

Epi Map 2

A Mapping Program for IBM-compatible Microcomputers

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Technical Assistance Hotline

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Notes

These programs were produced in the Surveillance, Forecasting, and Impact Assessment Unit, Global Programme on AIDS, World Health Organization, and the Epidemiology Program Office, Centers for Disease Control and Prevention (CDC), for use by the worldwide public health community. You are encouraged to give copies of the programs and the manual to your friends and colleagues. No warranty is made or implied for use of the software for any particular purpose. Although the programs as produced were tested and found to be free of computer viruses, successive copying on computers, networks, or bulletin boards may introduce viruses. You are urged to test any programs received from others with a computer virus detection program before use.

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The manual was written in Microsoft Word. Map illustrations were produced in Epi Map with output to PostScript files. Epi Map was written in Turbo Pascal from Borland International, Inc., Scotts Valley, California.

We are grateful to Robert K. Jung for contributing a license to use his ARJSFX compression software for installing Epi Map.

Telephone Assistance Line

Limited amounts of telephone assistance will be provided if a problem is not solved by reference to the manual. Contact information for the Epi Info / Epi Map Hotline is shown on the title page.

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Introduction

What Is Epi Map 2?

Introduction to Epi Map

Epi Map is a program for IBM-compatible microcomputers that produces and displays maps from geographic boundary files and data values entered from the keyboard or supplied in Epi Info or dBASE files. The data may be counts, rates, or other numeric values. In *Color/Pattern* maps, the values are represented as shading or color patterns for each geographic entity. In *Dot Density* maps, randomly placed dots proportional in number to the values are placed in each entity. Epi Map also produces *Cartograms*, in which the value for each geographic entity is allowed to control the size of the entity. Thus, a state or country will be small on the map if the value being represented (e.g., cases of AIDS) is small, but large if the number is large.

Outline maps are supplied with Epi Map and others can be created or edited within Epi Map. They consist of a series of numbers representing the coordinates of the entities in the map. These entities--countries, provinces, states, counties, cities, or buildings--are all polygons with complete boundaries, a number of vertices, and names recorded in a special format in the boundary (.BND) file.

Version 2 of Epi Map contains two major enhancements. It provides a complete system, including a small programming language, for creating "point-and-click" information systems, in which selecting a region on a map will display various types of geographically related information. The displays include text with hypertext features, other maps, and records in Epi Info data files. It also uses Random Access Memory above the DOS 640 K limit, allowing the use of larger and more detailed boundary files.

Epi Map is designed to work independently or as a companion to Epi Info, a system of computer programs for public health work that is available in the public domain (Dean AG, Dean JA, Coulombier, D, Brendel, KA, Smith, DC, Burton AH, Dicker RC, Sullivan, K, Fagan, RF, Arner, TG. Epi Info, Version 6: a word processing, database and statistics program for epidemiology on IBM-compatible microcomputers. Centers for Disease Control and Prevention, Atlanta, Georgia, U.S.A., 1995).

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Numerical data can be entered in Epi Info, manipulated and analyzed, and then sent to Epi Map for display and printing in map form if desired.

Data values may come from any Epi Info file that contains a variable giving the names of regions in an available boundary file, (e.g. FRANCE, GERMANY, SWITZERLAND), and one or more fields with numeric data for display, such as CASE COUNT. Epi Info will produce such a file from individual case records with Epi Info commands such as:

```
READ WEEK2  
SELECT DISEASE = "HEP B"  
ROUTE HEP.REC  
OUTPUT FREQ COUNTRY
```

This produces a summary file, with one record for each country, and a field called COUNT representing the number of cases of hepatitis for each country.

It is not necessary to use or understand Epi Info to make maps in Epi Map, since data can be entered from the keyboard and saved directly in Epi Map. This is the simplest method for small data sets.

