,15,16,24,27-29} Of the farmers in this sample who performed any farm work, an average of 20.2 hours per week was reported. Stueland et al.¹⁶ report a higher average (22 hours per week) in a case-control study of farmers 65 years and older in central Wisconsin. Two recent studies characterizing the hours worked by farmers reported that older farmers worked approximately twice as much: Lizer and Petrea¹⁵ reported 47 hours per week and Voaklander et al.⁷ reported 44 hours per week from the Saskatchewan Farm Injury Cohort (SFIC).

The hours worked by older farmers are not directly comparable across these four studies due to important differences among the samples and in the manner in which work hours were assessed. The samples of older farmers used by Lizer and Petrea¹⁵ and Voaklander et al.⁷ consisted solely of males, whereas Stueland et al.¹⁶ and our study included female farmers. Our study has shown that females work approximately 63% fewer hours than males, which would partially account for the lower average. However, the average number of hours of worked by the males in our cohort of farmers in Kentucky and South Carolina (20.0 hours/week) is also much lower than what the SFIC reported. We reported an 18% decrease in hours farmed per week for each decade increase in age. The relationship between increasing age and decreasing work hours documented in our study is comparable to that reported in the SFIC cohort.⁷ In sum, comparison of hours of work are sensitive to the age, gender, commodity, and work status (full-time vs. part-time) distributions of the cohorts surveyed, as well as whether such estimates include those who work very few or no hours per week.

The studies by Lizer and Petrea¹⁵ and Voaklander et al.⁷ assessed hours of work for each season by asking the participant to estimate the typical number of hours worked during different times of year, an approach that may

lead to an overestimation of exposure due to recall bias. In addition, 75% (baseline) of the farmers in the Kentucky and South Carolina sample obtained less than 50% of their income from farming. Although the time spent working at an off-farm job was not associated with the hours of farm work per week for our internal comparisons, the greater proportion of part-time farmers in this cohort limits the comparisons with cohorts primarily of full-time farmers. Voaklander et al.⁷ reported a significant decrease in hours farming among those that worked an off-farm job compared with those who did not.

Results from our study and the SFIC cohort mutually indicate that the presence of chronic health conditions did not affect the number of hours worked per week.⁷ As was the case in the study by Voaklander et al.,⁷ the "healthy worker effect," a lower prevalence of adverse health conditions among workers as compared with the general population, also appeared to be absent from our cohort of older farmers. Our sample of farmers reported a higher prevalence of vision impairments and a similar prevalence of hypertension, arthritis, and diabetes as compared with the general population aged 55 years and older in the National Health Interview Survey.³⁰ Sleep quality was assessed in our study and found to have no significant effect on the number of hours worked per week. However, a strong association was found between a better overall health self-rating and more hours of farm work per week. A larger proportion of the older farmers in our sample reported fair to poor health compared with the general population (28% and 24%, respectively).³⁰ Work by Amshoff and Reed²⁷ reported that 43% of the farmers in their sample defined good health as the ability to work; Reed and Claunch⁵ concluded that only those farmers with extreme disability had completely retired from farming. Consequently, it is apparent that farmers continue to work with chronic health conditions and that these health conditions only limit work hours when the conditions are severe enough to change the farmers' perceptions of their health status. In addition, unlike workers in other industries, farmers often have fewer alternatives for completing work that is necessary; sick leave, disability, and early retirement often are not options.

The demands of the farm were demonstrated to influence the number of hours worked per week, with older farmers working longer hours on larger farms (acreage) and those with livestock. The presence of livestock on the farm increased the number of hours worked per week by 31%. This is important, as it has been shown repeatedly that working with livestock increases injury risk.^{13,14,24,31–35} In the SFIC, farmers worked significantly longer hours in the spring and fall as compared with the winter.⁷ Seasonality affected the hours worked in our cohort as well, but the longest work weeks occurred in the summer. This difference may be due to, in part, dissimilar distributions of commodities or harvesting times due to geography.

