



CANCER MORBIDITY AMONG KANSAS FARMERS

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ABSTRACT

Data for 65,104 Kansas males (20 years of age and older) diagnosed with cancer between the years 1980 and 1990 were retrieved from the University of Kansas Cancer Data Service (UKCDS). Analysis of these data consisted of a series of case-control studies to determine the cancer morbidity risks of Kansas farmers. Preliminary analysis suggests that farmers were at increased risk of incidence for non-Hodgkin's lymphoma; Hodgkin's disease; multiple myeloma; leukemia; and cancers of the lip, bone and connective tissue, prostate, brain, and skin. Implications of the research are discussed briefly. A list of previous studies examining the cancer risks facing farmers is also included.

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INTRODUCTION

Epidemiologic studies of farming populations in the United States and several other industrialized countries indicate that farmers have an elevated risk of contracting and dying from various site-specific cancers (Blair, 1982; Blair et al. 1985, 1993; Blair and Zahm, 1991; Brackbill et al., 1994; Dosman et al., 1989, 1995; Pearce and Reif, 1990; Sullivan et al., 1992). Specific cancers for which farmers are at increased risk include leukemia; Hodgkin's disease; non-Hodgkin's lymphoma; multiple myeloma; and cancers of the skin (nonmelanoma and melanoma), stomach, prostate, and brain [1]. Research exists on the mortality risks of Kansas farmers for a wide variety of site-specific cancers (Frey and Glenn, 1988; Frey, 1991, 1994), but no research exists on the morbidity risks facing Kansas farmers for the full range of site-specific cancers [2]. This report presents data on the morbidity patterns of Kansas farmers for 26 site-specific cancers for the period of 1980-1990.

METHODS

White male Kansans (aged 20 years and older) who were diagnosed with cancer between 1980 and 1990 were identified through the University of Kansas Cancer Data Service (UKCDS). The UKCDS is a statewide, mandatory, tumor-reporting system that collects data from hospitals. For each newly diagnosed cancer case, hospitals are required to report name, date of birth, sex, primary site, histology, usual occupation and industry, and related information. Occupation and industry were coded according to the U.S. Bureau of the Census (1982) classification system, and site-specific cancers were coded according to the World Health Organization's (1977) Ninth Revision of the International Classification of Diseases.

Analysis was limited to 65,104 white males (20 years of age and older) from the cancer registry for whom complete information existed. Female cases were excluded because of the lack of complete occupational data, and nonwhites were excluded because of the relatively small number in Kansas. Of the total codable cases, 6,801 were identified as farmers or farm workers (U.S. Census codes 473 and 479).

Age-adjusted odds ratios (OR) and corresponding 95 percent confidence intervals were computed for 26 site-specific cancers according to Gart's (1970) method. The ORs were age-adjusted in each of five age groups (20-44, 45-54, 55-64, 65-74, and 75+). The "unexposed" reference category for each analysis was all men not employed in farming. The OR was calculated as the ratio of the odds of the farmers and farm workers having the cancer of interest to the odds of the "unexposed" reference group having it. The OR can be interpreted as a relative risk measure indicating the chance that farmers have of developing a specific type of

cancer relative to the chance that nonfarmers have of developing that cancer [3].

RESULTS

Age-adjusted ORs are presented in Table 1. Farmers were at substantially reduced risk of lung cancer (OR = 0.67). Site-specific cancers for which farmers were at a substantially inflated risk include lip (OR = 2.07), skin (OR = 1.24), prostate (OR = 1.38), brain (OR = 1.25), non-Hodgkin's lymphoma (OR = 1.40), multiple myeloma (OR 1.30), and leukemia (OR = 1.25). Slightly elevated risk existed for several additional cancers, including bone and connective tissue (OR = 1.16), Hodgkin's disease (OR = 1.15), and leukemia of unspecified cell type (OR 1.17). These results are generally consistent with previous research undertaken in several U.S. agricultural states and industrialized countries (Blair, 1982; Blair et al., 1985, 1993; Blair and Zahm, 1991; Pearce and Reif, 1990).

