

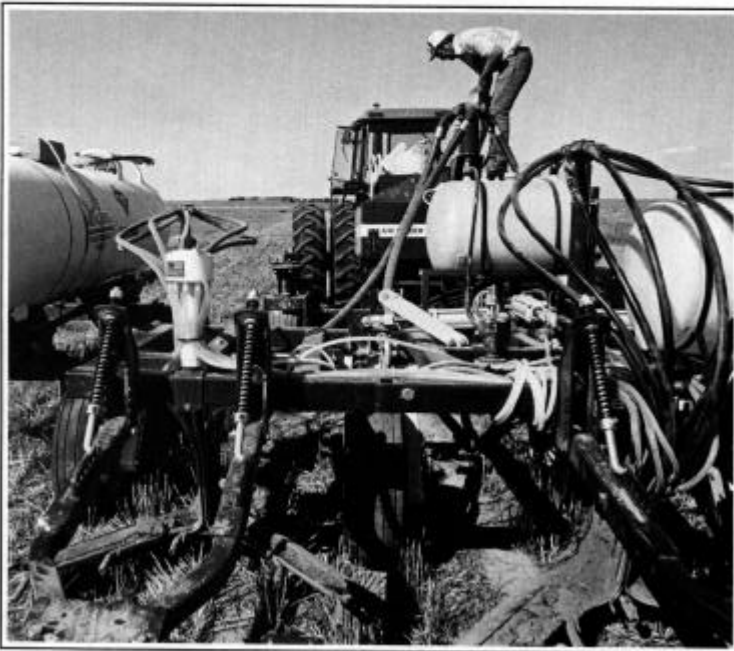
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# A Proportionate Mortality Study of Cancer and Accidents Among Kansas Farmers, 1983-1989

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**A PROPORTIONATE MORTALITY STUDY OF CANCER AND ACCIDENTS AMONG**

**KANSAS FARMERS, 1983-1989<sup>1</sup>**

**R. Scott Frey<sup>2</sup>**

**ABSTRACT**

A proportionate mortality study was conducted to determine if white, male, Kansas farmers were at increased risk of death from various site-specific cancers and accidents during 1983-1989. Kansas farmers were found to be at an increased risk of death from prostate cancer, brain cancer, non-Hodgkin's lymphoma, and leukemia. They were also found to be at elevated risk of death from all accidents, motor vehicle accidents, accidents resulting from falling objects, and machinery accidents. Results are generally consistent with findings of research undertaken in several industrialized countries and various agricultural states of the United States.

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## INTRODUCTION

Farmers are exposed to environmental agents and engage in physical activities that increase their risk of death for certain diseases and injuries (see Blair et al., 1985, 1990; Brown et al., 1990; Denis, 1988; Dosman and Cockcroft, 1989; Hoar et al., 1986; Wible et al. 1990; Zahm et al., 1988, 1990). They are at increased risk of death from various site-specific cancers and accidents (see Bell et al., 1990; Blair, 1982; Blair et al., 1985; Dosman and Cockcroft, 1989; Etherton et al., 1991; Saftlas et al., 1987; Spinelli et al., 1989; Stubbs et al., 1984). A substantial body of research has accumulated on the mortality risks of farmers in a number of industrialized nations as well as several agricultural states in the United States. With the exception of Frey and Glenn's (1988) study of cancer mortality rates for the 1983-1984 period, no research exists on the mortality risks facing Kansas farmers. A proportionate mortality study of deaths from various site-specific cancers and accidents for white, male, Kansas farmers over the period 1983-1989 was undertaken to expand the knowledge base.

## METHODS

All deaths that occurred among white, Kansas males (20 years and older) between the years 1983 and 1989 were identified from official death certificate records of the Kansas Department of Health and Environment. Female cases were excluded from the analysis, because accurate occupational data were not readily available for them. Non-white cases were excluded because of the small number of non-white farmers in Kansas. The following information was collected for each of the 69,920 cases included in the analysis: age at death; specific cause of death according to the World Health Organization's (1977) Ninth Revision of the International Classification of Diseases; and usual occupation according to farming (farm owners, tenants, and laborers) and non-farming occupational categories established by the U.S. Bureau of the Census (1983).

Age-standardized proportionate mortality ratios (PMRs) were computed for Kansas farmers according to the following formula for the specific causes of death listed in Tables 1 and 2:

$$PMR_i = d_i / (\text{Sum } [j = 1-12] D_j P_j )$$

where,

PMR<sub>i</sub> = cause-i-specific age-standardized proportionate mortality ratio:

i = specific cause of death;

j = age band (1 = 20-24, 2 = 25-29, 3 = 30-34, 4 = 35-39, 5 = 40-44, 6 = 45-49, 7 = 50-54, 8 = 55-59, 9 = 60-64, 10 = 65-69, 11 = 70-74, and 12 = 75+);

d<sub>i</sub> = number of deaths for specific cause of death i for white male farmers, 1983-1989;

- $D_j$  = number of deaths from all causes of death for white male farmers in age band  $j$ , 1983-1989;
- $P_j$  = ratio of the total number of deaths for specific cause of death  $i$  to total number of deaths from all causes for white males in age band  $j$ , 1983-1989.

