

Introduction

Overview of the Software

This software was developed to help determine exposure to herbicides that were sprayed in Vietnam during the period 1961-1971. The software can evaluate exposure for a person, a group of people (such as members of a military unit) who were all in the same place at the same time, or simply a location such as hamlet, village, or town as long it is provided with the location (in latitude and longitude) and time interval during which exposure could have occurred.

Some researchers may need to deal with large numbers of individuals in many locations over wide ranges of time. The software contains many features to help organize analyses in a systematic way in order to facilitate complex research projects. These features are explained at length in this manual.

There are two main features of the software. The first feature allows a researcher to create and maintain studies in which various datasets are analyzed to produce exposure values. The second feature allows the researcher to analyze data from the HERBS file, which contains a record of every known herbicide spraying which occurred during the Vietnam War.

Quick Start for experienced computer users. The software has been developed with two types of users in mind: professional scientists and interested laypersons. A non-scientist should be able to compute exposures after reading this manual. Individuals who are comfortable using computers in their everyday work and who would like to get a feel for the system without reading the entire manual may jump read the separate "Quick Start" brochure that accompanies this manual.

System Requirements

The Agent Orange Herbicide Exposure Assessment software requires an Intel-compatible computer running Microsoft Windows 2000 or XP with at least 256MB of RAM and 500MB of free hard drive space.

The .NET Framework must be installed prior to the installation of this software. The .NET Framework may be obtained from <http://www.microsoft.com/>.

Using the Software

What Am I Looking At?

When you start the software, the first thing that you see is the main window. All of your work with the software will be performed using this form. The form is split into three panels, each of which has a different function.

The left panel contains buttons which tell the program to perform various actions. Some of the left panel buttons are disabled because those functions are only available when a study is loaded.

The top panel and bottom panel are empty unless a study is loaded. The bottom panel contains a message explaining what your options are. Later, the top panel will contain information about the study and the bottom panel will contain a form to allow you to work with that study.

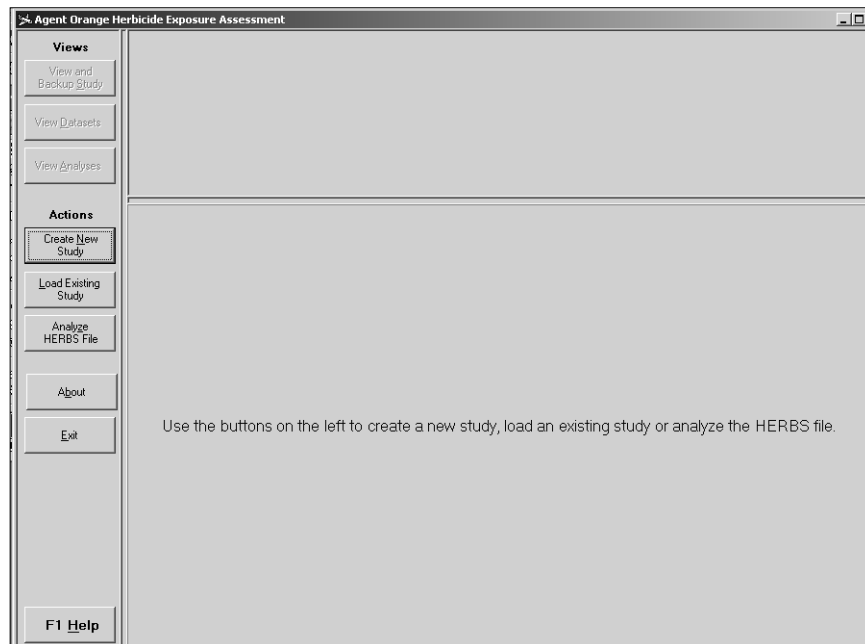


Figure 1: The main window, immediately after the software is loaded. The left panel contains buttons, the top panel is blank and the bottom panel contains a message.

You use the buttons in the left panel to perform tasks with the software. Some of these buttons will cause information to be displayed in the top panel. When this happens, there will be additional buttons displayed in the top panel which allow you to work with the software.

Other left-panel buttons will cause a pop-up window to be displayed. When this happens, you must work inside that pop-up window. You will not be able to use any of the other functions on the main window until the pop-up window is gone.

You may change the size of the main window. It functions like any other window in Microsoft Windows. In addition, you may change the size of any of the panels by clicking on a splitter (the thick lines which separate the panels) and dragging it.

Getting Help

You may request help at any time by either pressing the <F1> key or clicking the button on the main window labeled "F1 Help". This will bring up a separate window containing a section of this manual. Different pages will be shown depending on what feature of the software is being used.

Exiting the Software

You can exit the software from the main window. This can be done at any time unless there is a pop-up window being displayed, in which case you must first close the window to return to the main window. You can exit the software either by pressing the button labeled "Exit" or closing the main window using the Windows close window button (the "X" button in the upper right-hand corner of the window).

Assessing Herbicide Exposure

Using Studies

What is a Study?

A study is a collection of data about the persons or places for whom exposure will be estimated, and includes information about the types of exposure analyses that can be applied to those data. Most researchers will organize their work into one or more studies, each relating to a specific "entity" (person, military unit, or simple set of locations). Before you can assess the herbicide exposure for a dataset, you must create or load a study and import that dataset into the study. The software allows you to create as many studies as you need.

Each study has a name, which you choose, and which you can change at any time. Studies can be created and deleted. A study can be backed up to or restored from a file. All of this is done from the top panel of the main window after you load a study. If the study information is not displayed in the top panel, you can display it by pressing the "View Study Information" button.

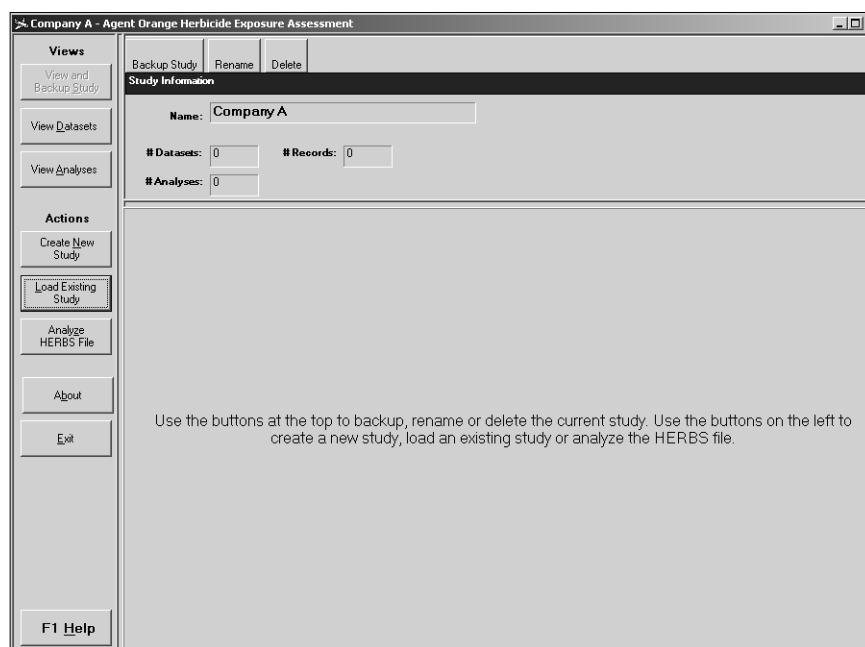


Figure 2: When a study is loaded, information about it is displayed in the top panel

The software displays several pieces of information about the current study in the top panel: its name, the number of datasets it contains, the total number of records in all of the datasets, and the number of analyses in the study.

At the top of the top panel, there are three buttons that allow you to work with studies. You can use these buttons to change the name of the study, delete it or back it up to a file.

Create a New Study

You can create a new study at any time by pressing the "Create New Study" button on the left panel of the main window.

