



Highlights of [GAO-04-159](#), a report to Congressional Requesters

## Why GAO Did This Study

Since the end of the Gulf War in 1991, many of the approximately 700,000 U.S. veterans have experienced undiagnosed illnesses. They attribute these illnesses to exposure to chemical warfare (CW) agents in plumes—clouds released from bombing of Iraqi sites. But in 2000, the Department of Defense (DOD) estimated that of the 700,000 veterans, 101,752 troops were potentially exposed. GAO was asked to evaluate the validity of DOD, Department of Veterans Affairs (VA), and British Ministry of Defense (MOD) conclusions about troops' exposure.

## What GAO Recommends

GAO recommends that the Secretary of Defense and the Secretary of Veterans Affairs not use the plume-modeling data for any other epidemiological studies of the 1991 Gulf War, since VA and DOD cannot know from the flawed plume modeling who was and who was not exposed. VA concurred with GAO's recommendation, but DOD did not concur.

GAO also recommends that the Secretary of Defense require no additional plume modeling of Khamisiyah and other sites. DOD concurred with GAO's recommendation.

The Central Intelligence (CIA) did not concur with the report, stating that it could not complete its review of the draft report in the time allotted.

[www.gao.gov/cgi-bin/getrpt?GAO-04-159](http://www.gao.gov/cgi-bin/getrpt?GAO-04-159).

To view the full product, including the scope and methodology, click on the link above. For more information, contact Keith Rhodes at (202) 512-6412 or [rhodesk@gao.gov](mailto:rhodesk@gao.gov).

# GULF WAR ILLNESSES

## DOD's Conclusions about U.S. Troops' Exposure Cannot Be Adequately Supported

### What GAO Found

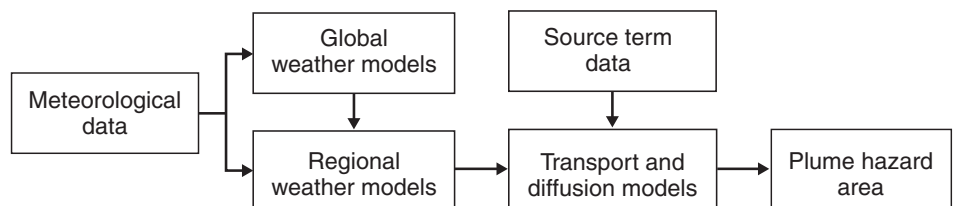
DOD's and MOD's conclusions about troops' exposure to CW agents, based on DOD and CIA plume modeling, cannot be adequately supported. The models were not fully developed for analyzing long-range dispersion of CW agents as an environmental hazard. The modeling assumptions as to source term data—quantity and purity of the agent—were inaccurate because they were uncertain, incomplete, and nonvalidated.

The plume heights used in the modeling were underestimated, and so were the hazard areas. Postwar field testing used to estimate the source term did not realistically simulate the actual conditions of bombings or demolitions. Finally, the results of all models—DOD and non-DOD models—showed wide divergences as to plume size and path.

DOD's and VA's conclusions about no association between exposure to CW agents and rates of hospitalization and mortality, based on two epidemiological studies conducted and funded by DOD and VA, also cannot be adequately supported because of study weaknesses. In both studies, flawed criteria—DOD's plume model and DOD's estimation of potentially exposed troops based on this model—were used to determine exposure. This may have resulted in large-scale misclassification.

Troops under the path of the plume were classified as exposed; those not under the path, as not exposed. But troops classified as not exposed under one DOD model could be classified as exposed under another DOD model. Under non-DOD models, however, a larger number of troops could be classified as exposed. Finally, as an outcome measure, hospitalization rate failed to capture the types of chronic illnesses that Gulf War veterans report but that typically do not lead to hospitalization.

### The Plume-Modeling Process



Source: GAO.