Epi Map offers a number of tools for enhancing a completed map. You can select the type of map, patterns of shading or color, number of dots per unit value, and color and thickness of boundaries, and also add three-dimensional shading, titles, legends, text, boxes, or lines. Both data and boundary files can be edited from within Epi Map. Maps can be changed in size and several different maps can be displayed on the same screen. Labels for geographic entities can be displayed or suppressed, and edited in a variety of ways. Details of the finished map, are stored in a .MAP file for later display or for printing.

Since Epi Map supports dot-matrix, laser, inkjet, and Postscript printers and Hewlett-Packard compatible plotters, the final map may be printed in color or black and white in a form suitable for publication. Maps may be sent to files in the CGM (Computer Graphics Metafile), TIF, PCX, and several other formats so that they can be imported into Harvard Graphics, Lotus Freelance, or other commercial programs for further enhancement or combined with other graphics.

For regular use, as in a public health surveillance system, programs may be written so that Epi Info produces data files for mapping that will automatically be sent to Epi Map for display and printing in a previously constructed map format.

Epi Map and this manual are not copyrighted and may be freely reproduced for use by others. The U.S. boundary files supplied with the system are licensed for use only with Epi Map, and they may be freely distributed and used only with Epi Map. The other boundary files may be distributed without limitation.

Using This Manual

A few simple rules will aid in reading this manual. Keys on the computer's keyboard are indicated by "<>." Thus, <Enter> is the key labeled "Enter." Material that the user types is shown in **boldface**. If you are instructed to type:

```
A:\> COPY A:*. * B:
```

the computer will have supplied "A:\>". You should type only "COPY A:*. * B:" (without the quotation marks) and press the <Enter> key. The <Enter> key is almost always required to mark the end of an entry, although this will not be shown in the manual each time.

Since programs may be run from a variety of disk drives, the drive letter in front of the DOS prompt will be omitted in this manual. If your copy of Epi Map is on drive C, then the command to run Epi Map,

```
>EPIMAP
```

may actually appear on your computer as:

```
C:\EPIMAP2>EPIMAP
```

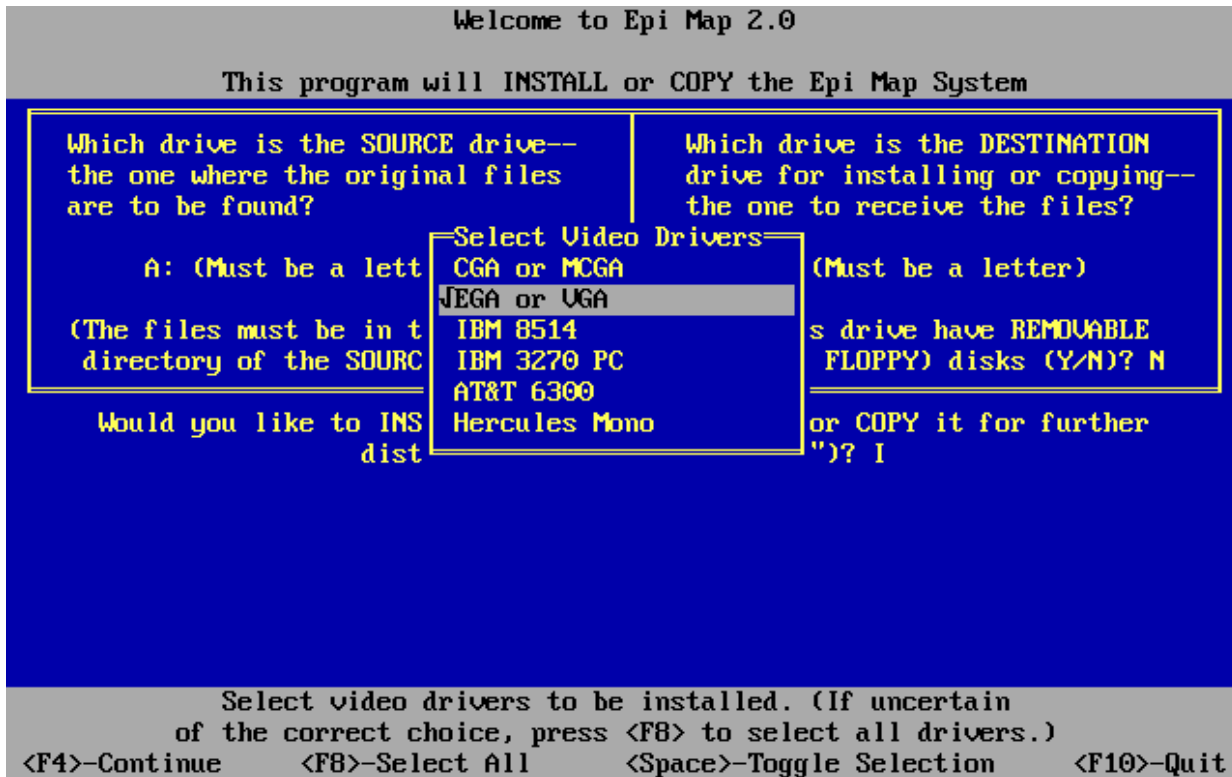
after you have typed "EPIMAP."

