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# Relationship Between Sleep Loss and Economic Worry Among Farmers: A Survey of 94 Active Saskatchewan Noncorporate Farms

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**ABSTRACT.** Farm work involves seasonal peak busy periods with long hours of work and potential sleep loss. Social, technological, and economic changes, and depressed commodity prices, have resulted in financial stress. There may be a relationship between sleep loss and worry about economic conditions. The objective of this study was to examine the association between hours of sleep and worry associated with cash flow shortages and worry associated with debt among a population of farmers and their family members. One hundred and ninety-five persons from 94 active farms in two rural municipalities in west central Saskatchewan were interviewed by questionnaire. Logistic regression analyses were used to quantify associations between sleep patterns and economic concerns during peak seasons and nonpeak seasons. During peak agricultural seasons, 31.6% of owner/operators

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reported less than 6 hours of sleep per night compared to 6.3% during the nonpeak season ( $p < .01$ ). A significant relationship (odds ratio [OR] 3.59, confidence interval [CI] 1.58–8.13) was observed between daily cash flow worry and impaired sleep during peak busy seasons. A large proportion of farmers surveyed suffered severe sleep deprivation during peak seasons, and this sleep loss appeared related to worries about cash flow that were not observed during nonpeak seasons. It is possible that sleep loss during peak busy seasons may be related to impaired judgment, as shown by differential worry habits, and might also be related to the high injury rates observed in farmers during peak busy seasons.

**KEYWORDS.** Agriculture, farm, injury, sleep, worry

## BACKGROUND

Canadian farmers and their families are subject to social, technological, and economic changes.<sup>1,2</sup> Depressed commodity prices and escalating production costs have resulted in a reduction of realized net income, increased long-term debt and cash flow problems.<sup>3,4</sup> Recent challenges related to weather patterns and animal disease outbreaks have further impacted economic returns.<sup>5</sup> Spring and autumn are times when farmers experience pressure to accomplish a large amount of work within a short time period. Saskatchewan weather permits the beginning of production activities in mid-April with soil preparation, planting, and spraying. This is followed by harvest season, which begins in mid-August extending to October. In addition, livestock production tasks go on throughout the year. The busy growing season is also accompanied by high cash expenditures for planting and harvesting inputs such as seed, fertilizer, pesticides, fuel, and machinery parts. These production realities result in long hours of work, considerable stress, and potential loss of sleep.<sup>6</sup> Sleep is a vital physiological process that has important restorative functions.<sup>7</sup> Thus, reducing sleep can reduce mental performance and increase the probability for worry. Mental stress, such as worry, can interfere with both the amount and quality of sleep. We were interested in exploring the relationship between impaired sleep and economic concerns in a population of active farmers and their families because sleep loss and worry are factors contributing to injuries sustained by people on farms.<sup>8,9</sup>

## METHODS

Data were collected in the spring of 2006 in two rural municipalities located in west central Saskatchewan. The sampling frame was a comprehensive list of active farm families ( $n = 243$ ) provided by participating rural municipalities. Large corporate farms and Hutterite colonies were excluded. A self-report mail questionnaire was used to measure farm characteristics, farm family demographics, farm safety practices, farm injury experience, and other factors, including sleep patterns and farm economic concerns. Questionnaire distribution and retrieval followed recognized principles described by Dillman.<sup>10</sup> Details of the project methods are as previously reported.<sup>11</sup>

For our study sleep was examined during two time periods, peak season and nonpeak season. Peak season was defined as the busy growing season from spring through autumn corresponding with seeding and harvesting activities. Nonpeak season was defined as the winter months from December to March when no crop production activities are conducted. We defined sleep in two categories as reported by Choi et al. who defined sleep impairment as less than 6 hours of sleep per day.<sup>8</sup> For our study, sleep of less than 6 hours was considered impaired sleep and sleep of greater than or equal to 6 hours was considered not impaired sleep.

A series of logistic regression models based on the generalized estimating equation (GEE) adjusting for age and sex were used to examine associations between impaired sleep and worry about daily cash flow and debt during peak and nonpeak agricultural seasons.

The project was approved by the Research Ethics Board of the University of Saskatchewan.

