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**AN EPIDEMIOLOGIC INVESTIGATION OF HEALTH
EFFECTS IN AIR FORCE PERSONNEL FOLLOWING
EXPOSURE TO HERBICIDES**

**MORTALITY UPDATE - 1986
26 DECEMBER 1986**

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<p>The purpose of the Air Force Health Study is to determine whether those individuals involved in the spraying of herbicides in Vietnam during the Ranch Hand operation have experienced any adverse health effects as a result of their participation in that program. The study is designed to evaluate both the mortality (death) and morbidity (disease) in these individuals over a 20-year period beginning in 1982.</p> <p>The Baseline Mortality Report was released in June 1983, the Baseline Morbidity Report in February 1984. Follow-up mortality reports were released in 1984 and 1985. This study has so far failed to demonstrate health effects which can be conclusively attributed to herbicide or dioxin exposure.</p> <p>This report contains summary statistics only for cumulative deaths occurring up to 31 December 1985. These data were not statistically analyzed since the 4 Ranch Hand and 27 Comparison deaths since the last report would not alter the results of the last analysis.</p>			
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As of 31 December 1985 59 Ranch Hand and 312 comparison subjects had died.

The small number of deaths since the last analysis suggests that the findings of the last report are still valid: there are no overall statistically significant differences between the Ranch Handers and their matched comparisons as regards mortality.

Continued mortality surveillance is recommended, since these study groups are still relatively young and healthy. While sufficient time may have elapsed for some clinically significant conditions to occur, additional time is necessary for other conditions, which may possibly be attributable to herbicide exposure, to develop.

Air Force Health Study Mortality Update - 1986

EXECUTIVE SUMMARY

BACKGROUND

The purpose of the Air Force Health Study is to determine whether those individuals involved in the aerial spraying of herbicides in Vietnam during the Ranch Hand operation have experienced any adverse health effects as a result of their participation in that program. The study is designed to evaluate both the mortality (death) and morbidity (disease) in these individuals over a 20 year period beginning in 1982.

The Baseline Mortality Report was released in June 1983, the Baseline Morbidity Report in February 1984. Follow-up mortality reports were released in 1984 and 1985. This study has so far failed to demonstrate health effects which can be conclusively attributed to herbicide or dioxin exposure. The reader is referred to the study reports for further details (1, 2, 3, 4).

RESULTS

This report contains summary statistics only for cumulative deaths occurring up to 31 December 1985. These data were not statistically analyzed since the 4 Ranch Hand and 27 Comparison deaths since the last report would not alter the results of the last analysis. Current percent dead by group, rank and occupation are shown below.

Percent Dead		
<u>Rank</u>	<u>Ranch Hand</u>	<u>Comparison</u>
Officer	3.6	4.7
Enlisted	5.3	5.3
<u>Occupation</u>		
Flying	4.0	5.5
Ground	5.4	4.6
<u>Total</u>	4.7	5.1

The small number of deaths since the last analysis suggests that the findings of the last report are still valid: there are no overall statistically significant differences between the Ranch Handers and their matched comparisons as regards mortality. These data will be subjected to extensive statistical analysis in the next report, planned for 1987.

CONCLUSION AND RECOMMENDATION

Continued mortality surveillance is recommended, since these study groups are still relatively young and healthy. While sufficient time may have elapsed for some clinically significant conditions to occur, additional time is necessary for other conditions, which may possibly be attributable to herbicide exposure, to develop.

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Air Force Health Study Mortality Update - 1986

1. Introduction

This report updates the findings of the last mortality report (4) released on 29 November 1985. This report contains summary statistics only, without statistical analysis, since so few deaths occurred during 1985. Noncause-specific findings, taken from the last mortality report, are summarized in the Appendix. A complete analyses of these data will be presented in the 1987 report. The reader is referred to the baseline mortality report (1), released on 30 June 1983, for information regarding the study design and mortality determination process.

2. Data Summary and Interpretation

Summary counts of the population at risk and the number of deaths in each of the two groups (Ranch Hand and Comparison) stratified by rank and occupation are shown in Table 1. Table 2 contains the counts of new deaths in the populations since the last report. Table 3 contains summary counts and death rates by occupation, race and group. All tables in this report correspond to similar tables in the last annual report. These counts reflect cumulative mortality as of 31 December 1985 (certified as of 15 April 1986).