Our results suggest that working more hours per week is dependent upon personal satisfaction with farming and an attachment to the rural lifestyle. Greater personal satisfaction with work, more time farming the same land, and farming before the age of 18 were all significantly associated with working more hours. These results provide quantitative evidence of what others have described as farmers being “uniquely” attached to their land.^{4,6} The results further suggest that there are likely subgroups of farmers who will continue to work because of the intrinsic rewards of accomplishing physical tasks and continuing a tradition; this may also be a group that works with vision, hearing, and health impairments, medication use, and other factors that increase their risk for injury, selected cancers, and adverse respiratory conditions.

Strengths and Limitations

The repeated measures, longitudinal design of this cohort study allowed for the characterization of farm work across age and calendar time. Participants were surveyed during different times of the year to capture seasonal differences in work habits, and recall bias should be minimized as participants reported the number of hours farmed in the last week. The inclusion of women and African American farmers in the cohort permitted description of exposures for special populations that are less often

considered in agricultural health studies. As with most longitudinal studies, missing data due to attrition were substantial in this study. Regression modeling was repeated to assess the effect of the imputation method used and the large proportion of missing for the season of interview. The imputation method and exclusion of observations with no seasonal data available did not appear to change the results nor did attrition change the demographic distribution of the cohort.

Generalizability

Though the cohort for this study was obtained from a convenience sample, the distribution of commodities produced by the sample was similar to that reported by the United States Department of Agriculture (USDA) in the Census of Agriculture.² The top two commodities reported by both were cattle and grain with less than 5% of the sample and farmers 45 years and older in the Census reporting production of fruits and vegetables, dairy products, sheep and goats, poultry, or pigs. The sample also had a similar proportion of farmers who had worked an off-farm job (35%) in comparison to that reported in the Census for a similar age group (40%). The majority of farmers in our sample (86%) had 10 or more years of experience farming, which is less than but comparable to farmers over 45 years of age in the United States overall (94%) as reported in the Census.²

Conclusion

This study indicates that older farmers will continue to work despite chronic health conditions. This is important because farm work may exacerbate existing conditions such as hearing loss, vision impairments, arthritis, or skin cancer. These chronic conditions can also limit mobility and awareness, putting older farmers at increased risk for injury.^{23,24,36–39} Use of proper personal protective equipment and ergonomic farming equipment may be especially important considerations for older farmers. Further, since many chronic conditions may be undiagnosed (e.g., hypertension) or poorly treated among the elderly, adequate primary care is essential to properly diagnose and to manage

these conditions. Physicians and health care providers need to have frank discussions with their older farming patients about the farm work that they continue to perform and to advise farmers appropriately when their health conditions and use of medications may increase their risk for injury or exacerbate their health conditions.

Older workers who continue farming have reported greater personal satisfaction from farming, and the continued work has positive benefits for their health in addition to increasing older farmers' risk for some adverse outcomes. Efforts to enhance their overall well-being and quality of life need to balance the positive aspects of their labor with a consideration of their abilities to safely continue to perform certain tasks and work a substantial number of hours per week through their later years.

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APPENDIX 1. Data Element Collection by Wave (2002–2005)

Data element	Wave 1	Wave 2	Wave 3	Wave 4
Demographic factors				
Birth date	X			
Gender	X			
Education	X			
Race	X			
Marital status	X	X	X	X
% income from farming	X	X	X	X
Health-related factors				
Height				X
Weight				X
No. of days with restless sleep in past week	X		X	X
Presence of following conditions: Heart attack/heart condition, stroke, high blood pressure, diabetes, hearing impairment, vision impairment/cataracts, arthritis/joint problems, broken hip, osteoporosis, carpal tunnel, skin cancer, other cancers, chronic bronchitis/emphysema, back problems, incontinence, prostate problems, other conditions	X		X	X
General health rating	X	X	X	X
Use of daily prescription	X	X	X	X
Farm/work practice factors				
Farm prior to age 18	X			
No. of years farming same land	X			
No. of family generations farming same land		X		
Participant's parents own farm		X		
Presence of animals on farm	X			X
Participant own farm	X		X	X
Use of contract/custom labor on farm	X		X	X
Time at off-farm job	X		X	X
Total acreage	X		X	X
Retirement status	X		X	X
No. of hours farmed in past week	X	X	X	X
Personal satisfaction from farming	X	X	X	X