SUMMARY AND CONCLUSIONS

The elevated cancer morbidity risks facing farmers can be explained in terms of environmental exposure to such hazardous agents as pesticides, fertilizers, fuels and exhaust emissions, organic and inorganic dusts, solvents, and zoonotic viruses (Blair, 1982; Blair et al., 1985, 1989, 1990, 1992, 1993; Blair and Zahm, 1991, 1993; Brown et al., 1990; Cordes and Rea, 1988; Hoar et al., 1986; Maroni and Fait, 1993; Morrison et al., 1992, 1994; Shaver and Tong, 1991; Wigle et al., 1990; Zahm et al., 1988, 1990; Zahm and Blair, 1992). Further research is needed to identify the specific environmental agents that increase farmers' risks of developing certain site-specific cancers. Despite the protestations of several investigators (Bond et al., 1989), pesticides seem to be the most obvious agents for more detailed investigation. Such research is important for reducing the cancer risks not only facing farmers, but among the general population as well, because several cancers that are inflated among farmers appear to be on the rise in the industrialized countries (Davis et al., 1990, 1992; Hoel et al., 1992; Weisenburger, 1994).

ENDNOTES

1. See, for instance, the following sampling of the existing epidemiologic research: Blair and Thomas (1979); Blair and White (1981, 1985); Blair et al. (1993); Brown and Pottern (1984); Browson et al. (1988, 1990); Buesching and Wollstadt (1984); Burmeister et al. (1982, 1983); Burmeister (1981, 1989, 1990); Cantor (1982); Cantor and Blair (1984); Cantor et al. (1985); Decoufle and Stanislawczyk (1977); Delzell and Grufferman (1985); Donham et al. (1982); Fasal et al. (1968); Frey (1991, 1994); Frey and Glenn (1988); Gallagher et al. (1984a, 1984b, 1989); Hardell et al. (1981); McDowall and Balarajan (1984); Milham (1971, 1976); Mussico et al. (1988); Nandakumar et al. (1986); Notkolaj et al. (1987); Pearce et al. (1985, 1986); Peterson and Milham (1980); Reif et al. (1989); Saftlas et al. (1987); Schumacher (1985); Stubbs et al. (1984); Wigle et al. (1990); Wiklund (1986); Wiklund and Holm (1986); Wiklund et al. (1988); Williams et al. (1977); Woods et al. (1987).

2. Several morbidity studies have been undertaken in Kansas, but they have been restricted to a few site-specific cancers (Hoar et al., 1986; Zahm et al., 1988).

3. A number of cancer researchers (Brownson et al., 1990; Reif et al., 1989) have used the procedure of cancer controls. Linet and Bookmeyer (1987) and Pearce and Checkoway (1988) discussed the advantages and disadvantages of this type of research. For further details, see Schlesselman (1976).

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Table 1. Age-Adjusted Odds Ratios (OR) for Cancer Morbidity among Male Kansas Farmers, 1980-1990

ICD-9 Code [a]	Site	Odds Ratios
140	Lip	2.07
141-149	Other buccal	0.67
150	Esophagus	0.56
151	Stomach	0.99
153-154	Large intestine	1.10
155	Liver	1.00
157	Pancreas	0.90
152, 156, 158, 159	Other digestive	1.14
162	Lung	0.67
160, 161, 163	Other respiratory	0.58
164	Heart	0.98
170-171	Bone and connective tissue	1.16
172-173	Skin	1.24
175	Breast	0.50
185	Prostate	1.38
186-187	Testes, penis, and other genital	1.04
188	Bladder	0.98
189	Kidney	1.02
191	Brain	1.25
190, 192-195	Other [b]	1.10
199	Unspecified sites	1.02
200, 202	Non-Hodgkin's lymphoma	1.40
201	Hodgkin's disease	1.15
203	Multiple myeloma	1.30
204-207	Leukemia	1.25
208	Leukemia of unspecified cell type	1.17

a. Ninth Revision of the International Classification of Diseases (World Health Organization, 1977).

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



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