

Pancreatic Cancer Mortality in Louisiana

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Abstract: As a preliminary step in the investigation of high pancreas-cancer mortality among White males in a cluster of Louisiana parishes, we examined 876 pairs of certificates of death which occurred in this area during 1960-75. The pancreas-cancer death records were matched to controls by age, race, sex, year of death, and parish of residence. The odds ratios were increased about two-fold for workers in the oil refining

and paper manufacturing industries, and slight elevations were seen among residents near refineries and food processing plants. Despite the limited residential and occupational information available on death certificates, this study suggests leads to environmental factors that can be further investigated by a case-control interview study in Louisiana. (*Am J Public Health* 70:256-259, 1980.)

Introduction

Recent studies of U.S. pancreatic-cancer mortality rates have revealed a cluster of parishes in Louisiana with high rates among White males.^{1,2} As a preliminary step in investigating this excess risk, we examined the death certificates of persons who died of pancreas cancer in this area for information on occupational, residential, and ethnic factors.

Methods

Nineteen parishes* were selected for study because of elevated mortality rates among White males for lung,⁴ pancreas, and bladder cancer during 1950-69 and/or because of concentrations of three major industries in the area (petroleum, chemical, or lumber/paper manufacturing) previously linked to high lung-cancer mortality rates. The majority were small parishes (maximum population 185,000; median 30,000) and were located in the southern part of the state. All but three had pancreatic cancer mortality rates that ex-

ceeded the U.S. average, and seven had excesses greater than 30 per cent.

Certificates of death due to lung, pancreas, or bladder cancer and an equal number of control certificates were collected; we report here on the pancreatic-cancer portion of the study. Each certificate of death due to cancer (ICD code 157) occurring over the years 1960-75 was identified and matched by sex, race, age (± 5 years), year of death (± 1 year), and parish of usual residence to a death certificate of a person dying of causes other than cancer. The information abstracted included usual residence, and usual occupation and industry. The major industry in the town of residence of each individual was determined. The likelihood of Acadian ancestry was estimated (probable, possible, or unlikely) based on place of birth and a comparison of family names with lists of the original Acadian settlers who migrated to southern Louisiana from Nova Scotia over 200 years ago. Odds ratios were calculated^{5,6} (with continuity correction of 0.5) by sex and race as estimates of relative risk for pancreatic cancer associated with each of 16 industrial categories, six occupational groups, residential proximity to five industries, and the three categories of Acadian ancestry. Positive associations were examined in more detail by employing logistic model maximum likelihood techniques to obtain point and interval estimates for the odds ratio adjusted for significant confounders and effect modifiers.⁷ Further details of the methodology are available elsewhere.³

Results

There were 876 pancreatic cancer deaths from 1960-75 in the 19 parishes, including 399 White males, 259 White fe-

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*Acadia, Allen, Ascension, Calcasieu, Concordia, Iberville, Jackson, Morehouse, Plaquemines, St. Bernard, St. Charles, St. James, St. John, St. Martin, Tensas, Terrebonne, Washington, Webster, West Feliciana. A map of the study area accompanies our lung cancer report.³

TABLE 1—Odds Ratios According to Usual Industry among White Males

Industry	Cases	Controls	Odds Ratios*
Agriculture	88	78	1.16 (0.82,1.65)
Fishing	10	10	1.00 (0.41,2.42)
Crude Oil	22	22	1.00 (0.54,1.85)
Construction	38	40	0.95 (0.59,1.52)
Lumber	9	9	1.00 (0.40,2.53)
Manufacturing			
Metal/Transport	5	4	1.23 (0.34,4.40)
Food	14	13	1.08 (0.50,2.33)
Paper	16	9	1.77 (0.77,4.04)
Chemical	7	6	1.16 (0.39,3.41)
Oil Refining	15	7	2.11 (0.86,5.20)
Other	4	4	1.00 (0.26,3.82)
Transportation	17	24	0.70 (0.37,1.33)
Communications/ Utilities	5	3	1.58 (0.40,6.25)
Wholesale/Retail	28	35	0.79 (0.47,1.33)
Finance/Business/Repair	10	16	0.63 (0.28,1.40)
Personal/Entertainment	8	8	1.00 (0.38,2.67)
Professional	15	16	0.94 (0.46,1.93)
Public Administration	19	31	0.60 (0.33,1.09)
State Roads Workers	11	11	1.00 (0.49,2.33)
Other	5	2	2.21 (0.48,10.26)
Unknown	53	51	1.05 (0.69, 1.59)
TOTALS	399	399	

*The intervals shown are of the form $\exp[\ln \theta \pm 2 \text{ std error}(\ln \theta)]$ where θ is the point estimate of the odds ratio with standard error as defined in references 5,6.

males, 125 Black males, and 93 Black females. The mean age at death was 66.5 for cases and 65.1 for controls (for White males the mean age was 65.1 for cases and 63.6 for controls). There was an increasing trend of mortality from pancreas cancer over time for Whites (57 per cent more cases in 1972-75 than in 1960-63) but not for Blacks.

