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# Actuarial analysis of Agent Orange Program

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From 1961 to 1972 approximately 3.5 million American, Australian, and New Zealand servicemen and women served in or near the Vietnam combat area. During that period, an estimated 20 million gallons of chemical defoliants, the best known of which is Agent Orange, were used to eliminate known or potential enemy hiding places.

In 1979 a veteran sued several major U.S. chemical companies alleging a wide range of health effects from exposure to Agent Orange and other defoliants. In 1983 this suit was expanded into a class action.

In 1984 the claimants and the chemical companies reached a settlement. While admitting no liability, nor any cause-and-effect relationship between the defoliants and any health effects (other than cloracne, a skin condition), the chemical companies agreed to pay \$180 million into a settlement fund.

Under a unique structure established by the court, the fund was to be divided into three parts:

- 1) about 2% for non-U.S. service personnel,
- 2) about 23% for a "class-assistance" fund to establish and fund support organizations to help veterans and their dependents, and

3) the rest for direct "insurance-style" benefits to disabled veterans and the eligible survivors of deceased veterans, based upon a general payment structure established by the court.

In 1988, after all legal challenges to this settlement approach were completed, we began work on the unusual actuarial problem presented by the third part of the fund.

## The actuarial problem

The court-established benefit formulas specified benefits in terms of "units." The number of "units" payable was based on the date of incidence of disability or death — the number being reduced if close to the 12/31/94 end of the payment program, and on age — the number being reduced if disability or death occurs later in life. In addition, disability awards were to be annual installments continuing until the earlier of the end of the program or termination of disability.

The purpose of the actuarial analysis was to provide the information necessary to choose dollar values per unit so that the available funds would be sufficient to pay eligible claims filed and to cover administrative expenses.

## The model

The population of veterans exposed to Agent Orange is a closed group with a distinct age-sex-race composition that has generated and will

continue to generate eligible deaths and disabilities. However, many eligible veterans or survivors may not utilize the payment program either because, despite extensive publicity, they do not know of its existence or because they believe they are ineligible. This latter cause may be particularly prevalent, because many veterans may not realize they were exposed to Agent Orange.

The estimation of disability claim incidence and duration from a closed group with known characteristics is a traditional actuarial problem, and data are relatively easily available. The same cannot be said, however, of the utilization variable as it applies to this unique case. Further, this variable would be least predictable for the group eligible for the largest awards, namely those with incidence well into the past. These eligible veterans or survivors may have lost contact with veterans organizations or even society in general for various reasons. Nonetheless, a successful analysis required accurate estimation of this group's utilization.

Because of these factors, we decided to separate the estimated claimant group into two parts, those with incidence before 1/1/89, and those with incidence after that date and before the end of the program. The methods for analyzing these two components differed.

For incidence before 1/1/89 we made no attempt to estimate utilization as such. Rather, several circumstances allowed us to project directly the final result, namely, the number of claims actually received by the claims administrator. These circumstances were:

- 1) the program had already received wide publicity,
- 2) mailing of claim kits to those requesting them began in November 1988, and
- 3) payments were to be made beginning February 1989.

Thus, we would be able to directly observe how many kits were mailed, how fast they were returned, and the number and distribution of resulting eligible claims. While not all kits would be returned and processed in time to simply measure all existing

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## Science foundation seeks conference proposals

To stimulate interest and activity in mathematical research, the National Science Foundation each year supports eight to ten NSF-CBMS regional research conferences. A panel chosen by the Conference Board of the Mathematical Sciences makes the selections from among the submitted proposals.

Each five-day conference features a distinguished lecturer who delivers 10 lectures on a topic of important current research in one sharply focused area of the mathematical sciences. The lecturer subsequently prepares an expository monograph based upon these lectures, which is normally published as a part of a regional conference series. Depending on the conference topic, the monog-

raph is published by the American Mathematical Society or the Society for Industrial and Applied Mathematics, or jointly by the American Statistical Association and the Institute of Mathematical Statistics.

Support is provided for about 30 participants at each conference, and the conference organizer invites both established researchers and interested newcomers, including graduate students, to attend.

Guidelines for submitting proposals may be obtained by writing or calling the Conference Board of the Mathematical Sciences: CBMS, 1529 Eighteenth Street, N.W., Washington, D.C. 20036, 202-293-1170.