Menu choices in Epi Map and file names are shown in UPPER CASE LETTERS.

Obtaining Help

This entire manual is available from within Epi Map as a help file. Simply press the <F1> key from within the program. Both a table of contents and an index will become available. To choose an entry, place the cursor over the choice with the arrow keys and then press <Enter>. Instructions for moving around in the help file are contained on the screen. The telephone and FAX numbers and E-mail address for the Epi Info/Epi Map assistance hotline are found on the title page.

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The Epi Map Installation Program

Chapter 1

Installation

Tutorial Summary of Installation

If you obtained Epi Map from a bulletin board or other unofficial source, it is a good idea to scan the disk for computer viruses before installation. See the note on page 2.

Place Disk 1 of Epi Map in drive A. Type:

A:INSTALL

and follow the directions given by the program, indicating that you wish to install rather than copy Epi Map. If you are installing Epi Map on floppy disks, you will need to format the disks for your computer before running INSTALL, as described below in the section on Floppy Disk Installation.

Overview

The programs on the Epi Map distribution disks are in compressed format and they must be expanded before the programs are run. A program called INSTALL is provided on Disk 1 and this program should always be used for installing the system. INSTALL will perform either of two functions:

1. It will *install* Epi Map for use on either hard or floppy disks.
2. It will make *copies* for distribution in the compressed format on any size disk.

If you have a computer with a hard (fixed) disk, installation of Epi Map is as simple as the instructions given in the Tutorial section above. Epi Map can be run from 720 K or 1.44 megabyte 3 1/2-inch disks often used with laptop computers.

Hardware and Software

Epi Map 2 will run on any IBM-compatible microcomputer with 640 K of random access memory (RAM), a graphic display adapter, and a 286 or newer processor. The graphic adapter may be of the types known as CGA, EGA, VGA, AT&T, Hercules monochrome, or IBM 8514. In order to print maps, software is supplied to work with Epson, IBM, Toshiba, and OkiData dot matrix printers, Hewlett-Packard plotters (7470, 7475, 7550, 7090, 7595, 7585), Hewlett-Packard Laserjet-compatible printers, Postscript printers, and Hewlett-Packard PaintJet, DeskJet, and color DeskJet printers. Epi Map can produce files in several formats, including Computer Graphics Metafile (CGM), TIFF, AutoCad DXF, GEM IMG, PCX, ANSI NAPLPS (Video Show), and WordPerfect Graphics formats. From one of these formats, the images can be imported into Lotus Freelance, Harvard Graphics, WordPerfect, and many other commercial programs, and then sent to a number of other devices to produce colored slides or printed images. Methods for photographing the screen with an ordinary camera to produce 35 mm slides are described in Chapter 10.