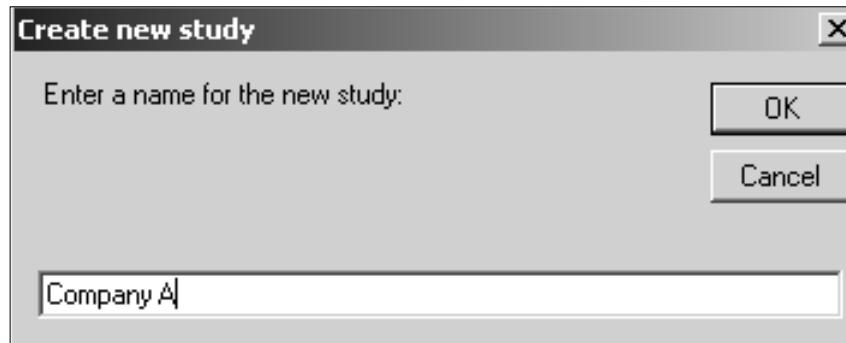
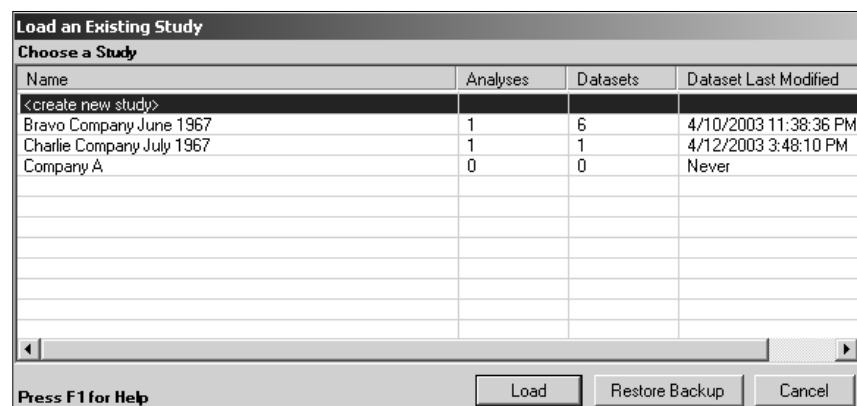
A dialog box titled "Create new study" with a close button (X) in the top right corner. It contains a text input field with the placeholder text "Enter a name for the new study:". To the right of the input field are two buttons: "OK" and "Cancel". Below the input field, the text "Company A" is entered.

Figure 3: When you press the "Create New Study" button on the main window, the software asks for a name for the new study.

After you enter the name of a study and press the "OK" button, the software creates the study and shows information about the study in the top panel.

Load a Study

You can load a study that you previously created at any time by pressing the "Load Existing Study" button on the left panel of the main window. When you press this button, the software displays the "Load an Existing Study" pop-up window.

A dialog box titled "Load an Existing Study" with a subtitle "Choose a Study". It contains a table with four columns: "Name", "Analyses", "Datasets", and "Dataset Last Modified". The table lists several studies, including "Bravo Company June 1967", "Charlie Company July 1967", and "Company A". At the bottom of the dialog box are three buttons: "Load", "Restore Backup", and "Cancel". A status bar at the very bottom says "Press F1 for Help".

Name	Analyses	Datasets	Dataset Last Modified
<create new study>			
Bravo Company June 1967	1	6	4/10/2003 11:38:36 PM
Charlie Company July 1967	1	1	4/12/2003 3:48:10 PM
Company A	0	0	Never

Figure 4: When you press the "Load Existing Study" button on the main window, the software displays this pop-up window.

From the "Load an Existing Study" pop-up window, you have several options. If there are already studies which have been created, they will be displayed in the list. To load one of them, select it and click the "Load" button. An entry named "<Create a new study>" will always be displayed at the top of the list. If you load this one, the software will act as if you had pressed the "Create New Study" left-panel button (see above, "Create a New Study").

If you press the "Restore Backup" button, the software will ask you to locate a previously saved backup file. If you select one, it will restore the study from the backup and then load it (see below, "Backing Up and Restoring Studies"). When a study is restored, all of the analyses and datasets associated with the study are restored into it.

WARNING: The backup file typically has the ".XML" extension. However not all XML files are backups. There are many XML files which reside naturally on most computers running Microsoft Windows XP. If you attempt to use the "Restore Backup" button to load an XML file which is not a valid backup file, the software will display an error message. This will not cause any damage to your system or data.

If you press "Cancel", the pop-up window will close without causing the software to take any action.

Rename or Delete a Study

Once a study is loaded and the study information is being displayed, you can rename or delete it using the "Rename" and "Delete" buttons in the Top Panel.

To rename the study, press the "Rename" button. A pop-up window will prompt you for a new name. If you enter a new name and press "OK", the software will rename the study. If you press "Cancel", the pop-up window will close without causing the software to take any action.

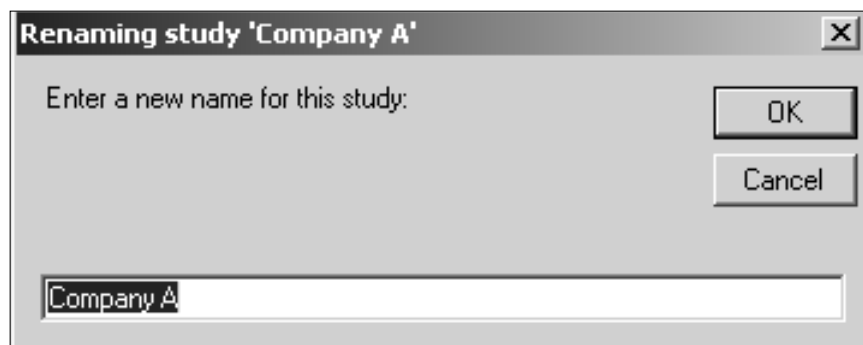


Figure 5: The "Renaming study" window will pop up when the "Rename" button is pressed.

To delete the study, press the "Delete" button. The software will display a pop-up window asking you to confirm the deletion. If you press "Yes", the study will be deleted and the software will return to the same empty main window that is displayed when the software is started. If you press "No", the pop-up window will close without causing the software to take any action.

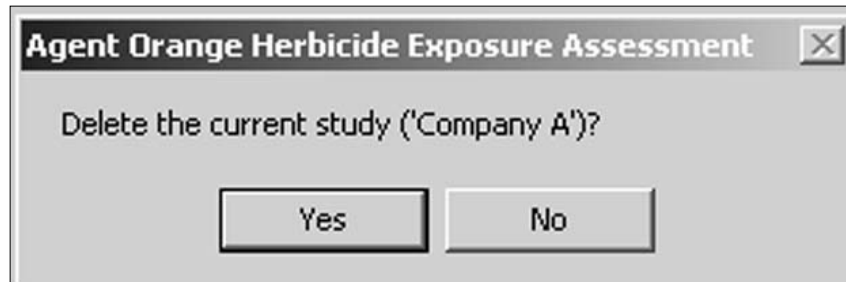


Figure 6: When the "Delete" button is pressed, a pop-up window will ask you to confirm the deletion.

Backing Up and Restoring Studies

There are many reasons that you may want to back up a study. You may want to send data to a colleague via e-mail. You may just want to save your work to a storage device to protect your work from a potential disaster. The Backup/Restore feature of the software allows you to do these things.

Once a study is loaded and the study information is being displayed, you can back up a study by press the "Backup Study" in the top panel. The software will ask you to specify a filename to save the backup. This file should end with the .XML extension. After you specify this file, the software will write all of the study information to it, including all of the datasets and analyses contained in the study. After this is done, you can copy the XML file to a storage device, e-mail it to a colleague, or even delete it.

Backing up a study may take some time, depending on the number of datasets it contains and the number of records in each dataset. A progress bar will be displayed while the backup is in progress.

To restore a backup, use the "Load Study" function (see above, "Load a Study").

Working with Datasets

What is a Dataset?

All working data needed for an exposure calculation reside in a "dataset." A dataset is a special collection of data that the program uses to describe the location and time interval for the people, units, or places for which exposure will be calculated. Every dataset is associated with a particular study, and each study can contain as many datasets as you need. The smallest possible dataset may provide information about one individual, military unit, or specific place in Vietnam. However, datasets may be as large as needed. They can contain data on many people and many places. A typical dataset will often consist of a collection of location histories that track a military unit's movement over time.

This section describes how the user can get his or her own data into a dataset, and how to work with several datasets in one study.

What kind of data does the program need?

A dataset consists of individual "location history records." Each location history record must provide the software with the following five pieces of information:

- An identification code of up to 255 characters
- The longitude of the location for which exposure will be calculated
- The latitude of the location for which exposure will be calculated
- The earliest date for which exposure at that location will be calculated
- The latest date for which exposure at that location will be calculated

The user can give the software this information in either of two ways: by entering it directly from the keyboard or by importing it from a file. In this section we explain how a dataset is created, and illustrate both ways of providing data to the software.

When you press the "View Datasets" button, the software displays a list of all datasets in the study in the top panel. For each dataset, the software displays its name, the date it was created, the date it was last modified (or "null" if it was never modified), the total number of records in the dataset, and the name and time of the analysis last run against the dataset (or "null" if no analysis was ever run against it).

