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LIFTING THE CLOUD OF AGENT ORANGE

Air Force Health Study brings science of epidemiology to the Agent Orange issue with help from SAS®

Industry

Government

Business Issue

Determine health risks and study long-term effects of exposure to Agent Orange.

Solution

SAS® software provides fast, efficient analyses and reporting.

Benefits

Medical and financial relief for sick veterans and their families.

It was one of the most controversial operations in one of America's most controversial wars. The tactical use of herbicides in Vietnam carried unintended consequences that linger nearly 40 years after the last drop was sprayed.

Of the 19 million gallons of herbicides that US warplanes sprayed onto the jungles and croplands of South Vietnam, 11 million gallons were the defoliant commonly known as Agent Orange. The military action was supposed to destroy food supplies and hiding places used by the North Vietnamese. The health consequences of exposure to Agent Orange and its dioxin contaminant have been a topic of intense scientific investigation and debate since herbicide spraying ceased in 1971.

Since 1978, the US Air Force has been studying the health concerns of veterans and their families as well as trying to determine the long-term health risks attributable to Agent Orange exposure. From the beginning, the Air Force Health Study has relied on SAS to make sense of all the variables associated with the study.

Operation Ranch Hand, as the military action was called, took place from 1962 until 1971, when the US secretary of defense shut it down after researchers discovered that dioxin and other chemical components of Agent Orange were possibly associated with birth defects in lab animals.

As a result, in part, of the Air Force's findings using SAS, exposed troops who suffer from various forms of cancer and endocrine-related diseases receive treatment and compensation from the US Department of Veterans Affairs (VA).

Narrowing the scope

Scheduled to be completed in 2006, the study has resulted in findings that analysts say they couldn't have made without the use of SAS. "We are fully invested in SAS," says Dr. Joel Michalek, the study's Principal Investigator. "We generated about 26,000 SAS command files and about 8,000 SAS data tables. All of our statistical analysis, graphics and report writing depend on SAS."

The study is the largest, most detailed follow-up study ever conducted among humans who were exposed to a chemical. It consists of 2,200 participants who underwent physical examinations every five years for 20 years, a group of 1,200 veterans in the exposed group, a group of 19,000 veterans in the control population, and 2,500 of the veterans' children. The study's data comes from physical exams, questionnaires, medical records and death certificates.

"It's complex and sometimes difficult to interpret because we're measuring numerous outcomes — up to 300 different measures of health on each person," Michalek says. "When the study began, there was little known about the effect of this exposure, and so the scope

> "SAS is the reason we're able to do our job, and we're not impeded in any way by SAS."
>
> **Dr. Joel Michalek**
> Principal Investigator
> Air Force Health Study

was really wide. Using SAS, we've been able to determine that we're dealing with just two areas: cancer and endocrine."

Essential to success

Analysis files include health outcomes and risk factors, such as use of tobacco and alcohol, as well as disease outcomes and laboratory results like cholesterol and triglyceride levels. The idea is to compare these variables between the control group and the exposed group to determine what health-related and reproductive outcomes are associated with Agent Orange exposure.

"SAS is absolutely essential," says Billy Jackson, a statistician involved with the study. "In a longitudinal study like this, you can't keep changing software every five years."

Sometimes Jackson, Michalek and fellow statistician Norma Ketchum need to look at old programs written, say, in 1982 to try to reproduce something that occurred then. While they no longer have the version of SAS used at that time, they can still get the program up to speed in a hurry.

The study's results are published in peer-reviewed journals and are presented at scientific meetings. All statistical data is released publicly, and methods and results are reviewed by the National Academy of Sciences (NAS).

"This is a sensitive issue of national scope," Michalek says. "It's a project of continued interest by the US House of Representatives and the Senate as well as various government agencies, including the Centers for Disease Control, the VA, the National Institute for Environmental Health and Safety, and the Environmental Protection Agency."

SAS® uncovers cancer link

The team's findings might have benefits for Vietnam vets in general. Using SAS, it discovered that control group veterans who had never been exposed to Agent Orange still had an increased risk of cancer, and the risk grew with increased length of service in Southeast Asia. "We hadn't expected to see that," Michalek says. "So it's been written into an article and submitted to a journal."

SAS expedites the production of publication-quality documents with unprecedented efficiency, Michalek says. The study team moves findings from SAS output into Microsoft Word using the SAS output delivery system. And SAS/GRAPH® allows them to produce publication-quality graphs as computer graphic metafiles for use in Word and Microsoft PowerPoint.

"SAS has enabled us to perform optimally in our research," Michalek says. "SAS is the reason we're able to do our job, and we're not impeded in any way by SAS."