Usual Industry

Information concerning usual industry of employment was available for 87 per cent of White males, 66 per cent of Black males, 98 per cent of White females, and 94 per cent of Black females. Nearly one-half of the Black males with known usual industry were farmers, and most females

worked in the home. The number of Blacks and females in other industries was generally small. Table 1 shows the number of cases and controls among White males and the observed odds ratios for each of 16 industrial categories. Although the results were not statistically significant, (i.e., the interval estimates included the value one), the odds ratios were increased about two-fold in the oil refining and paper industries. The ratios were not remarkable for the other two large manufacturing industries in the state (chemical and food).

The odds ratio for farming, by far the most common industry named, was 1.16 (approximate 95 per cent confidence interval = [0.82, 1.65]), rising to 1.60 (1.02, 2.49) in certain central and northern parishes (Acadia, Webster, Morehouse). There was no overall increase in the odds ratio associated with construction, the second most commonly cited industry; but among white-collar and craftsman construction workers in the Lake Charles area the odds ratio was 2.85 (0.93, 8.60) while older (65+) blue-collar workers in this area had an even higher ratio of 4.21 (1.42, 12.5).

Occupation

Odds ratios for six occupational categories are shown in Table 2. The highest ratio was seen for married White female white-collar workers (3.09 [1.04, 9.17]).

Proximity to Industry

Table 3 shows the number of cases and controls and odds ratios observed for nearness of residence to five of the major manufacturing industries in Louisiana. The risk for White males and females was slightly elevated for residence near oil refineries or food processing plants (especially canneries).

The association of nearness of residence to the paper, chemical, and oil industries was further examined by calculating the distance of each plant within three miles of the individual's residence. There was a two-fold excess observed among those living within one mile of oil refineries compared to those living over three miles away, but the intermediate group (one-three miles distant) showed the lowest mortality. For about one-half of those living within three miles of refineries, estimates of duration of residence could

TABLE 2—Odds Ratios for Major Occupational Categories by Sex and Race

Occupation*	White Males	White Females	Black Males	Black Females
White-collar (001-396)	0.94 (0.67,1.32)	1.37 (0.78,2.42)	0.26 (0.04,1.70)	0.59 (0.07,4.78)
Craftsmen (401-586)	0.97 (0.68,1.38)		1.00 (0.37,2.73)	
Operatives (601-726)	1.17 (0.77,1.79)		1.26 (0.48,3.28)	
Laborers (740-785)	0.94 (0.57,1.55)		1.07 (0.64,1.77)	0.59 (0.07,4.78)
Service Workers (901-986)	1.09 (0.60,1.97)	0.91 (0.38,2.18)	0.68 (0.19,2.38)	0.77 (0.37,1.59)
Farmers (801-846)	1.16 (0.82,1.65)		1.00 (0.57,1.75)	1.00 (0.34,2.93)

*Codes shown are occupation codes of the Occupational Coding System 8.

TABLE 3—Odds Ratios for Residence Near Industry by Sex and Race

Industry	White Males			White Females			Black Males			Black Females		
	Cases	Controls	Odds Ratio	Cases	Controls	Odds Ratio	Cases	Controls	Odds Ratio	Cases	Controls	Odds Ratio
Food Processing	110	103	1.09	79	72	1.14	35	36	0.96	22	28	0.72
Sawmills	82	88	0.92	51	48	1.08	31	33	0.92	23	24	0.95
Chemical	85	82	1.05	44	53	0.80	30	26	1.20	16	15	1.08
Oil Refining	40	35	1.16	36	31	1.19	3	3	1.00	3	2	1.42
Paper	31	35	0.88	27	33	0.80	7	12	0.58	13	10	1.33
Other	51	56	0.90	22	22	1.00	7	15	0.45	14	14	1.00
TOTAL	399	399		259	259		125	125		93	93	

be estimated from public records. Among these individuals, the cases tended to have lived in the area longer than the controls.