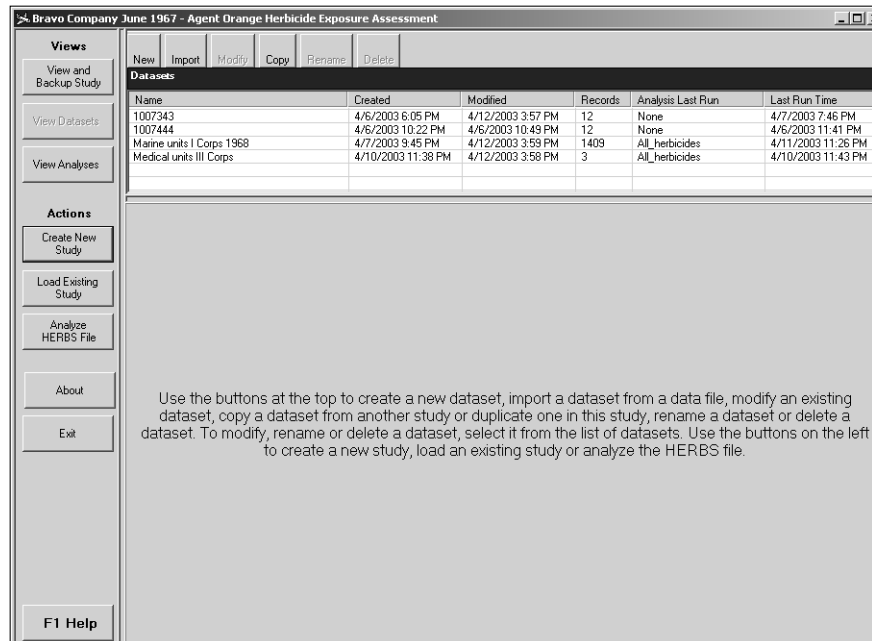


Figure 7: When you press the "View Datasets" button, a list of datasets is displayed in the top panel

When you are viewing dataset information, six buttons appear in the top panel that allow you to work with the datasets in the study. Each dataset has a name, which you can change using the "Rename" button. Datasets can be created with the "New" button or deleted using the "Delete" button. You can use the "Import" button to import data from a Microsoft Excel, Microsoft Access or a comma-delimited (CSV) text file into a new dataset. You can modify individual records belonging to a dataset by hand using the "Modify" button, and you can duplicate a dataset or copy it from another study with the "Copy" button.

Create a New Dataset

When you are viewing the dataset information, you can create a new dataset by pressing the "New" button on the top panel of the main window.



Figure 8: When you are viewing the dataset information, you can create a new dataset by pressing the "New" button on the top panel.

After you enter the name for the new dataset and press the "OK" button, the software creates the dataset and then adds it to the list of datasets in the top panel.

Import Data

When you are viewing the dataset information, you can import a new dataset by pressing the "Import" button on the top panel of the main window. After you press the "Import" button, a form will appear in the bottom panel of the main window. Use this form to identify the source for the new dataset and import data from it.

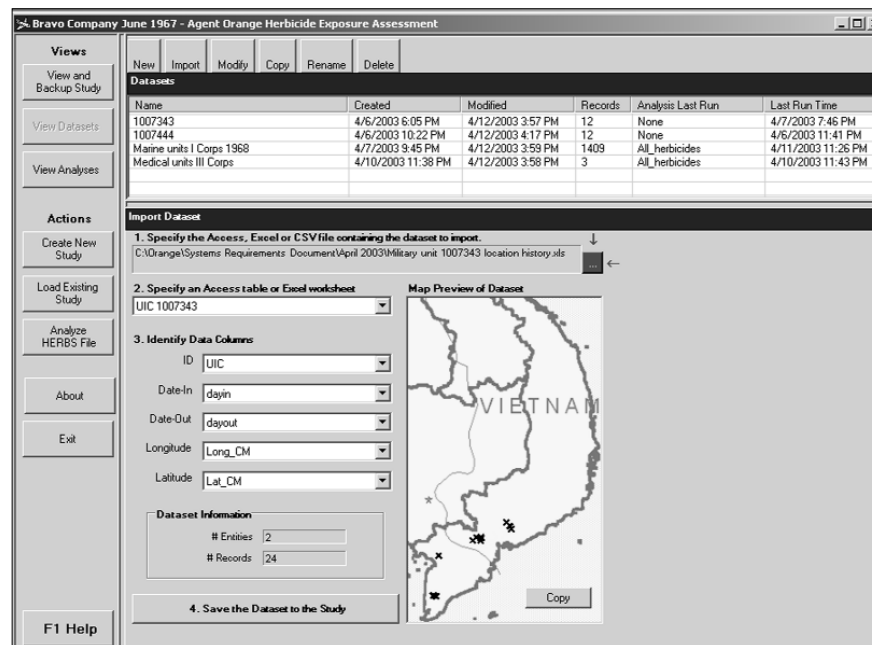


Figure 9: You can import a new dataset by pressing the "Import" button and using the bottom panel to specify the data source to import from.

To use the "Import Dataset" bottom panel, you must follow these steps:

1. Press the green square indicated by the two green arrows to activate the file open dialog. Specify the name of a file that contains the data. This may be a Microsoft Access, Microsoft Excel or comma-delimited (CSV) file.
2. Specify the source within the selected file from which data is to be imported. For a Microsoft Access file, you will be able to select a table from the list of all tables in that file. For a Microsoft Excel file, you will select a worksheet from a list of worksheets. For a CSV file, you will only have one option, corresponding to the name of the CSV file.

3. Identify the columns from the data source which correspond to the ID, Date-In, Date-Out, Longitude and Latitude columns. You will be able to select the column names from the list of columns in the data source. Ordinarily you will enter the date in a standard format: mm/dd/yyyy (example: 03/07/1966). However, the program also accepts "day number", such as 1892. In this system days are numbered consecutively beginning with January 1, 1961 = 1. The highest possible day number is 5478 corresponding to December 31, 1975.
4. Once you have specified all five columns, the software will read the data in the data source. The number of entities and records will be displayed on the form, and the dataset will be plotted on the map of Vietnam. If you are not satisfied with this data, you may return to step 1, 2 or 3.
5. You may abort this operation at any time by pressing any of the buttons in the left or top panel or closing the software.

Note on previewing: The program automatically displays a preview map of any dataset with 1,000 records or less. However, previewing data is a time-consuming process on most computers. If the dataset contains more than 1,000 records the program will prompt you to confirm that a preview is still desired. Your data will be processed normally whether or not you decide to continue with the preview.

After the dataset has been input, press the button labeled "Save the Dataset to the Study". The software will prompt you for a new name for the dataset. If you specify the name of a dataset that already exists in the study, the software will ask if you want to overwrite the dataset. (If you select "No", you will be able to press the "Save the Dataset to the Study" button again and specify a different name.)

Data rules: errors, conflicts, and date overlaps

The software inspects all incoming data for possible errors. Incoming data, whether entered by hand or imported from an external data file, must conform to certain rules. If any of these rules is violated, the software may take several actions ranging from simply warning the user to halting the program, depending on which rule has been broken.

There are two types of rules: a set of four fundamental conditions that can never be violated, plus a set of more "forgiving" rules that govern situations where dates may overlap.

Data validation rules:

1. None of the five required data fields can be zero or empty.
2. Longitude must be within the range (102.00° to 111.00°) and latitude must be within the range (8.00° to 21.00°). Any records with either parameter outside of this range will be rejected.

3. Both the in-date and the out-date must lie between January 1, 1961, and December 31, 1975, inclusive. Any records with either date outside this range will be rejected.