## RESULTS

Of the 243 farms surveyed,<sup>11</sup> 94 farms (39%) returned completed questionnaires, representing 195 individuals (117 males, 78 females) 16 years of age and older with data that were eligible for analysis. Table 1 describes reports of daily worry concerning cash flow and debt and impaired sleep (less than 6 hours sleep per night) during nonpeak and peak seasons. Substantial proportions of both men and women reported daily cash flow worry. Among men, the frequency of daily worry about cash flow was similar in all age categories. Among women, the group less than

30 years of age and the group 60 years and older experienced significantly more daily cash flow worry than other age groups ( $p < .05$ ). No significant differences were observed in the proportion of daily worry about cash flow and daily worry about debt between types of relationship or types of main occupation. Generally speaking, daily worry about debt paralleled the distribution of daily worry about cash flow. Reporting less than 6 hours of sleep per night was the exception during the nonpeak season. However, during the peak season, men reported significantly ( $p < .05$ ) greater prevalence of sleep <6 hours per night than did women. During the peak season, nearly one third of owner/operators (31.6%) reported experiencing less than 6 hours of sleep per night, as compared to 6.3% of owner/operators during the nonpeak season ( $p < .05$ ).

TABLE 1. Description of Study Population Reporting Daily Worry Concerning Cash Flow and Debt and Less Than 6 Hours Sleep Per Night

Respondent	n	Daily Worry		<6 Hours' Sleep	
		Cash Flow n (%)	Debt n (%)	Nonpeak Season n (%)	During Peak Season n (%)
<b>Male</b>					
<30 years	26	13 (50.0)	11 (42.3)	0 (0)	2 (7.7)
30 to <45 years	23	10 (43.5)	9 (39.1)	0 (0)	8 (36.4)
45 to <60 years	42	21 (50.0)	19 (45.2)	3 (7.1)	13 (31.0)
≥ 60 years	26	12 (46.2)	9 (34.6)	2 (7.7)	4 (15.4)
Total	117	56 (47.9)	48 (41.0)	5 (4.3)	27 (23.3)§
<b>Female</b>					
<30 years	11	8 (72.7)	6 (54.5)	1 (9.1)	1 (9.1)
30 to <45 years	17	8 (47.1)	6 (35.3)	0 (0)	0 (0)
45 to <60 years	33	13 (39.4)	12 (36.4)	4 (11.8)	6 (18.2)
≥ 60 years	16	10 (62.5)	7 (43.8)	1 (6.3)	2 (12.5)
Total	77*	39 (50.6)	31 (40.3)	6 (7.8)	9 (11.7)
<b>Relationship</b>					
Owner-operator	94	47 (50.0)	38 (40.4)	6 (6.3)	30 (31.6)‡
Spouse	58	25 (43.1)	22 (37.9)	4 (6.9)	4 (7.0)
Parent/child/other relative	43	24 (55.8)	20 (46.5)	1 (2.4)	2 (4.9)
Total	195	96 (49.2)	80 (41.0)	11 (5.7)	36 (18.7)
<b>Main occupation</b>					
Farm work	112	57 (50.9)	46 (41.1)	7 (6.3)	24 (21.4)
Off farm work	61	26 (42.6)	24 (39.3)	2 (3.3)	10 (16.4)
Student/retired	18	12 (66.6)	9 (50.0)	2 (9.5)	2 (10.0)
Total	191†	95 (49.7)	79 (41.4)	11 (5.7)	36 (18.7)

\*Daily cash flow and debt worry information missing for one female.

†Main occupation information missing for four individuals.

‡ $p < .01$  for comparison of <6 hours sleep in owner-operator in peak season (31.6%) versus nonpeak season (6.3%).

§ $p < .05$  for comparison of <6 hours sleep during peak season in men (23.3%) versus women (11.7%).

TABLE 2. Logistic Regression Analysis Based on Generalized Estimating Equation Approach Examining Associations and Sleep Impairment Between Economic Worry and Sleep Impairment Among Respondents\*

	Sleep During Peak Season			Sleep During Nonpeak Season		
	<6 Hours n (%)	≥6 Hours n (%)	OR* (95% CI)	<6 Hours n (%)	≥6 Hours n (%)	OR* (95% CI)
Daily cash flow worry						
No	11 (11.1)	88 (88.9)	1.0	6 (6.1)	93 (93.9)	1.0
Yes	25 (26.0)	71 (74.0)	3.59 (1.58–8.13)	5 (5.2)	91 (94.8)	0.87 (0.26–2.91)
Daily debt worry						
No	17 (14.8)	98 (85.2)	1.0	7 (6.1)	108 (93.9)	1.0
Yes	19 (52.8)	61 (38.4)	1.95 (1.06–3.61)	4 (5.6)	76 (94.4)	0.85 (0.28–2.62)

\*Adjusted for age and sex.