Acadian Ancestry

Table 4 shows the number of cases and controls and the odds ratios for three categories of Acadian ancestry. Odds ratios were slightly increased among White males of "probable" and "possible" Acadian ancestry. Logistic analysis indicated an approximate two-fold elevation in the odds ratio for "probable" Acadians among younger Whites (2.22 [1.10, 4.47]) and a 33 per cent decrease in the older groups (0.66 [0.36, 1.22]). Among younger Whites of "probable" Acadian descent, more cases than controls (13 vs. 2) lived in towns with grain mills and miscellaneous food processing plants. The slight increase in the observed odds ratio for White males of "possible" Acadian ancestry was primarily in older men.

Comparison to Lung Cancer Data

In the absence of death certificate information concerning tobacco consumption, the pancreatic-cancer death certificates were compared to those for deaths due to lung cancer, a group expected to include a high proportion of heavy smokers. Of the positive associations detailed above, only the odds ratio for the operative occupational category was reduced to 1.0 when compared to the lung cancer series. The other associations were reduced only slightly, if at all.

Discussion

In a county-by-county survey of pancreas cancer in the U.S., the only geographic cluster occurred in southern Louisiana, extending into the northern part of the state and into Mississippi.^{1, 2} Although rates for all race/sex groups have been rising over time, the clustering was limited to White males, suggesting the role of occupational factors. In this study of death certificates, no statistically significant differences in occupational statements were observed between cancer and non-cancer deaths, although increased odds ratios were observed for workers in the oil refining and paper manufacturing industries. The possibility of environmental pollutants was raised also by the slightly elevated odds ratios among residents, particularly Acadians, living near refineries or food processing plants. The observed increased risk for proximity to oil refineries as determined by major industry in the region was further supported by specific distance measurements to the refineries. Since residential exposure to an industry more than three miles distant may be confounded by other factors, the finding of the lowest mortality in the one-three mile group is not inconsistent with a "dose-response" effect.

Industrial agents have been suspected as causes of pancreas cancer among chemists, metal workers, potroom workers in aluminum mills, and chemical workers exposed to β -naphthylamine and benzidine, but the evidence so far has been preliminary and based on small numbers.⁹ A recent

TABLE 4—Odds Ratios for Likelihood of Acadian Ancestry^a by Sex and Race

	Probable Acadians		Possible Acadians		Unlikely Acadians	
	Cases	Controls	Cases	Controls	Cases	Controls
White Males	28	25	71	61	300	313
Odds Ratio*	1.17(0.66,2.06)		1.21(0.83,1.78)		1.00	
White Females	16	15	51	52	192	192
Odds Ratio	1.07(0.51,2.22)		0.98(0.63,1.53)		1.00	
Black Males	0	1	15	18	110	106
Odds Ratio	—		0.82(0.39,1.71)		1.00	
Black Females	0	1	6	7	87	85
Odds Ratio	—		0.86 (0.28,2.61)		1.00	

*Odds ratios are computed versus "unlikely" Acadian category.

^aBased on family surnames and places of birth (see text).

death-certificate study in Washington State showed an excess of pancreatic cancer among canning and food processing workers, but again the number observed was small.¹⁰

The limitations of death certificate data should be kept in mind, since the statements on occupation and other items provide only a fragmentary description of the work and residential histories and no information on risk factors such as smoking and alcohol consumption.⁹ The apparent underrepresentation of workers in the chemical industry, a dominant industry in the study area, may indicate characteristics of employment which make death certificates a poor substitute for work histories. Nevertheless, this review of Louisiana death certificates suggests several etiologic clues that can be evaluated through case-control interview studies in Louisiana.

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International Nuclear Plant Safety Conference

The International Atomic Energy Agency (IAEA) has announced a forthcoming "International Conference on Current Nuclear Power Plant Safety Issues," to be held October 20-24, 1980 in Stockholm, Sweden. The conference will be structured around plenary sessions with exclusively invited papers, round table discussions, and parallel technical sessions with contributed papers. Contributed papers for technical sessions are invited on:

- Details of incident and accident evaluation and related emergency response
- Advanced safety system design
- Design for operability in emergencies
- Operator training to prevent and mitigate emergencies
- Small-leak loss of coolant accidents
- Specification and qualification of equipment to ensure safety
- Developments in accident and post-accident instrumentation
- Radiological protection concepts in the light of new experiences

Participation in the conference, whether or not a paper will be presented, must be through designation by the Government of a Member State of the IAEA or by an international organization invited to participate.

Participation forms and forms for submission of a paper may be obtained from the appropriate national authority (in the United States, contact J. H. Kane, Office of Technical Information, Department of Energy, Washington, DC 20545). Completed forms must be submitted to the national authority for transmission to the IAEA. Deadline for receipt by the IAEA of the completed form for submission of a paper and of a synopsis of the paper is April 15, 1980.