4. The out-date cannot come before the in-date. Any records with this error will be rejected.

Residence date overlap rules:

In the simplest situation, a location history for an individual or military unit would consist of a sequence of records, each covering a different period of time. In practice, however, it is not always possible to know the precise date that a unit moved from one place to another. Even if a moving date is known to have occurred on the same day a herbicide spray took place, it is rarely possible to know whether moving happened before or after the spraying. The software takes these uncertainties into account by permitting two types of date overlaps for people or units with the same ID.

a) One record may have the same out-date as another record's in-date. In this case, it could happen that the unit receives "credit" for exposure to spraying at both locations for the day they have in common and the researcher must decide whether to accept the exposure score.

b) Two records may overlap by more than one day. In this situation the software averages the exposure scores for the interval that the two records have in common. The output will then contain only a single record rather than two records, and will show the earlier in-date and the later out-date of the two. No record may share a time interval with more than one other record. A situation in which three or more records cover the same period of time is regarded as a fatal error. The software will not import those records but will issue an error message instead, such as the one below:

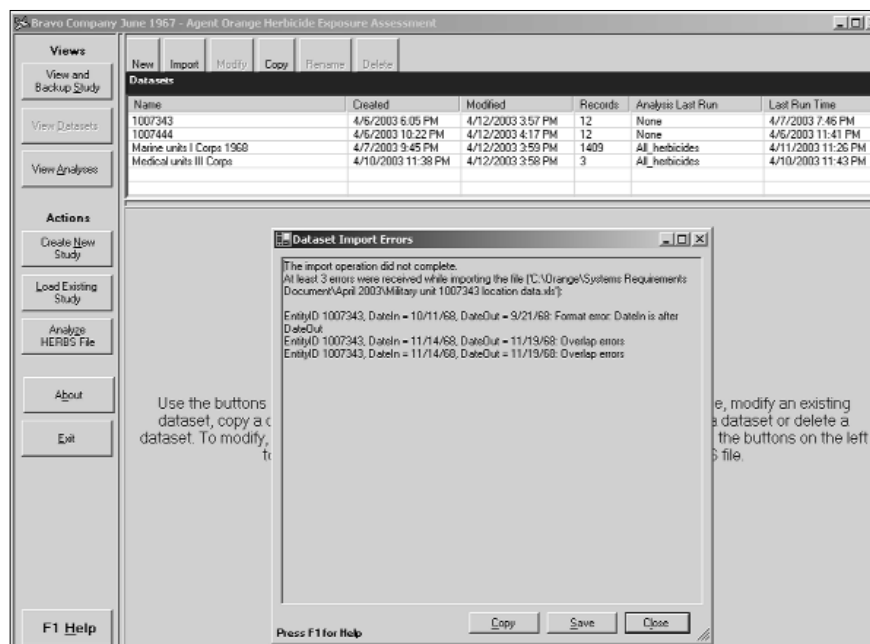


Figure 10: Errors that occurred during the import of a dataset will be displayed in a window.

If any errors occurred during the dataset import, the dataset will be created with only those rows which did not contain an error. Any errors that occurred during the import will be displayed in a pop-up window. You can copy the errors to the copy/paste buffer using the "Copy" button, save them to a file using the "Save" button or simply close the pop-up window using the "Close" button.

Modify a Dataset

When you are viewing the dataset information, you can modify an existing dataset by pressing the "Modify" button on the top panel of the main window. After you press the "Modify" button, a form will appear in the bottom panel of the main window. Use this form to add, edit or remove records from the dataset.

Name	Created	Modified	Records	Analysis Last Run	Last Run Time
Maine units I Corps 1968	4/7/2003 9:45 PM	4/12/2003 3:58 PM	14/08	All herbicides	4/11/2003 11:26 PM
Medical units III Corps	4/10/2003 11:38 PM	4/12/2003 3:58 PM	3	All herbicides	4/10/2003 11:43 PM
Military unit 1007343	4/8/2003 6:05 PM	4/12/2003 4:34 PM	12	None	4/7/2003 7:46 PM
Military unit 1007444	4/8/2003 10:22 PM	4/12/2003 4:34 PM	12	None	4/6/2003 11:41 PM

Modify Dataset

Name: Military unit 1007444

Modify Location History Record

ID: 1007444

Date-In: 8/21/1967

Date-Out: 3/30/1967

Longitude: 106.49

Latitude: 10.86

Buttons: Create a New Record, Update Record Being Edited, Cancel Record Without Updating

Select a Location History Record to Modify

1. Select an Entity: 1007444

2. Select a Record:

- 1/1/67 - 1/2/67
- 1/3/67 - 1/6/67
- 1/7/67 - 1/10/67
- 1/11/67 - 1/14/67
- 1/15/67 - 2/6/67
- 2/6/67 - 3/13/67
- 2/14/67 - 2/27/67
- 2/28/67 - 3/10/67
- 3/11/67 - 3/20/67
- 3/21/67 - 4/5/67
- 4/10/67 - 4/19/67

Buttons: Delete Entity, Edit Record, Delete Record

Map Preview of Dataset

VIETNAM

Copy

Statistics: 1 Entities, 12 Records, Created: 4/8/2003 10:22:10 PM, Modified: 4/12/2003 4:34:58 PM

Figure 11: You can modify the dataset using the Modify Dataset form in the bottom panel

The "Modify Dataset" bottom panel contains a form that is set up to let you make changes to the data. At the top of the form is the name of the dataset being modified. At the bottom of the form are statistics about the dataset: the number of entities and records and the time and date the dataset was created and modified. At the right of the form is a map of Vietnam with each of the records plotted on it. The middle of the form contains two list-boxes which allow you to select a record to modify. And finally, at the left of the form are input boxes which allow you to modify or enter new records.

There are three separate actions which you may take when the "Modify Dataset" bottom panel is displayed. You may create a new record, edit an existing record or delete an existing record.

NOTE: The rules that govern addition or modification of datasets are the same as those that cover errors in dataset importing. If any of these rules is violated when you attempt to add or modify a record, the software will not allow you to complete the operation.

To create a new record, press the "Create a New Record" button. The form will allow you to enter the ID, Date-In, Date-Out, Longitude and Latitude of the record. You may abort this operation by pressing the "Cancel Record Without Updating" button. When you are finished adding the data, press the "Update Record Being Edited" button. The software will then attempt to add the record. If it violates one of the dataset rules, an error will be displayed and the software will allow you to continue to modify the record to correct the error.

To modify an existing record, first select the record to modify by selecting the entity and date range of that record. Press the "Edit Record" button to edit the record. You will be able to alter the record using the fields at the left. When you are finished modifying the data, press the "Update Record Being Edited" button. The software will then attempt to add the record. If it violates one of the dataset rules, an error will be displayed and the software will allow you to continue to modify the record to correct the error.

To delete an existing record, select the record to delete by selecting the entity and date range of that record and press the "Delete Record" button. The software will remove the record from the dataset.

To delete all of the records associated with a single entity, select the entity to delete and press the "Delete Entity" button. The software will remove all of the records associated with that entity from the dataset.

Copy or Duplicate a Dataset

There are times when you have multiple studies in the system and want to copy a dataset from one study to another. Alternatively, you may want to duplicate a dataset within a study, perhaps so that you can modify the copy slightly to see what happens. You can copy or duplicate datasets by pressing the "Copy" button on the top panel of the main window. After you press the "Copy" button, a form will appear in the bottom panel of the main window. Use this form to copy or duplicate datasets.

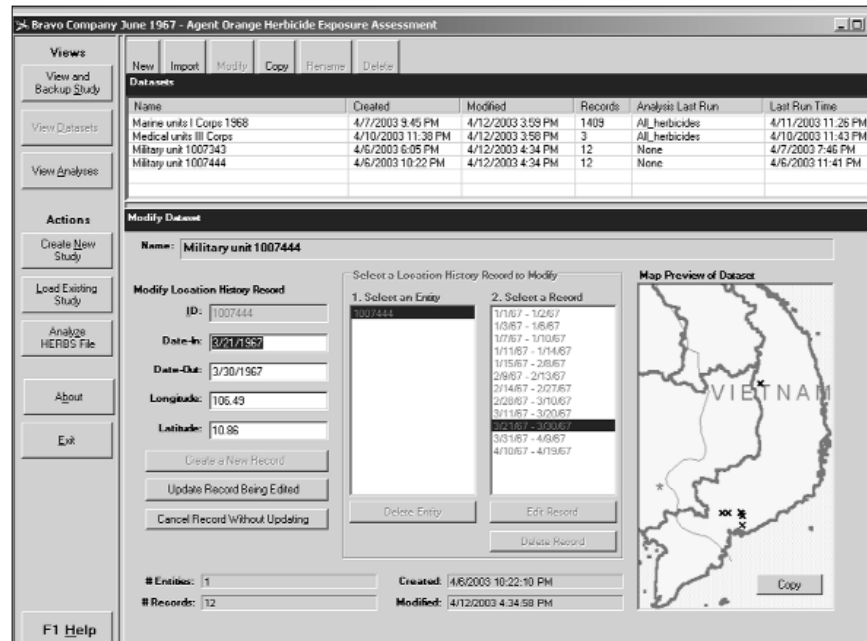


Figure 12: Use the "Copy Dataset" bottom panel to copy or duplicate datasets

The "Copy Dataset" bottom panel allows you to copy or duplicate datasets. To do this, first load the destination study to which you want to copy datasets. Use the list on the left to select the source study from which the datasets are to be copied. If you select the study which is currently loaded, the software will duplicate datasets within the study; if you select another study, the datasets will be copied rather than duplicated.