Table 2 demonstrates the association between economic worry and sleep impairment amongst the farmers. During the peak busy season, a significant relationship (odds ratio [OR] 3.59, confidence interval [CI] 1.58–8.13) was observed between impaired sleep (less than 6 hours sleep per night) and daily cash flow worry. Similarly, a significant association (OR 1.95, CI 1.06–3.61) was observed between impaired sleep and debt worry. These associations were not observed during the nonpeak agricultural season.

## DISCUSSION

Study findings suggested that a large population of farmers experienced sleep less than 6 hours per night during peak agricultural seasons. It is known that irregular hours of work are associated with acute reactions such as stress and fatigue.<sup>12</sup> Effects of stress and worry extend into the sleeping period,<sup>13</sup> adversely affecting sleepiness<sup>14</sup> and relating to poor sleep quality.<sup>15</sup> The length of sleep period and quality of sleep are both salient health issues for farmers and their families. So-called “short sleepers” (i.e., those who experience 6 hours or less of sleep every 24 hours) are known to experience more anxiety than do “long sleepers” (those who experience 9 hours or more every 24 hours),<sup>16</sup> and worried individuals report more night time thoughts, and worse sleep than do non-worried individuals.<sup>14</sup>

Our study observed a significant association between impaired sleep and daily worry about

cash flow that was not apparent during the non-peak seasons when subjects reported having greater than 6 hours of sleep per night. It was also observed that the confidence interval for the association between impaired sleep and daily worry about cash flow was wider than the confidence interval for the association between impaired sleep and daily worry about debt. This may be due to the increased variability around a larger point estimate (e.g., OR). This stronger association as seen in the OR may reflect the more immediate effect of cash flow shortages as compared to long-term debt pressures. The peak periods are also accompanied by extensive expenditures for seed, fertilizers, fuel, and machinery repairs during planting and harvesting season. These inputs require large cash outlays and are often purchased on credit until the crop is successfully harvested and marketed. These findings suggest that farmers may experience more anxiety during the peak busy seasons, and this observation is consistent with work suggesting that short sleepers report more anxiety than do long sleepers.<sup>17</sup>

Farm injuries show seasonal patterns in that there are distinct peaks in the frequency of traumatic injuries during the months of April to November, corresponding with the peak planting and harvest seasons.<sup>18</sup> Choi et al. report that both sleep quantity and quality are significant determinants of injury among farmers.<sup>8</sup> Impaired sleep has been associated with increased risks for work-related injuries among veterinarians, railway and construction workers.<sup>8</sup> Similar relationships

between sleep deprivation and injuries in part-time farmers<sup>6</sup> and adolescents<sup>19</sup> have been described.

Our findings may imply that elevated injury rates during peak periods on Canadian farms could be related, at least in part, to short sleep periods and poor sleep quality that is exacerbated by worry. Our findings suggest an enhanced relationship between sleep loss and worry among older farmers. Disproportionately high injury rates observed among older farmers in Saskatchewan have been reported.<sup>20</sup>

It is not possible from our study to determine the reasons for the associations that we describe. However, during and prior to the time in which this study was undertaken, realized net income for Canadian farmers had been at an historic low.<sup>5</sup> A sizable percentage of farm operators appear to have responded to the economic situation by taking off-farm employment as respondents indicated that 50.4% of farm women and 47.6% of farm men were currently working off the farm.<sup>21</sup> Income from nonfarming activities in 2003 accounted for approximately 74 cents of every dollar of net farm family income in Canada.<sup>22</sup> It is therefore possible that some of the short sleep periods reported during peak agricultural periods could be attributed to farmers combining off-farm employment with farming activities.

What are the pitfalls? Because our study is cross sectional in design, we cannot discern whether economic worry results in sleep loss or whether sleep loss results in economic worry. There is evidence that worriers may be at risk of developing sleep disturbances.<sup>17</sup> Speculatively, the fact that respondents in our study did not demonstrate a relationship between sleep and worry during nonpeak periods may indicate that sleep loss is driving worry during peak farming periods. However, it is also possible that other factors such as high input costs during peak periods could cause worry. We did not include a measure in our study as to whether sleep is impacted specifically by worry.<sup>14</sup> Also we are aware that sleep patterns are highly individual, and that generalizations from our data may be difficult.<sup>23,24</sup>

These findings highlight the necessity for a better understanding of the relationship between sleep patterns, the economic impact of farming, and farm-related injuries.

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