Table 1

Summary Counts of Death by Rank and Occupation

Rank	Ranch Hand			Comparison		
	At risk	Dead	Rate (%)	At risk	Dead	Rate (%)
Officer	466	17	0.036 (3.6)	2278	106	0.047 (4.7)
Enlisted	791	42	0.053 (5.3)	3893	206	0.053 (5.3)
<u>Occupation</u>						
Flying	646	26	0.040 (4.0)	3163	173	0.055 (5.5)
Ground	611	33	0.054 (5.4)	3008	139	0.046 (4.6)
<u>Total</u>	1257	59	0.047 (4.7)	6171	312	0.051 (5.1)

In Table 2, the number "At risk" is the number alive on 1 January 1985.

Table 2

Deaths During 1985 by Rank and Occupation

Rank	Ranch Hand			Comparison		
	At risk	Dead	Rate per 100	At risk	Dead	Rate per 100
Officer	450	1	0.2	2180	8	0.4
Enlisted	752	3	0.4	3706	19	0.5
<u>Occupation</u>						
Flying	622	2	0.3	3002	12	0.4
Ground	580	2	0.3	2884	15	0.5
<u>Total</u>	1202	4	0.3	5886	27	0.5

Table 3

Occupational and Race-Specific Cumulative Mortality

Race	Occupation	Ranch Hand			Comparison		
		At risk	Dead	Rate per 100	At risk	Dead	Rate per 100
Non-Black	Officer-Pilot	350	12	3.4	1740	86	4.9
	Officer-Nav.	82	4	4.9	390	16	4.1
	Officer-Other	25	1	4.0	123	4	3.3
	Enlisted-Flt Eng.	191	7	3.7	935	61	6.5
	Enlisted-Other	533	30	5.6	2628	123	4.7
Black	Officer-Pilot	6	0	0.0	13	0	0.0
	Officer-Nav.	2	0	0.0	10	0	0.0
	Officer-Other	1	0	0.0	2	0	0.0
	Enlisted-Flt Eng.	15	3	20.0	75	10	13.3
	Enlisted-Other	52	2	3.8	255	12	4.7
Total		1257	59	4.7	6171	312	5.1

Summary counts by rank, occupation and group are shown in Table 4.

Table 4

Summary Counts by Rank, Occupation and Group

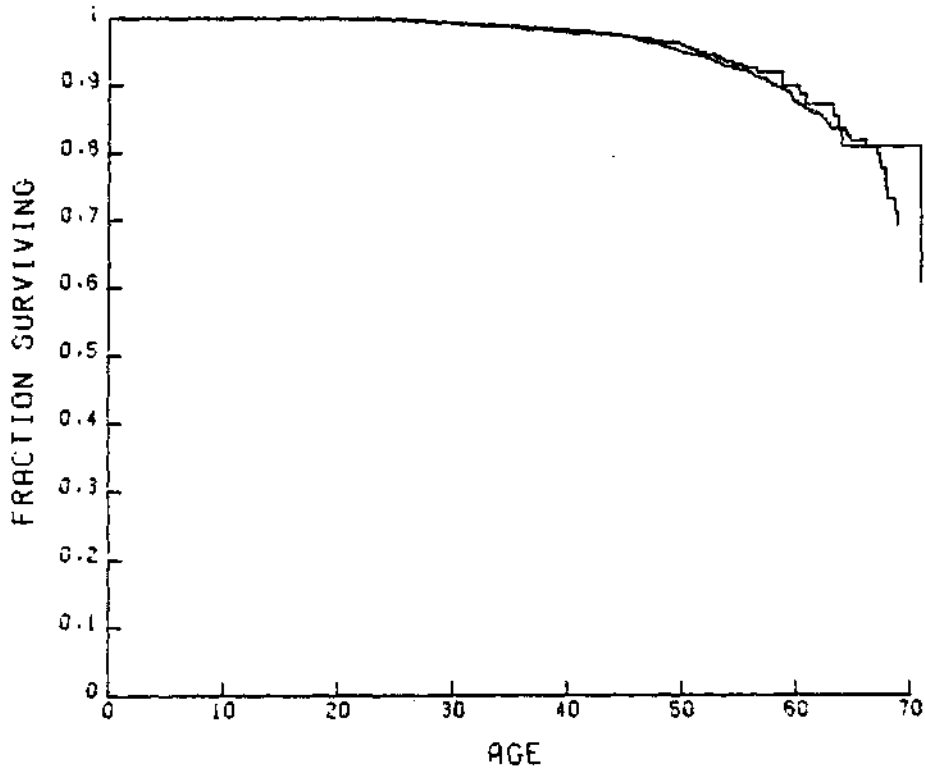
Group	Flying Personnel								
	Officer			Enlisted			Total		
	At risk	Dead	Rate per 100	At risk	Dead	Rate per 100	At risk	Dead	Rate per 100
Ranch Hand	440	16	3.6	206	10	4.9	646	26	4.0
Comparison	2153	102	4.7	1010	71	7.0	3163	173	5.5
Group	Ground Personnel								
	Officer			Enlisted			Total		
	At risk	Dead	Rate per 100	At risk	Dead	Rate per 100	At risk	Dead	Rate per 100
Ranch Hand	26	1	3.8	585	32	5.5	611	33	5.4
Comparison	125	4	3.2	2883	135	4.7	3008	139	4.6