After you select a study, the list of its datasets will appear in the list on the right. Check one or more datasets to copy or duplicate. When you are satisfied with your selection, press the "Copy Datasets" button. The datasets will be copied into or duplicated in the study. The software will automatically add "(2)" (or another number if 2 is already taken) to any dataset that has the same name as one that already exists in the study.

You may abort this operation at any time by pressing any of the buttons in the left or top panel or by exiting the software.

Rename or Delete a Dataset

When you are viewing the dataset information, you can rename or delete a dataset using the "Rename" and "Delete" buttons in the Top Panel.

To rename a dataset, select it in the top panel and press the "Rename" button. A pop-up window will prompt you for a new name. If you enter a new name and press "OK", the software will rename the dataset. If you press "Cancel", the pop-up window will close without causing the software to take any action.

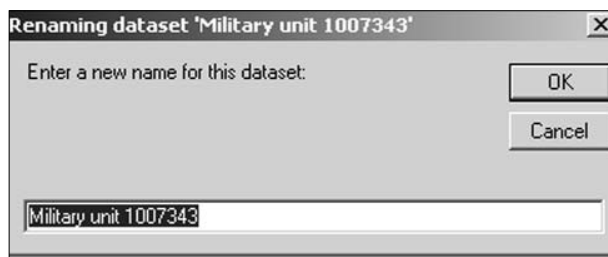


Figure 13: The "Renaming dataset" window will pop up when the "Rename" button is pressed.

To delete a dataset, select it in the top panel and press the "Delete" button. The software will display a pop-up window asking you to confirm the deletion. If you press "Yes", the dataset will be deleted from the study. If you press "No", the pop-up window will close without causing the software to take any action.

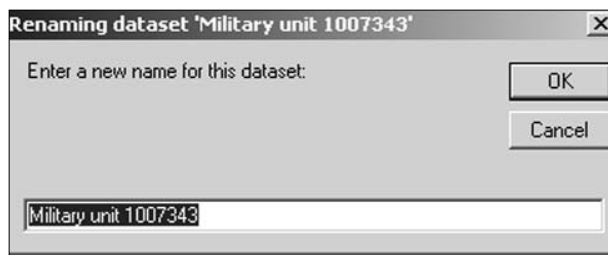


Figure 14: When the "Delete" button is pressed, a pop-up window will ask you to confirm the deletion.

Analyzing the Data

What is an Analysis?

An analysis is the operation of evaluating exposure for every record in a dataset. Each analysis is associated with a study, and each study can contain as many analyses as you need. Every analysis has a name associated with it. You choose the name when you create the analysis. What makes one analysis different from another is the combination of specific parameters from the HERBS file and other possible restrictions that govern the calculation of exposure scores. For example, an Analysis called "Orange_only" might specify that only exposure to Agent Orange is to be counted, while one called "Dioxin" might specify exposure to Orange, Purple, and Pink. An analysis called "Orange 45 days" might specify Agent Orange only with a half-life of 45 days for the E4 score.

Once an analysis has been defined, it can be used to generate a set of exposures for a specific dataset. This is called "running an analysis." When you run an analysis, the software generates one output record for each record contained in the dataset (except for the overlap situation explained above). Each output record contains the five essential variables in the original input record (ID, longitude, latitude, day in, and day out), plus five unique exposure "scores" or variables. These variables are:

NT05	Number of "hits" falling within 0.5 km (500 meters) of the location
NT1	Number of "hits" falling within 1 km (1000 meters) of the location
NT2	Number of "hits" falling within 2 km (2000 meters) of the location
NT5	Number of "hits" falling within 5 km (5000 meters) of the location
E4	Exposure opportunity score for the location

The "hits" scores are easy to understand. A "hit" represents an instance of one spray path falling within the stated distance of the location whose longitude and latitude are given in the input record. "Hits" scores count only applications that occurred during the time interval given in the input record. They ignore prior spraying, no matter how recent.

The E4 score is based on a mathematical model that takes into account the number of gallons of herbicide sprayed, the actual distance along the flight path, and continuing exposure over the entire residence time at the location. It also takes into account previous sprays at the location, using a formula that assumes that the herbicide disappears at a rate proportional to its environmental concentration at a given time (first-order decay). The details of this model have been described in scientific publications. ,

Note: The geographic information system which supports this system divides Vietnam into grids approximately 1 km on a side. The "hits" scores and the E4 score are calculated for each location in the dataset using the center of the grid as the exposed location, rather than the actual location of the person or military unit. As explained in the supporting publications, this gains a great deal of efficiency with very little loss of precision. It means, however, that an individual will be assigned the same score no matter where he actually was within a particular grid. The farthest anyone could be from the center point and still be in the same grid is just over 700 meters or 2,300 feet.

When you press the "View Analyses" button, the software displays a list of all the existing analyses in the study in the top panel. For each analysis, the software displays its name, the half life parameter, the name of the dataset associated with it ("null" if no dataset is associated with it) and the number of records in that dataset (0 if no dataset is associated with it or if the dataset contains no records).

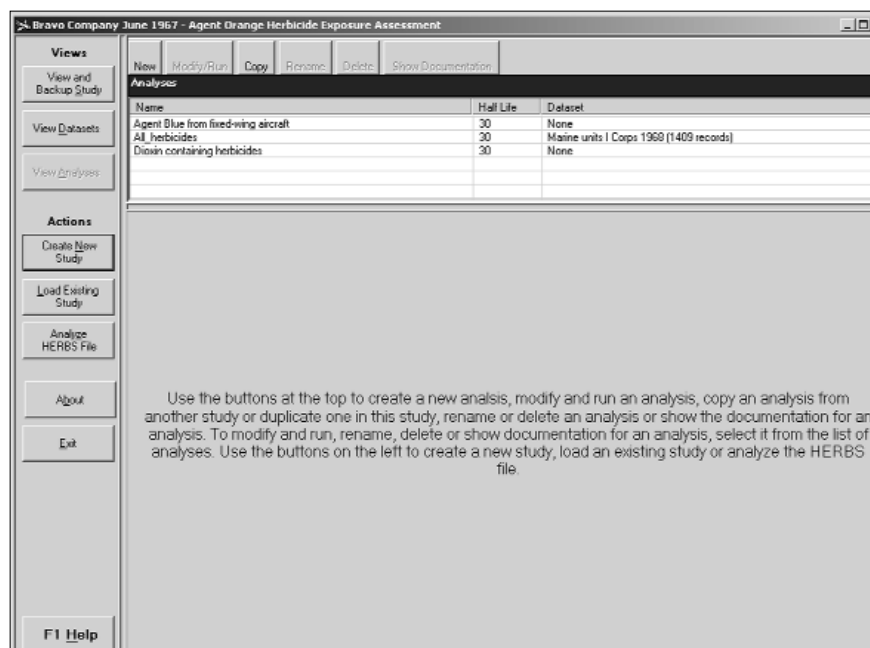


Figure 15: When you press the "View Analyses" button, a list of analyses is displayed in the top panel

When you are viewing analysis information, six buttons appear at the top of the top panel that allow you to work with the analyses in the study. Each analysis has a name, which you can change using the "Rename" button. Analyses can be created with the "New" button or deleted using the "Delete" button. You can modify and run the analysis using the "Modify/Run" button. The software can generate documentation for each analysis which can be used in your laboratory notes. You can duplicate an analysis or copy it from another study with the "Copy" button.

Create a New Analysis

When you are viewing the analysis information, you can create a new analysis by pressing the "New" button on the top panel of the main window.

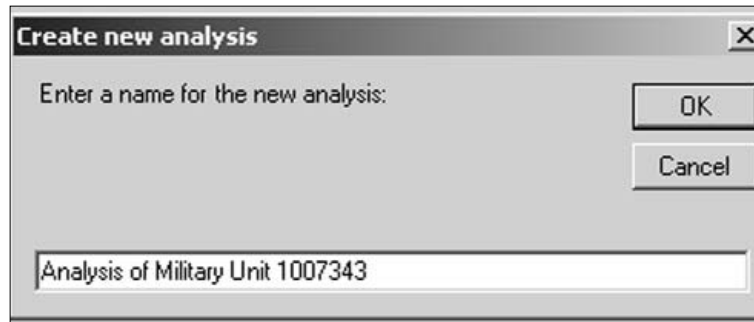


Figure 16: When you are viewing the analysis information, you can create a new analysis by pressing the "New" button on the top panel.

