

Camp Lejeune Health Studies

Evaluation of mortality among Marines and Navy personnel exposed to contaminated drinking water at USMC Base Camp Lejeune: A retrospective cohort study

Study Purpose

The purpose of this study was to determine whether residential exposures of Marines and Navy personnel to contaminated drinking water at Camp Lejeune increased risk of mortality from cancers and other chronic diseases.

What Was Studied

The study evaluated specific causes of death in 154,932 Marines and Navy personnel who began service during 1975-1985¹ and were stationed at Camp Lejeune anytime during this period. We also evaluated a comparison group of 154,969 Marines and Navy personnel from Camp Pendleton. The Camp Pendleton group was not exposed to contaminated drinking water, but was otherwise similar to the Camp Lejeune group.

Cause of death data from 1979-2008 was used to study the Camp Lejeune and Camp Pendleton cohorts. Information on causes of death was obtained from the National Center for Health Statistics National Death Index (NDI). The study included all underlying causes of death that other studies have shown associations with one or more of the chemicals found in the drinking water at Camp Lejeune. Causes of death were selected based on literature reviews conducted by the U.S. Environmental Protection Agency (EPA), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), and ATSDR.

The causes of death studied include:

- Amyotrophic lateral sclerosis (ALS)
- Cancers of the bladder, brain, cervix, colon, esophagus, female breast, kidney, larynx, liver, lung, oral cavity, pancreas, prostate, rectum, and soft tissue
- Hematopoietic cancers
 - Hodgkin's Lymphoma
 - Leukemias
 - Multiple myeloma
 - Non-Hodgkin's lymphoma
- Non-cancerous kidney diseases
- Non-cancerous liver diseases
- Multiple sclerosis

¹Unit information with location for marines and navy personnel was not available in the Defense Manpower Data Center personnel database prior to 1975. The most heavily contaminated wells were shut down in 1985.

Continued on next page



Also included in the study were three causes of death that are known to be caused by cigarette smoking but are not known to be associated with the drinking water contaminants: cardiovascular disease, chronic obstructive pulmonary disease (COPD), and stomach cancer. These causes of death were included to assess the possible impact of smoking on the findings because we did not have information on smoking status for study subjects.

Features of this Study

The study included a comparison population from Camp Pendleton that was similar to the Camp Lejeune cohort on risk factors such as military training, occupations, and smoking. Camp Pendleton did not have a contaminated drinking water supply.

Residential cumulative exposure to each contaminant was based on results from the water modeling and the location and duration of residence.

Key Results

Compared to Camp Pendleton, the Camp Lejeune group had higher mortality rates for the following causes of death:

- Cancers of the cervix, esophagus, kidney, liver, lung, pancreas, prostate, rectum, and soft tissue
- Hodgkin's lymphoma
- Leukemias
- Multiple myeloma
- Multiple sclerosis

The higher rates for kidney cancer, cervical cancer, Hodgkin's lymphoma, leukemias, multiple myeloma, and lung cancer were mainly among those with higher cumulative exposures to the contaminants. However, the precision of the estimated rates of many of these conditions was low.

The findings for the smoking-related causes of death such as stomach cancer, cardiovascular disease, and COPD suggested that smoking would have only a slight impact on the associations between causes of death and exposure to the drinking water contaminants at Camp Lejeune.

Conclusion

The study found increased risk of death in the Camp Lejeune cohort for several causes including cancers of the cervix, esophagus, kidney, and liver, Hodgkin's lymphoma, and multiple myeloma. This study makes an important contribution to the body of evidence about harm caused by these chemicals. However, due to its limitations it does not provide definitive evidence for causality nor can it answer the question whether an individual has been affected by these exposures at Camp Lejeune.