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**AIR FORCE HEALTH STUDY
(PROJECT RANCH HAND II)**

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

**MORTALITY UPDATE - 1989
17 APRIL 1989**

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This report contains analyses of cumulative deaths occurring up to 31 December 1987. These data show no statistical difference between the cumulative mortality of 1,261 Ranch Hands and that of 6,250 matched Comparisons and the entire population of 19,101 Comparisons. To date, 5.8% of the Ranch Hands, 6.02% of the matched Comparisons and 5.44% of the Comparison population have died.

The overall cumulative mortality of the Ranch Hands remains statistically indistinguishable from that of both their matched Comparisons and the entire Comparison population, although there is a statistically significant increasing trend in post-1983 death rates among Ranch Hand flying officers and a statistically significant increase in Ranch Hand digestive system deaths relative to the Comparison population; these findings are not suggestive of a herbicide effect. Ranch Hands are equivalent to all Comparisons in cumulative accidental, malignant neoplasm and circulatory system mortality.

Executive Summary

An evaluation of data through 31 December 1987 (certified as of 15 June 1988) has found no statistical difference between the cumulative mortality of 1,261 Ranch Hands and that of 6,250 matched Comparisons and the entire population of 19,101 Comparisons. The overall adjusted Ranch Hand mortality rate is 2.81 deaths per 1000 person-years and the corresponding rates for the matched Comparisons and the Comparison population are 2.74 and 2.87 deaths per 1000 person-years respectively. To date, 5.87% of the Ranch Hands, 6.02% of the matched Comparisons and 5.44% of the Comparison population have died.

Restriction to deaths occurring after 1983, however shows a statistically significant increasing trend in the standardized mortality ratio (SMR), unadjusted for year of birth, during the years 1983 through 1987 among flying officers, flyers, officers and all personnel. The trends in flyers, officers and all personnel are attributed to the increasing trend among flying officers wherein the calendar year-specific SMR's were 0.00 in 1983, 0.59 in 1984, 0.69 in 1985, 2.80 in 1986 and 1.75 in 1987. This pattern is due to unusually low Ranch Hand death rates prior to 1986 and increased numbers of Ranch Hand circulatory and malignant neoplasm deaths during 1986 and 1987. However, Ranch Hand malignant neoplasm deaths in this stratum during 1986 and 1987 are not restricted to a particular anatomic site or cancer type. Additionally, current TCDD assay results suggest that flying officers were among the least exposed of all Ranch Hand personnel. These trends could not be analyzed with respect to the exposure index due to sparseness. Although they appear unrelated to herbicide exposure, these results remain unexplained at this time. Continued surveillance is indicated to determine whether this trend continues.

This evaluation differs from previous statistical contrasts of Ranch Hand and Comparison mortality in that the mortality experience of the entire Comparison population has been determined as the standard for assessing Ranch Hand mortality. This expansion of the mortality study was prompted by an analysis of mortality through 31 December 1983 which revealed heterogeneity within the cohort of matched Comparisons.

All analyses in this update contrast Ranch Hand mortality with that of the matched Comparisons of previous reports as well as with the mortality of the entire Comparison population. The results of both assessments are similar, with the overall adjusted relative risks assessing Ranch Hand cumulative mortality with matched Comparisons and with all Comparisons estimated as 1.00 and 1.01, respectively.

Adjusted cumulative cause-specific analyses reveal group equivalence in accidental, malignant neoplasm and circulatory deaths. Digestive system deaths are statistically significantly more frequent in Ranch Hands (unadjusted SMR=2.7, P=0.01) relative to the Comparison population. However, five of the six Ranch Hand digestive system deaths were attributable to alcohol consumption and, therefore, this finding is considered unrelated to herbicide exposure.

Analyses of Ranch Hand mortality versus exposure to dioxin, as estimated by the Air Force exposure index, reveal no significant association between mortality and exposure.

In conclusion, the overall cumulative mortality of the Ranch Hands remains statistically indistinguishable from that of both their matched Comparisons and the entire Comparison population, although there is a statistically significant increasing trend in post-1983 death rates among Ranch Hand flying officers and a statistically significant increase in Ranch Hand digestive system deaths relative to the Comparison population; these findings are not suggestive of a herbicide effect. Ranch Hands are equivalent to all Comparisons in cumulative accidental, malignant neoplasm and circulatory system mortality.

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