The PMR is an age-standardized ratio that compares the extent to which observed deaths among Kansas farmers vary as a proportion of the expected number of deaths. (For a good technical discussion of the PMR, see Zeighami and Morris [1983] or Alderson [1986].) A PMR of less or more than 1.00 indicates a rate deviating from expectations. The Poisson model was used to assess the extent to which PMRs deviated significantly from unity (Bailar and Ederer, 1964).

## RESULTS

### Cancer

PMRs for deaths from 27 site-specific cancers are reported in Table 1. Kansas farmers have a significantly reduced risk of death from overall cancer (PMR = .95) and cancer of the lung (PMR = .74). The reduced mortality risk for these cancers among farmers is typically attributed to the "healthy worker effect" and the low rates of alcohol and tobacco use among farmers (Blair, 1982; Blair et al., 1985). Farmers are at a significantly elevated risk of death for prostate cancer (PMR = 1.17), brain cancer (PMR = 1.27), non-Hodgkin's lymphoma (PMR = 1.22), and leukemia (PMR = 1.39). PMRs for other site-specific cancers are within expected limits. Results are generally consistent with research conducted in California (Stubbs et al., 1984); Illinois (Buesching and Wollstadt, 1984); Iowa (Blair et al., 1989; Burmeister et al., 1981, 1989); Minnesota (Blair et al., 1989); Nebraska (Blair and Thomas, 1979; Blair and White, 1985); North Carolina (Delzell and Grufferman, 1985); Utah (Schumacher, 1985); Washington (Milham, 1976), and Wisconsin (Saftlas et al., 1987), as well as Canada, England and Wales, Finland, and Iceland (Blair, 1982; Blair et al., 1985; Gallagher et al., 1984a, 1984b, 1989; Notkolaj et al., 1987; Rafnsson and Gunnarsdottir, 1989; Wigle et al., 1990).

### Accidents

PMRs for deaths from 14 different types of accidents are reported in Table 2. PMRs for four of these types of accidents are higher than expected for Kansas farmers. Significantly elevated PMRs exist for all accidents (PMR = 1.30), motor vehicle or road accidents (PMR = 1.46), accidents resulting from falling objects (PMR = 2.08), and machinery accidents (PMR = 4.33). PMRs for the remaining types of accidents are within expected limits. Results are generally consistent with previous research undertaken in Canada (Spinelli et al., 1989); California (Stubbs et al., 1984); New York (Stark et al., 1987); Washington (Milham, 1976); and Wisconsin (Saftlas et al., 1987).

## CONCLUSIONS

Preliminary results clearly indicate that Kansas farmers are at

an elevated risk for certain types of death. The standard interpretation is that farmers engage in physical activities and come into contact with environmental agents that increase their risk of death. Further research is needed to assess the full scope and underlying causes of the mortality risks facing Kansas farmers.

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**Table 1. Proportionate Mortality Ratios (PMRs) for Deaths from Site-Specific Cancers among White Male Farmers in Kansas, 1983-1989**

ICD-9 No. <sup>a</sup>	Site	No. of Deaths	PMR
140-208	All Sites	3022	.95*
140	Lip	1	.98
141-149	Other buccal	39	.80
150	Esophagus	44	.75
151	Stomach	84	1.06
153-154	Large intestine	375	.96
155	Liver	33	1.05
157	Pancreas	167	1.01
152, 156, 158, 159	Other digestive	58	1.29
162	Lung	750	.74**
160, 161, 163	Other respiratory	31	.81
164	Heart	3	1.24
170-171	Bone and connective tissue	19	.90
172-173	Skin	54	1.10
175	Breast	3	.69
185	Prostate	574	1.17**
186-187	Testes, penis, and other genital	5	1.06
188	Bladder	91	.83
189	Kidney	84	.97
191	Brain	81	1.27*
190, 192-195	Other <sup>b</sup>	18	1.14
199	Unspecified sites	117	1.05
200, 202	Non-Hodgkin's lymphoma	142	1.22*
201	Hodgkin's disease	10	1.13
203	Multiple myeloma	57	1.03
204-207	Leukemia	134	1.39**
208	Leukemia of unspecified cell type	32	1.27

\*  $p < .05$     \*\*  $p < .01$

a. Cause of death according to Ninth Revision of the International Classification of Diseases (WHO, 1977).

b. This category consists of eye (190); other and unspecified parts of the nervous system (192): thyroid gland (193); other endocrine (194); and head, face, and neck (195).



**Table 2. Proportionate Mortality Ratios (PMRs) for Deaths from Accidents among White Male Farmers in Kansas, 1983-1989**

ICD-9 No.	Cause of Death	No. of Deaths	PMR
E800-E949	All accidents	507	1.30**
E810-E829	Motor vehicle or road accident	201	1.46**
E840-E845	Aircraft accident	4	.90
E850-E860	Poison: drugs or alcohol	5	.30
E861-E866	Poison: chemicals	1	.94
E867-E869	Poison: gases	5	1.16
E880-E888	Falls	105	1.05
E900-E909	Natural and environmental factors	14	.61
E910	Drowning	6	1.06
E916	Struck by falling object	13	2.08*
E919	Machinery accident	61	4.33**
E921-E923	Firearms or explosion	9	1.32
E924	Burns	1	.76
	All other accidents	82	.99

\*  $p < .05$        $p < .01$



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