**Agent Orange cont'd**

claims and their distribution and thus to set the value of payment units before payments commenced, we felt an adequate sample would be available to estimate these variables.

The method of projecting claims after 1/1/89 was more traditional in that we directly modeled death claim incidence using population distributions and mortality rates. For disabilities we judged the incidence of the 1982 SOA Group LTD study with a six-month elimination period to be the best match with the court-determined definition of disability. Disability termination rates were based on the Krieger table.

The *Statistical Abstract of the United States* was used for the size and age distribution of the Vietnam veteran population as a whole, as well as for the racial composition, which was assumed to be the same as that of the general population. The population also was assumed to be entirely male.

The level of exposure to Agent Orange within the population was not estimated as such. The court separately had commissioned consultants to develop a model that, using military information and data supplied by claimants, determines the level of the individual's exposure. The consultants estimated from a sample of approximately 5,000 claimants that 90% of all claimants met the exposure criteria established by the court. With these assumptions, the model could estimate total "units" to be paid, and these were then used to determine the values for each unit.

**Ongoing**

The task of setting initial dollar values per unit was completed early this year. However, the process is ongoing. The analyses used to set these values must be periodically redone as new data become available. Increasingly, of course, the analysis shifts from projecting what will happen to merely incorporating what already has happened. The ultimate goal is to pay all eligible claims and exactly exhaust the fund at the end of the program.

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# Transactions papers – Review procedures, tips for authors

by James R. Thompson  
and Klaus O. Shigley

This article explains the review procedures for papers submitted for publication in the *Transactions* and offers prospective authors tips to improve their chances of acceptance.

The review process begins when the author submits a paper to the Society office, where all indications of the author's identity are deleted. The article is then sent to the chairperson of the Committee on Papers.

The chairperson selects five persons to review the article. Although we try to select from permanent members of the Papers Committee, time constraints and lack of sufficient expertise sometimes dictate that we select appropriate reviewers from outside the committee. In the past, for example, the committee has had difficulty locating reviewers for pension papers and turned to a consulting house to find an appropriate reviewer.

Each reviewer subsequently submits an initial review, which includes:

- The reviewer's recommendation to accept, reject, or reject conditionally,
- A summary of the reviewer's opinions on the paper,
- A detailed comments section containing suggestions and/or disagreement with specific points raised in the author's text, and
- An opinion on whether the target audience is broad or narrow, general or technical.

Each reviewer also makes editorial suggestions. These suggestions do not affect the publication decision, but are helpful to the *Transactions* technical editor.

The individual reviews are then submitted to a lead reviewer, who produces a summary review reflecting the best elements of the individual reviews and representing the collective opinion to accept, reject or reject conditionally (resubmit with specific changes). The summary reviewer frequently uses conference calls to clarify comments of individual reviewers. Reviewers are free to change their

comments, to disagree with the summary review and to recommend changes. The summary review is then submitted to the chairperson.

The final decision to accept or reject an article requires a consensus of at least three reviewers and is expressed in writing. Notably, 33 of 35 reviews in a 12-month period studied (August to August) were unanimous or had only one dissent. The other two reviews were three-to-two splits – one article was accepted and the other rejected. This indicates a high degree of consensus among reviewers.

When the final decision has been reached, it is communicated to the Society office, which then communicates it to the author.

The entire process from submission to decision takes about four months. The average time for the initial review is 10 weeks. The summary review takes about five weeks. The total elapsed time for all submissions reflects several very long turnarounds due to business pressures.

There are three potential decisions: accept, reject, or reject with a recommendation to resubmit with specific changes. If an article is resubmitted after a conditional rejection, it will be reconsidered by the original reviewers.

Overall, about one-third of the articles are ultimately accepted. About half the initial rejections are conditional. Reasons for each rejection are given in the cover letter to the author.

Some articles are rejected because they are insubstantial; that is, they describe exercises routinely performed by actuaries in that field and not warranting publication in the *Transactions*. On the other hand, an acceptable article does not have to present original research. For example, we accept educational papers intended for less expert audiences, provided they are comprehensive.

Some articles are rejected because they appear disorganized or unclear. There also may be a judgment that

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