After you enter the name for the new analysis and press the "OK" button, the software creates the analysis and adds it to the list of analyses in the top panel.

Modify and Run an Analysis

The main feature of this software is to run an analysis. This is the process by which each record in a dataset is compared with the database of all herbicide sprayings throughout the entire Vietnam War in order to compute exposure values. The results of the analyses may be previewed and saved to comma-delimited (CSV) text files.

When you are viewing the list of analyses in the top panel, you may select an analysis from the list and press the "Modify/Run" button to modify it. The "Modify and Run Analysis" form will appear in the bottom panel.

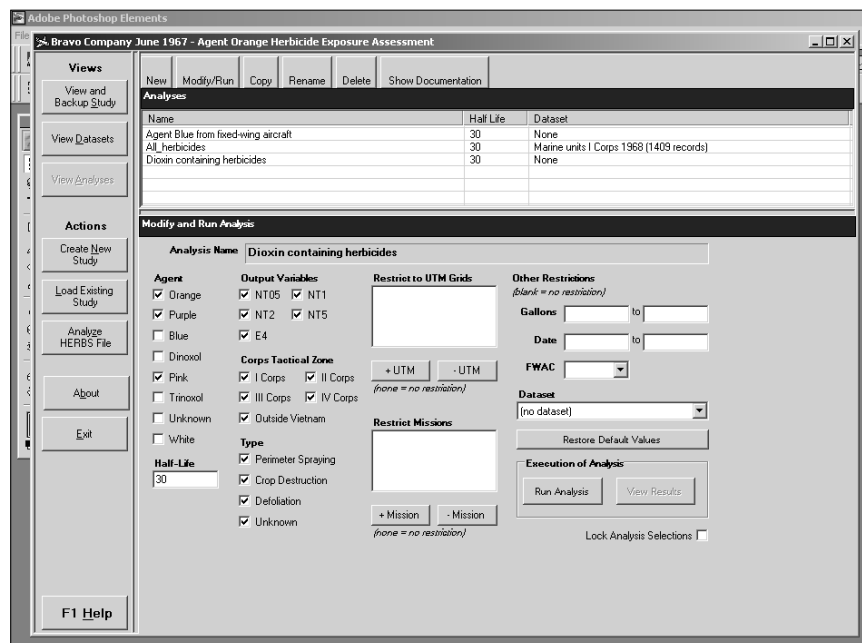


Figure 17: When you select an analysis and press the "Modify/Run" button, you may modify the analysis parameters and generate exposures for a dataset.

To use the "Modify and Run Analysis" bottom panel to analyze data, first specify the analysis parameters. These parameters include Agent, Half-Life, Output Variables, Corps Tactical Zone, Type, UTM Restrictions, Mission Restrictions, Gallons Restrictions, Date Restrictions and FWAC Restrictions. By selecting different combinations of these parameters you can control what type of exposure is analyzed. There are two types of selections: checkboxes and fill-ins.

Modify and Run Analysis screen: Checkboxes

If a box is checked, that means the analysis will include all herbicide missions involving that parameter. You use checkboxes to select the specific herbicide, the type of mission, and the region of Vietnam (Corps Tactical Zone or CTZ). A separate set of checkboxes is used to control which of the five output variables to display.

Herbicide. For example, checking the box next to "Orange" means that your analysis will include all Agent Orange missions. If both "Orange" and "Blue" are checked as shown in Figure 17, your analysis will include all Agent Orange missions and all Agent Blue missions. If a box is unchecked or left blank, then the corresponding missions will be excluded.

Corps Tactical Zone. You may choose herbicide missions that occurred in any or all of the four Corps Tactical Zones (from North to South: I, II, III, and IV Corps), also called Military Regions. You can also choose missions over Laos and Cambodia ("Outside Vietnam").

Type of Mission. You can also choose to include or exclude specific types of herbicide missions. The three major types are defoliation, crop destruction, and perimeter spraying (i.e., around the perimeter of base camps and other military installations), as well as unknown types. However, this information is not regarded as being as accurate as other data in the HERBS files. Some missions had multiple purposes, and "defoliation" can include perimeter spraying as well as other objectives.

Modify and Run Analysis screen: Fill-ins

You can select specific herbicide missions on the basis of their UTM grid, the gallonage sprayed, dates of spraying, the number of fixed-wing aircraft, and the mission number itself. These choices all require you to fill in boxes that are initially empty. You can fill in any combination of these boxes, or leave them all blank. Leaving a box blank means that no restrictions are placed on that particular variable.

UTM grid. UTM (universal transverse Mercator) refers to the map coordinate system that was used by the Armed Forces in Vietnam. It utilizes a system of rectangular grids 100 km on a side. Each grid is identified by a 2-letter code, such as XT or WS. Vietnam and sprayed areas of Laos and Cambodia are covered by approximately 52 different grids. If you know the specific grid you are interested in, you can restrict an analysis to herbicide runs that took place within that grid. Clicking on the "+ UTM" button opens up a box that lets you enter a grid. You may add as many grids as you like. The grids that you select will all appear in a list within the "Restrict to UTM Grids" box. You can remove grids from the list by clicking the "- UTM" button.

Caution: The UTM refers to the starting position of a spray path. Selecting a specific UTM will pick up only the sprays that started in that grid, and will fail to identify sprays that may have started in an adjoining grid, leading to potential underestimation of exposure.

Gallons. You can direct the software to include only missions that sprayed specific amounts of herbicide by entering a range into the two boxes marked "Gallons." For example, to choose missions that sprayed between 1000 and 5000 gallons, enter 1000 in the first box and 5000 in the second. To choose missions that sprayed 1000 gallons or more, enter 1000

Dates. You can direct the software to include only missions that occurred during a specific time period by entering the beginning and ending dates of that period into the two boxes marked "Date." The correct form for entering dates is 05/12/1967.

FWAC. You can direct the software to include only missions that involved specific numbers of fixed-wing aircraft. You may use the drop-down menu to choose any number from 01 through 12 aircraft. You may also choose 00 [None] for missions that have no fixed-wing aircraft associated with them.

Missions. You can direct the software to include specific missions if you know their mission numbers by clicking the "+ Mission" button. This opens a dialog box that lets you enter a mission number. You may do this as many times as you like. Each mission you select will appear in a list in the "Restrict Missions" box. To remove missions from that box simply click the "- Mission" button.

Half-life

Half-life applies only to the E4 score. It does not play a part in any of the "hits" scores. The E4 score uses a mathematical model that assumes that the toxic agent persists in the environment, but decays over time. The half-life is the number of days it takes a given amount of herbicide (or its contaminant, dioxin) to be reduced to half its initial value. A box labeled "Half-life" at the lower left-hand corner of the Analysis window displays the current value of half-life used by the E4 score. It initially contains a 30, indicating a half-life of 30 days. You can direct the software to use a different half-life by replacing the number in the "Half-life" box with a different value.

Restore Default Values

The first time you open the "Analyses" window by clicking the "View Analyses" button, the software provides you with pre-set choices of all of the analysis parameters. These pre-set choices are called "Default Values." The default analysis selects only Agents Orange and Purple (the two major dioxin-contaminated herbicides), all of the CTZ regions including areas outside of Vietnam, and all types of spraying. All fill-in boxes are blank, meaning that there are no restrictions on UTM, gallonage, dates, FWACs, or missions.

If at any time you wish to reset the parameters to their default values, click the "Restore Default Values" button.

Running an Analysis

Once you are satisfied with the analysis parameters, you may run the analysis by pressing the "Run Analysis" button. This will bring up the "View Analysis Results" pop-up window containing the results of the analysis. You can dismiss this window by pressing the "Close" button. If you dismiss the window but want to bring it back, you may press the "View Results" button in the "Modify and Run Analysis" bottom panel. The same analysis results will be displayed until you press the "Run Analysis" button again, even if you modify the analysis parameters before you press the "View Results" button again.

