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## Talking Paper for ESG and CDC

The purpose of Phase II is to validate the best method (if any) of estimating Agent Orange exposure from military records of Vietnam veterans by correlating exposure indices for each veteran with the level of TCDD measured in his plasma. We anticipate that about 400 participants (the exact number to be determined) will be needed in this study: 150 in a "low exposure" group and 250 in a combined "high exposure" group. Based on participation rates from the VES, we will need to select approximately 1,000 veterans to get the 400 necessary for the analysis of dioxin levels in blood plasma. Three issues need to be addressed by Centers for Disease Control (CDC) and Environmental Support Group (ESG) staff before attempting to recruit these veterans: (1) eligibility criteria, (2) scoring likelihood of exposure to Agent Orange, and (3) nomination and selection of veterans.

### (1) Eligibility criteria

The ESG used the following criteria in their pilot study:

- a. Single tour enlistee
- b. Grade E5 or below
- c. Served in Vietnam between 10-1-66 and 3-31-69

Other possible criteria proposed by CDC for discussion with ESG are:

- d. All "low-exposed" veterans must have every day of their tour spent in companies completely tracked.
- e. Exclude veterans who served no time in a line company in a tracked unit.

Related Issues:

1. Can men from battalions 43 and 50 be used for this study?
2. Is the tracking information good enough to use artillery battalion 6?
3. Will data from battalion 20 be expanded?
4. It appears that we will be a bit short of men who score zero on all methods.

### (2) Scoring likelihood of exposure to Agent Orange

Each veteran eligible by the criteria arrived at in Section (1) will be scored by CDC for probable exposure to Agent Orange by four methods described below. The methods vary in how they consider the time and distance proximity to Agent Orange applications.

#### 1. Acute

The following measure acute exposure: Encounter score or "Hits" and the "intermediate compartment" score (E2) of an exponential decay model. For the Hits score a veteran is given a value of 1 on a day if the location of his company is within 2 kilometers of any application on that day or within 6 days after the application, otherwise his value

is zero. For example, if a veteran's company is within 2 kilometers of a spray application on the day of spraying he is given 1 hit and if his company is still present within 2 kilometers during the next 6 days add 1 to his score for each day present. The E2 score is the same as the Hits score but weights the hits according to time since spraying:

E2 Score with 2 day half-life and 2 km cutoff (E2-2)

- 1: if within 2 km on day of spray
- 0.5: if within 2 km two days after spray
- 0.25: if within 2 km four days after spray
- 0.125: if within 2 km six days after spray
- 0: if more than 2 km from spray path

For the "low exposure" group 5 km is proposed for the E2 score (E2-5).

## 2. Chronic and acute (these emphasize "chronic")

Two indices measure both chronic and acute exposure simultaneously: Zone (or "Area") scores and the "slow compartment" score (E3) of an exponential decay model. For the Area score a veteran is given a value of 1 on a day if the centroid (median x, median y) of his battalion is within at least one of four large zones within III Corps (War Zones C and D, Iron Triangle, Rung Sat Special Zone) in which spray applications are known to have been relatively common during the war, otherwise his value is zero for that day. The E3 score is more restrictive for distance than the Area score, and it weights hits according to time since spraying:

E3 score with 5 year half-life and 2 km cutoff (E3-2)

- 1: if within 2 km within a few days after spray
- 0.87: if within 2 km one year after spray
- 0.76: if within 2 km two years after spray
- 0.66: if within 2 km three years after spray
- 0: if more than 2 km from spray path

For the "low exposure" group 5 km is proposed for the E3 score (E3-5).

In addition to these four methods of scoring we will determine how information on self-assessment of exposure by a structured interview carried out by CDC's contractors relates to TCDD levels.

## (3) Nomination and selection of veterans

The attached tables provide exposure information for veterans in the 6 batches of data collection forms completed by ESG. These batches have been processed by locating agencies IRS, SSA, NDI, VA BIRLS/HINES. The following additional qualification criteria were applied to these veterans:

1. All service time in a tracked battalion
2. At least 180 days in line companies
3. All service time between 10-1-66 and 3-31-69

These restrictions have been used only because these men form the group for which scores have been completed and are immediately available. The scores are currently based on data abstracted by ESG for 1967-1968 only and do not include "imputed" locations. Before final selection these scores should be revised according to ESG's new and corrected unit location data. Scores will be computed for whatever eligibility criteria are adopted.

Table 1 shows the number of veterans with given exposure scores using all available data. Panel A of Table 2 gives the number of veterans by battalion of first assignment and type of exposure score after applying cutoffs to form a "high exposure" group and a "low exposure" group. The top part of the table is for battalions in the ESG pilot study, and the bottom part lists battalions which appear to be rich in men with low exposure scores, where we appear to be a bit poor. One possible strategy for choosing veterans is for CDC to "nominate" men for each study group according to some combination of exposure scores (Panel B of Table 2), then for ESG to verify exposure data upon which the scores are based so that men can be selected with confidence.

Related Issues:

1. For the "low exposure" group, add criterion that a veteran must have no "hits" or a low score for unknown agents as well as Agent Orange?
2. Should a man with a low E3 or area score also be required to have no hits to be included in the "low" group?
3. How extensive (time-consuming) is the job for ESG to confirm "no hits" for the "low" group and "high hits" for the "high" group to be nominated by CDC? If this is a problem, due to CDC's tight schedule, can we have confirmation of a random sample rather than a 100% confirmation?

Table 1. Number of Veterans in the Agent Orange Study (Batches 1-5)

With Given Exposure Scores

Score	<0.1	0.1-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0+
<u>Infantry, Armor, Cavalry (N = 4,056)</u>						
Hits	2,984	266	191	194	49	372
E2-2	2,924	596	137	161	103	135
E2-5	1,994	819	289	137	147	670
<u>Artillery (N = 1,357)</u>						
Hits	1,029	74	50	13	0	191
E2-2	951	214	1	42	4	145
E2-5	748	230	25	52	1	301

Table 2.A. Number of Veterans Eligible\* for TCDD Study by Battalion\*\*

Bat	"High Exposure" Group				"Low Exposure" Group			
	Hit >2	Score			Hit <0.1	Score		
		E2-2 >2	Area >220	E3-2 >350		E2-5 <0.1	Area <40	E3-5 <300
<b>Pilot Study Battalions</b>								
2	206	280	484	314	237	195	2	6
6	191	192	192	207	126	15	1	3
10	224	155	0	157	218	155	404	57
20	0	0	3	1	2	0	0	0
22	32	32	198	2	167	102	1	106
<b>Total</b>	<b>653</b>	<b>659</b>	<b>877</b>	<b>681</b>	<b>750</b>	<b>467</b>	<b>408</b>	<b>172</b>
<b>Other Battalions (with substantial low exposure numbers)</b>								
1	46	1	300	4	423	101	1	102
11	0	0	0	210	361	333	131	116
12	31	0	1	150	189	188	42	43

\* 1) All service time in a tracked battalion.  
 2) At least 180 days in line companies.  
 3) All service time between 10-1-66 to 3-31-69.  
 \*\* Battalion of first assignment

Table 2.B. Number of Veterans by Inclusion in High and  
 Low Exposure Groups for Battalions 2,6,10,20,22\*

Number of Methods Scored	Number of Veterans
	<u>"High Exposure" Group</u>
All 4	182
At least 3	550
At least 2	888
At least 1	1,250
	<u>"Low Exposure" Group</u>
All 4	54
At least 3	212
At least 2	567
At least 1	964

\* Battalion of first assignment. Criteria and  
 cutoffs noted in Panel A applied.