A hard disk is useful, but not required for Epi Map; many laptop computers with graphics displays will run Epi Map comfortably. Since the program will fit on a single 720 K floppy disk, disk space is not usually a limitation. The program itself occupies about 560 K and boundary files (map outlines) of typical states or countries occupy 4 to 20 K each.

Epi Map runs under DOS, Version 3.3 or greater, including DOS 6, and does not require Microsoft Windows or other special software. It can, however, be run from Windows in DOS mode. Although it is designed to work with data from Epi Map files, it can also be used with dBASE files or as a stand-alone program, in which data values are entered directly from the keyboard.

Installation

If you obtained Epi Map from a bulletin board or other unofficial source, it is a good idea to scan the disk for computer viruses before installation. See the note on page 2. There are many commercial and shareware programs available for this purpose. Epi Map master disks are tested for viruses but viruses may be acquired in the process of copying by others.

To install Epi Map, start your computer in the usual way until the operating system prompt is seen.

C> (or D>, etc.)

Place Disk 1 of the Epi Map system in drive A. Now give the commands:

C>A: (And press <Enter>)

A>INSTALL

The program will ask for the following information:

Which drive is the SOURCE drive--the one where the original files are to be found? Usually this will be Drive **A** or **B** where you have inserted the first Epi Map distribution disk.

Which drive is the DESTINATION drive for installing or copying--the one to receive the files? If you are installing the system on a hard disk, this will be the correct letter for the hard drive, usually **C** or **D**. To install on floppy disks for use in a computer without a hard drive, such as a laptop computer for field use, give the letter of another floppy disk drive, such as Drive **B**.

Does this drive have removable (usually floppy) disks (Y/N)? You should answer "Y" if the destination disk is removable, particularly if you intend to use the installed system on a computer other than the one you are using for installation.

Would you like to INSTALL the system for use, or COPY it for further distribution (enter "I" or "C")? You should answer "I" unless you are making disks for further distribution. If you answer "C", the resulting disks will contain compressed files that cannot be run until they are installed.

Select Video Drivers. Choices are presented for **CGA or MCGA, EGA or VGA, IBM 8514, IBM 3270 PC, AT&T 6300, and Hercules Monochrome.** The installation program will usually supply an answer, but, if not, you should be able to find this information in the manual for the computer. If the computer is a laptop, it probably has either a CGA or EGA/VGA graphics adapter. If you are not sure, choose all the possibilities by moving to each choice with the up or down-arrow keys and pressing the <Spacebar> until a check mark appears, or simply press <F8>. Graphics drivers are contained in files labeled .BGI. They take up approximately 7 to 24 K of disk space for each one chosen.

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Select Print Drivers. A window with many choices of output formats will appear. Each choice represents a special file that allows sending completed maps to a particular kind of printer or plotter, or to a file for importing into other graphics programs. Although each driver occupies space (about 7 to 24 K) on the disk, you should choose all that may be useful in the future on this computer. Move the cursor bar with the up and down arrow keys to the choices and press the <Spacebar> until a check mark appears beside the choice. Output driver filenames begin with an underline character ("_") and end with ".BGI", as in `_DJ.BGI` for Hewlett Packard Deskjet printers.

Select Groups to Install. The Epi Map files are divided into *groups* on the disks. The first four groups contain the core of the system. The remainder--beginning with those labeled USA--are map boundary files for various parts of the world. If you are installing Epi Map for the first time, choose the first four groups and then groups for the boundary files you will work with, using the arrow keys and the space bar until check marks appear beside the desired groups. Pressing <F8> will choose all. If you have previously installed Epi Map and wish to install additional boundary files or were interrupted during a previous installation, choose only the groups you wish to install.

The INSTALL program will prompt you to insert a different disk containing file groups if necessary. When this happens, insert the disk containing the indicated group and press <Enter> to continue. At any time except during file copying, you may press <F10> to stop the installation and leave the INSTALL program.