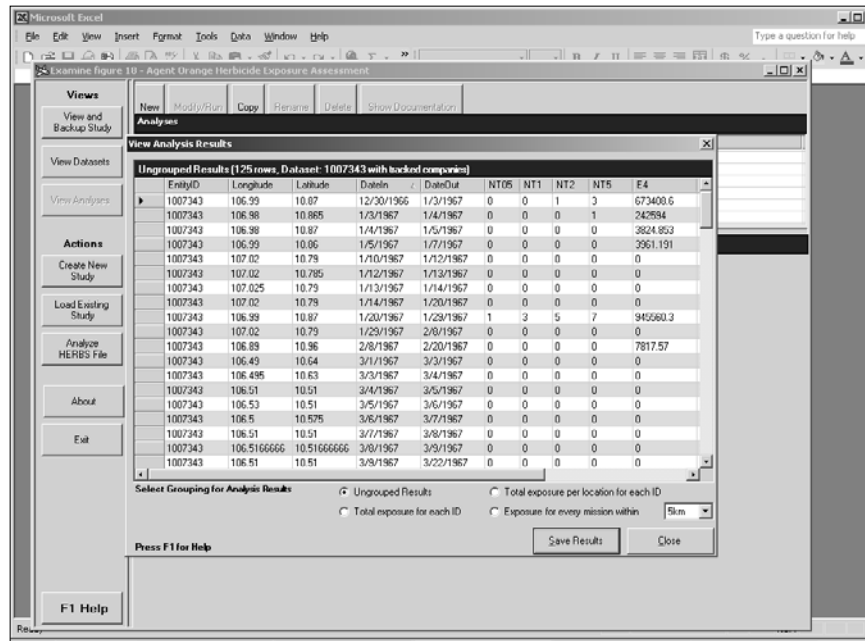


Figure 18: You can preview results of the analysis in the View Analysis Results pop-up window.

Grouping of Exposure Results

You may change the way the exposure results for a given individual or military unit are grouped together.

Ungrouped Results. When an Analysis is run, the exposure calculations are carried out for each row in the dataset as if it were unrelated to any other row. As a result, every row that is initially displayed in the "View Analysis Results" window corresponds to one row in the dataset, and the output rows are displayed in the same order in which they appear in the dataset. (See Figure 18.)

For example, if the input dataset has 100 rows, the output results will also consist of 100 rows and the order of rows in the result window will be the same as the order of rows in the dataset. Each row in the results window will contain the original input data plus five columns of exposure scores: NT05, NT1, NT2, NT5, and E4.

This manner of displaying the exposure output is called "Ungrouped Results" and is the default results display.

For convenience, the user can group the results in three other ways, which may be selected using buttons that appear below the output window.

Total exposure for each ID. Frequently, the rows in a dataset will represent different locations visited by an entity (such as a military unit) at different times. This is a common pattern for a unit that is tracked over a long period of time, or for an individual who served in several different military units. The user may wish to display the total exposure for the entity rather than the individual location scores. The total exposure is obtained by simply summing the exposures over all of the individual locations that were visited. This total can be displayed by selecting the button labeled "Total exposure for each ID." Each output variable will now be total of its values for the different locations, summed over all records with the same ID. For example, suppose the military unit with ID = 1007343 was in 5 different locations with NT1 = 0, 3, 2, 1, and 4. If the user chooses "Total exposure for each ID," only 1 row will be displayed for ID = 1007343, and the value of NT1 will be 10.

Total exposure per location for each ID. The user may wish to see the total exposure at every location visited by the entity. This might be useful if some locations were visited more than once. By choosing "Total exposure per location for each ID," the program displays one row for every different location for each ID number. The exposure variables shown in the output are the totals for each location.

Exposure for every mission within X km. This option allows the user to restrict the exposure calculations to HERBS missions that fell within a specified distance of the location. Normally, exposures are based on HERBS missions falling within 5 km of a given location, because the criterion for a mission-grid combination to be included in the exposure database is that the mission must have passed within 5 km of the center of the grid. Selecting this option results in counting exposures only from missions that passed within the selected distance of the center of the grid, possible selections being 2, 1, or 0.5 km.

Intersect and overlap flags

As noted previously, the software permits a limited number of date conflicts in records from the same individual or unit (i.e., records with the same ID). There are two types of allowable conflicts: intersection and overlap. Two records "intersect" if the ending date for one is the same as the beginning date for the other. Two records A and B "overlap" if the beginning date for A comes before the beginning date for B, but the ending date for A comes after the beginning date for B.

Three special variables called "flags" are displayed at the end of each row of output in the form of checkboxes. A flag can either be true (checked) or false (unchecked). These flags can help you interpret results that involve location records with overlapping dates.

Intersect Flags. If an entity has several location history records whose dates intersect (e.g., if the ending date for one record is the same as the beginning date for the next record), the grouped results may overestimate the true exposure scores because the entity may be "credited" with exposure at both locations on the same day. Two intersect flags appear in the output: one for the date-in and one for the date-out. The date-in flag will be checked if the date-in is the same as the date-out of another row. The date-out flag will be checked if the date-out is the same as the date-in of another row. It is possible for both flags to be checked, as in the following example:

Input:

ID	Date-in	Date-out	Longitude	Latitude
1007343	1/1/1967	2/1/1967	106.98	10.87
1007343	2/1/1967	3/1/1967	106.99	10.86
1007343	3/1/1967	4/1/1976	107.00	10.85

Output:

ID	Long	Lat	Date-in	Date-out	Nt05	NT1	NT2	NT5	E4	Date-in Intersect	Dateout Intersect	Overlap
1007343	106.98	10.87	1/1/1967	2/1/1967	0	1	3	3	25035	FALSE	TRUE	FALSE
1007343	106.99	10.86	2/1/1967	3/1/1967	0	0	0	0	3111	TRUE	TRUE	FALSE
1007343	107	10.85	3/1/1967	4/1/1967	0	0	0	0	1061	TRUE	FALSE	FALSE

The second output record has both Intersect flags checked because that record "intersects" both the record before it and after it.

Overlap flag. The software permits a limited number of date overlaps between records. If two records have the same entity ID but different date ranges and the date ranges of the two records overlap, then the software reports a single output record instead of two records. The scores for that output are generated by giving half-credit for each of the two locations during the location period. This output record can be identified because its overlap flag is checked (true).

Date intersections and overlaps can result in overestimation of exposure because it is possible for the same exposure to be counted more than once. It is the user's responsibility to avoid possible double-counting exposures by using the intersection and overlap flags to identify date overlaps.

Analysis Documentation

All researchers must keep careful notes while conducting studies. This software is built to accommodate that need by automatically generating documentation for analyses which can be incorporated into research notes.

When you are viewing the list of analyses in a study, select on and press the "Show Documentation" button to display the documentation for the analysis.

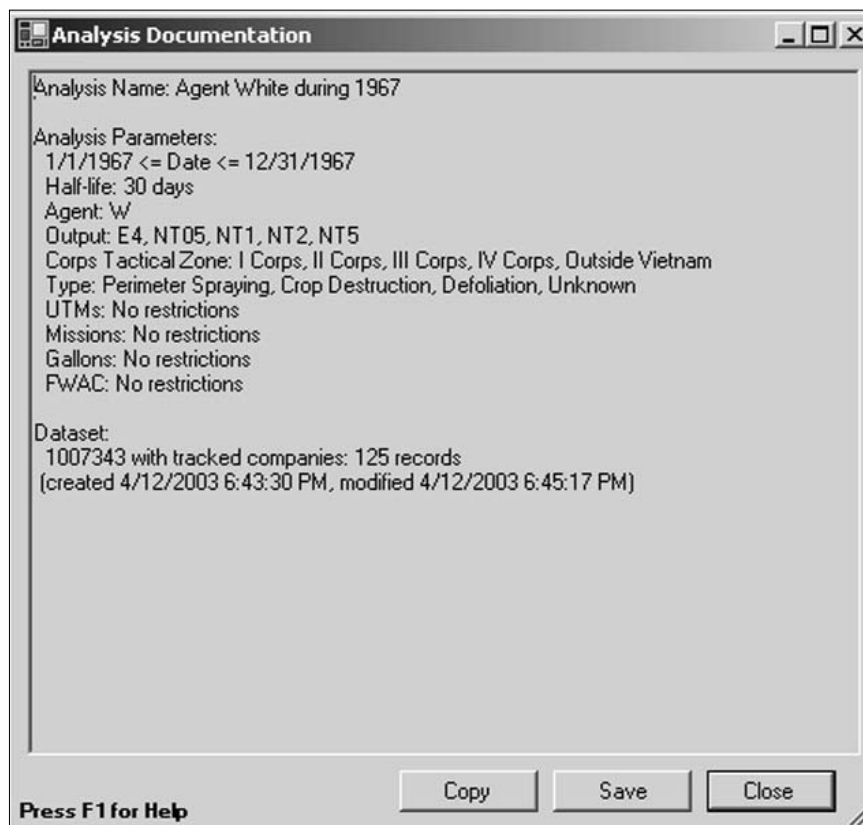


Figure 19: You can copy the analysis documentation to the copy buffer or save it to a file.

