

XVII. ANNEX 1 - EXPOSURE INDEX CONSTRUCTION

When exposure concepts were initially discussed, the principal investigators were optimistic about the feasibility of developing an exposure estimate or index which was specific to the individual study subject. However, as the investigators became more familiar with the operational environment of the Vietnam War and the limitations of the personnel records system, it became obvious that a validated individual-specific exposure index could not be developed. This specific index was dependent on the availability of operational records containing individual flying time data and aircraft maintenance records containing the names of ground support crew members. Because this data was unobtainable, a less specific exposure concept was then developed. This index was to be base-specific rather than individual-specific, and is the index presented in the protocol in this technical report. However, further inquiry disappointingly showed once again that available data sources would not provide adequate information to support the construction of this index. The base-specific index relied upon records to provide a quantitative measurement of the number of missions and amount and type of herbicides sprayed by air crews from each base. This index assumed that all personnel at a given base shared equally in the workload. Unfortunately, the "Herbs tapes" did not specify the base to which spray aircraft were assigned, and the military personnel records did not definitively specify the exact duty locations of all personnel. Thus, a still more generalized exposure concept was necessary.

Although the more refined indices could not be validly applied, it was feasible to develop an exposure index for this study which can be validated, fulfills the requirements of the study design, and is fully supported by available data sources. A crude index can be developed and applied universally to all exposed subjects, regardless of their assigned duties in Vietnam. This index is based solely on the amount of dioxin disseminated throughout Vietnam each month from January 1962 through April 1970. The data to support this index are based on a comprehensive listing of herbicide missions, being developed by the Department of Defense, and estimates of the TCDD content of 2,4,5-T over time. These estimates are being developed and refined at USAFSAM at the present time. A refined exposure index for ground crew members is also feasible and is under development. This index builds on the crude index and takes the experience of ground crew members into account. It also assumes that each individual assigned to these duties in the Vietnam theater carried out his share of the workload in his specialty. This "experience factor" is constructed by dividing the total number of herbicide spray sorties flown during a subject's tour of duty by the number of individuals performing the subject's duties during the period of his tour. Similarly, a refined air crew index can be constructed. This index expands the concept of the ground crew index by including a factor reflecting the variable levels of exposure within the C-123 aircraft. Simulant studies to quantify these differences were conducted, and plans are underway to repeat these studies to revalidate the conclusions.

Symbolic representations of these indices are shown below:

Crude Exposure Index:

$$E_1 = \left\{ \begin{array}{l} \text{TCDD sprayed in the} \\ \text{Vietnam Theater during} \\ \text{the 1th subject's tour} \end{array} \right\}$$

Refined Ground Crew Exposure Index:

$$E_{1 \text{ GND}} = \left\{ \begin{array}{l} \text{TCDD sprayed in} \\ \text{the Vietnam} \\ \text{theater during} \\ \text{the 1th subject's} \\ \text{tour} \end{array} \right\} \times \left\{ \begin{array}{l} \text{Herbicide sorties} \\ \text{performed in the Vietnam} \\ \text{theater during the 1th} \\ \text{subject's tour} \\ \hline \text{Number of ground crew} \\ \text{personnel (job specified)} \\ \text{in the Vietnam theater} \\ \text{during the 1th subject's} \\ \text{tour} \end{array} \right\}$$

Refined Air Crew Exposure Index:

$$E_{1 \text{ AIR}} = \left\{ \begin{array}{l} \text{TCDD sprayed in} \\ \text{the Vietnam} \\ \text{theater during} \\ \text{the 1th subject's} \\ \text{tour} \end{array} \right\} \times \left\{ \begin{array}{l} \text{Herbicide sorties performed} \\ \text{in the Vietnam theater} \\ \text{during the 1th subject's} \\ \text{tour} \\ \hline \text{Number of airmen with} \\ \text{subject's duties in the} \\ \text{Vietnam theater during the} \\ \text{1th subject's tour} \end{array} \right\} \times \left\{ \begin{array}{l} \text{Crew position} \\ \text{weight of the} \\ \text{1th subject} \end{array} \right\}$$

(total amount) X (experience) X (intensity)

The data required to support these indices are either currently available or are in the final stages of development. These indices are feasible and will adequately support the analytic strategy of the study design.