Special Files

Your computer system may already contain special files called AUTOEXEC.BAT and CONFIG.SYS that tell DOS to perform operations automatically whenever the computer is first "booted." Several statements need to be added to these files for proper operation of Epi Map, particularly if you have a hard disk. The necessary statements are:

In the AUTOEXEC.BAT file, there must be a PATH statement that includes a path to `\EPIMAP` on the disk where the Epi Map system resides. Previous paths must remain in effect. For example, if your AUTOEXEC.BAT file contains the statement:

PATH C:\DOS

change this to:

PATH C:\DOS;C:\EPIMAP2

In the CONFIG.SYS file, there should be the statements "FILES = 20" and "BUFFERS = 20". These numbers can be larger than 20, if DOS and your other programs have already inserted these statements.

During installation, INSTALL may announce that these statements will be inserted automatically. If you type "Y" to signal your agreement, the previous files, if any, will be changed to AUTOEXEC.OLD and CONFIG.OLD. New AUTOEXEC.BAT and CONFIG.SYS files will be created containing the necessary additions as described above.

Automatic creation of the two files occurs only if you are installing Epi Map on a hard disk; on floppy disks the PATH statement is not necessary and you must add the necessary statements to CONFIG.SYS with a text editor such as EPED from Epi Info if you intend to have more than four files open at one time.

Installing Epi Map to Run Under Microsoft Windows

After DOS installation is complete, a message will appear providing information on installing icons and other items to make it easy to run Epi Map and BOUNDARY from the Microsoft Windows desktop. Even if you do not choose this option, you can always run the two programs from Windows using Window's MSDOS feature; having icons on the desktop merely makes it easier.

If you have Windows and wish to install the icons and create an Epi Map program group, run Windows as usual. From the FILE menu, choose RUN. Indicate the drive and directory where your Epi Map system has been installed and the SETUP program's name, e.g. C:\EPIMAP\SETUP.EXE. Press <Enter> or click OK and you should soon see a new program group window containing the Epi Map and Boundary icons.

To run Epi Map, click twice on the icon. You have the choice of running Epi Map from Windows (as a DOS program), or directly from DOS by typing EPIMAP.

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If you are running Windows from a local area network rather than from your own hard disk and have difficulty installing the icon feature, ask your network administrator for advice, as the network may not allow changes to Windows except by the network administrator.

Registration

During installation, information is provided for registering your copy of Epi Map 2. If you obtained the system directly from the Epi Map supplier mentioned on the screen, there is no need to register, and you can press <F10> and begin to run Epi Map as described in the next chapter.

If you obtained a copy of Epi Map from another source, this form gives you the opportunity to be on the mailing list for future updates and occasional newsletters. It also tells us how well the informal copy distribution system has been working and how many copies have actually been received. In contrast to commercial programs, Epi Map is designed to be distributed by copying from person to person. Please register, and then encourage others to copy your original disks and the manual. Before distributing copies it is a good idea to use a commercial program to check the disks for viruses that may have been acquired as a result of passage through other computers.

Options

The SETUP option on the Epi Map menu is used to tell Epi Map what type of printer you plan to use and in what directories necessary files are stored. More details are given in Chapter 9. Setting these options can be done at any time prior to printing the first map.

Mice

Epi Map works with, but does not require, a mouse to move the cursor and choose commands on the screen. If you have a Microsoft-compatible mouse, be sure to run the mouse driver before running Epi Map. If you have other programs that use a mouse, it is likely that the driver is loaded automatically when your computer "boots up" through a command in the AUTOEXEC.BAT file such as C:\MOUSE\MOUSE, or a statement in the CONFIG.SYS file like DEVICE=MOUSE.SYS. If not, the most common way to activate the mouse is to type **MOUSE** from the DOS

prompt. If this fails to produce a message about the mouse, consult your mouse manual for further instructions.

The mouse is a convenience, but not a necessity. You will be able to make maps easily in Epi Map using the function and cursor keys to control the program. The mouse makes it easier to create new maps or to edit the resulting graphics, but anything done with a mouse can also be done from the keyboard.