The analysis documentation will be displayed in a pop-up window. You can copy the documentation to the copy/paste buffer using the "Copy" button or save it using the "Save" button. Use the "Close" button to close the pop-up window. You can even select a portion of the documentation with the mouse, and copy it to a separate document file using standard windows commands (ctl-C , ctl-V).

Copy or Duplicate an Analysis

There are times when you have multiple studies in the system and want to copy an analysis from one study to another. Alternately, you may want to duplicate an analysis within a study for subsequent modification. You can copy or duplicate analyses by pressing the "Copy" button on the top panel of the main window. After you press the "Copy" button, a form will appear in the bottom panel of the main window. Use this form to copy or duplicate analyses.

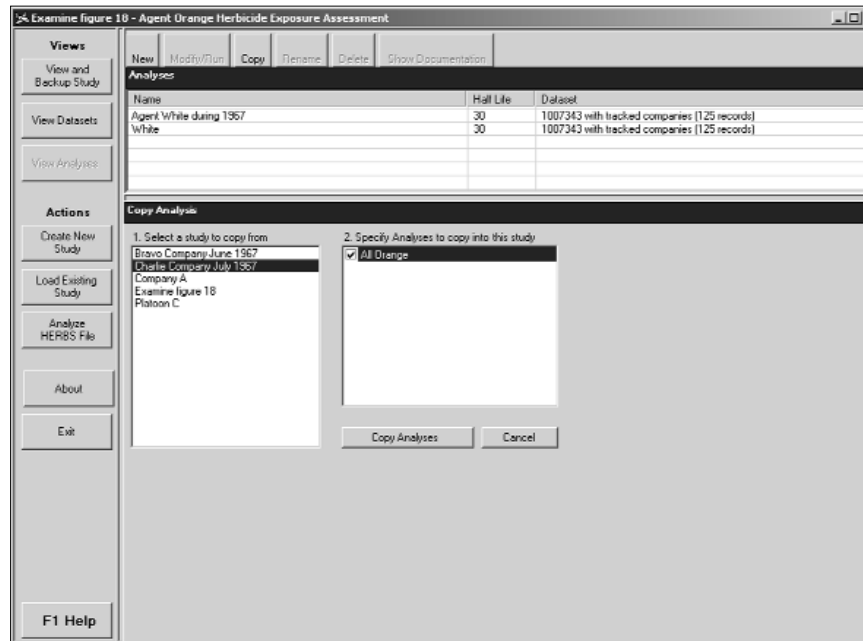


Figure 20: Use the "Copy Analysis" bottom panel to copy or duplicate analyses.

The "Copy Analysis" bottom panel allows you to copy or duplicate analyses. To do this, first load the destination study to which you want to copy analyses. Use the list on the left to select the source study from which the analyses are to be copied. If you select the study which is currently loaded, the software will duplicate analyses within the study; if you select another study, the analyses will be copied rather than duplicated.

After you select a study, the list of its analyses will appear in the list on the right. Check one or more analyses to copy or duplicate. When you are satisfied with your selection, press the "Copy Analyses" button. The analyses will be copied into or duplicated in the study. The software will automatically add "(2)" (or another number if 2 is already taken) to any analysis that has the same name as one that already exists in the study.

You may abort this operation at any time by pressing any of the buttons in the left or top panel or by exiting the software.

Rename or Delete an Analysis

When you are viewing the analysis information, you can rename or delete an analysis using the "Rename" and "Delete" buttons in the Top Panel.

To rename an analysis, select it in the top panel and press the "Rename" button. A pop-up window will prompt you for a new name. If you enter a new name and press "OK", the software will rename the analysis. If you press "Cancel", the pop-up window will close without causing the software to take any action.

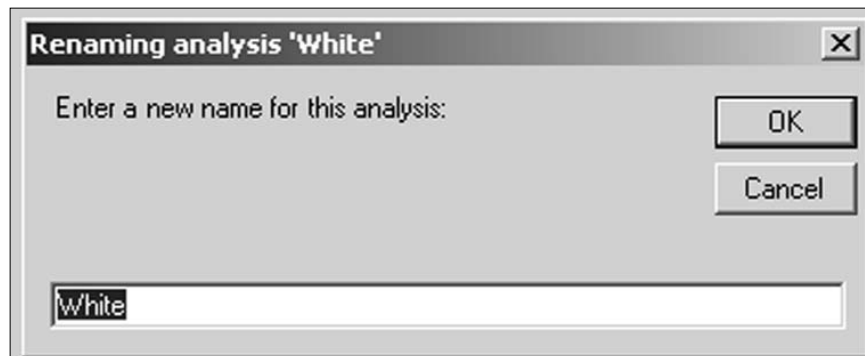


Figure 21: The "Renaming analysis" window will pop up when the "Rename" button is pressed.

To delete an analysis, select it in the top panel and press the "Delete" button. The software will display a pop-up window asking you to confirm the deletion. If you press "Yes", the analysis will be deleted from the study. If you press "No", the pop-up window will close without causing the software to take any action.

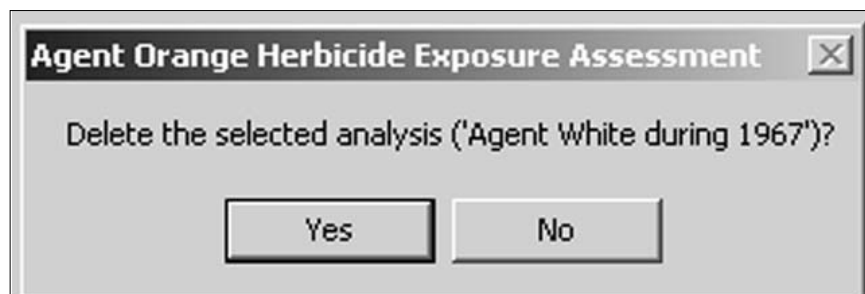


Figure 22: When the "Delete" button is pressed, a pop-up window will ask you to confirm the deletion.

HERBS file data analysis

Scientific background

The software described in this manual was developed by the contractor to the National Academy of Sciences. It is based upon many years of working with data about the Vietnam wars and veterans of that war. The software was developed in order to satisfy the need of epidemiologists, public health specialists, and environmental scientists to estimate the amount of exposure to phenoxy and other herbicides might have been experienced by US and Vietnamese forces and civilians. The estimation methods used by this program have been published as scientific articles in several peer-reviewed journals. They include:

Stellman, S. D., and Stellman, J. M. Estimation of exposure to Agent Orange and other defoliants among American troops in Vietnam. A methodological approach. *Amer. J. Indust. Med.*, 9: 305-321, 1986.

Stellman, S. D., Stellman, J. M., and Sommer, J. F., Jr. Combat and herbicide exposure in Vietnam among American Legionnaires. *Environ. Res.*, 47: 112-128, 1988.

Stellman, J. M., Stellman, S. D., and Sommer, J. F., Jr. Social and behavioral consequences of combat and herbicide exposure in Vietnam among American Legionnaires. *Environ. Res.*, 47: 129- 149, 1988.

Stellman, S. D., Stellman, J. M., and Sommer, J. F., Jr. Health and reproductive effects of combat and herbicide exposure in Vietnam among American Legionnaires. *Environ. Res.*, 47: 150-174, 1988.

Snow, B., Stellman, J. M., Stellman, S. D., and Sommer, J. F., Jr. Post traumatic stress disorder in relation to military service in Vietnam among American Legionnaires. *Environ. Res.*, 47: 175-192, 1988.

Stellman, J. M., Stellman, S. D., and Sommer, J. F., Jr. Utilization, attitudes, and experiences of Vietnam Era veterans with Veterans Administration health facilities. *Environ. Res.*, 47: 193-209, 1988.

Stellman, S. D., Stellman, J. M., Weber, T., Tomasallo, C., Stellman, A. B., and Christian, R. J. A geographic information system for characterizing exposure to Agent Orange and other herbicides in Vietnam. *Environ. Health Persp.*, 111: 231-238 (2003).

Stellman, J. M., Stellman, S. D., Christian, R., Weber, T., and Tomasallo, C. Agent Orange and other herbicides used in Vietnam: A reappraisal of the extent and patterns of usage. *Nature*, 422:681-687 (2003).