The death rates in Tables 1 through 4 are very similar to the corresponding rates in the 1985 report. For example, the overall Ranch Hand ground personnel rate of 5.4%, shown in Table 4, has increased from 5.1%, shown in the last report, due to 2 Ranch Hand ground deaths during 1985. Although the overall Ranch Hand and Comparison death rates of 4.7 and 5.1 percent, shown in Table 1, are very comparable, Table 4 suggests that group contrasts change with rank and job. That is, the Ranch Hand flying officer death rate (3.6) is smaller than that of their matched comparisons (4.7), while the situation is reversed for enlisted ground personnel with the Ranch Hand rate (5.5) being greater than that of the Comparisons (4.7). The statistical significance of this reversal will be assessed in the 1987 report.

Survival curve estimates for all Ranch Handers and all comparisons are shown in Figure 1.

Figure 1

Survival Curve Estimates for All Ranch Handers and All Comparisons



Deaths by cause, group, rank and occupation are shown in Table 5. This corresponds to Table 16 in the 1985 report.

Table 5

Deaths by Cause, Group, Rank and Occupation

	Officer				Enlisted				Total	
	Flying		Ground		Flying		Ground			
	RH	C	RH	C	RH	C	RH	C	RH	C
Accident	8	33	0	1	4	27	8	36	20	97
Suicide	0	5	1	1	1	3	1	10	3	19
Homicide	0	0	0	0	0	2	2	3	2	5
Parasitic Infection	0	2	0	0	0	0	0	2	0	4
Malignant Neoplasm	1	18	0	1	1	14	5	25	7	58
Uncertain Neoplasm	0	1	0	0	0	0	0	1	0	2
Endocrine	0	1	0	0	0	1	1	0	1	2
Mental Disorder	0	0	0	0	0	0	0	1	0	1
Nervous System	0	1	0	0	0	0	0	1	0	2
Circulatory System	5	32	0	0	1	15	13	47	19	94
Respiratory System	0	2	0	0	0	3	0	2	0	7
Digestive System	2	5	0	1	2	4	2	5	6	15
Genitourinary System	0	1	0	0	0	0	0	2	0	3
Congenital Abnormalities	0	0	0	0	0	1	0	0	0	1
Ill Defined	0	1	0	0	1	1	0	0	1	2
Total	16	102	1	4	10	71	32	135	59	312

Deaths during 1985 by cause are shown in Table 6.

Table 6

Deaths During 1985 by Cause

Cause	Ranch Hand	Comparison
Accident	1	1
Suicide	0	1
Malignant Neoplasm	1	7
Endocrine	0	1
Circulatory System	1	14
Digestive	1	2
Congenital Anomalies	0	1
Total	4	27

3. Conclusion

No statistical inference can be drawn from these summary counts since these data were not analyzed, although the low counts in Table 2 suggest that the conclusions of the last report are still valid. These data will be subjected to regression analyses of the hazard ratio and of the SMR in the 1987 mortality report.

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APPENDIX

Noncause-Specific Statistical Summary
1985 Mortality Update

Age at Death

<u>Group</u>	<u>Logrank</u>	
	<u>Value</u>	<u>P-Value</u>
Officer	-0.835	0.40
Enlisted	0.187	0.85
Flying	-1.34	0.18
Ground	0.976	0.33
Total	0.305	0.76

Deaths to Date

<u>Group</u>	<u>RR</u>	<u>P-Value</u>	<u>SMR</u>	<u>P-Value</u>
Officer	0.715	0.26	0.791	0.37
Enlisted	0.987	0.94	1.03	0.89
Flying	0.692	0.12	0.726	0.13
Ground	1.21	0.35	1.23	0.33
Total	0.915	0.57	0.954	0.73