Many commands require that you move the cursor with the mouse to the correct spot and then click the left mouse button once. In Epi Map, it is generally not necessary to hold the mouse button down, as clicking it again has the same effect as releasing the button in other programs. Since the middle and right buttons are not used in Epi Map, "mouse button" in this manual means "**left** mouse button."

The Driver List, EPIMAP.DRV

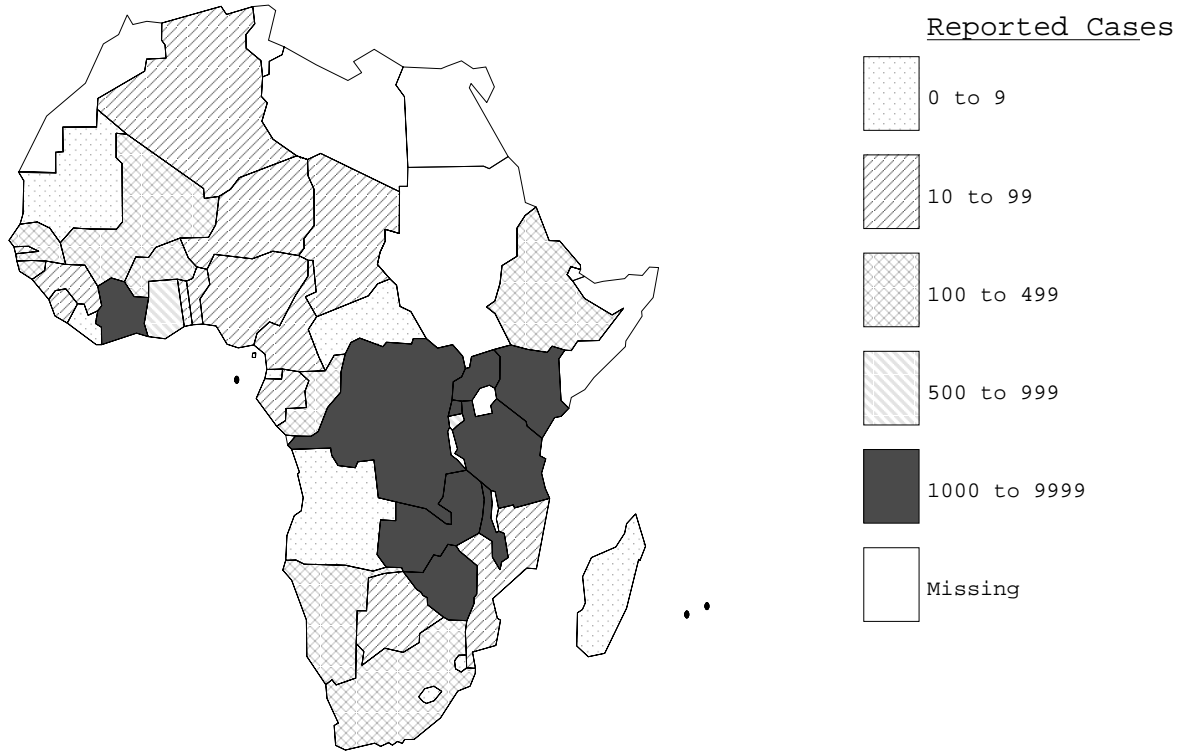
The file EPIMAP.DRV contains a list of drivers for printers and file types and ancillary information about various modes of operation and the correspondence between colors on the screen and printed colors.

The file is documented internally. To see and/or edit its contents, examine the file in EPED or another editor. After making a backup copy you can edit the file to adjust output for a particular printer or to add a driver for another printer or file type. The drivers must be of the .BGI (Borland Graphics Interface) type, however; not all drivers will work.

Related Topics

The next chapter contains a quick tutorial so that you can learn to make maps almost immediately. The other chapters describe the remaining items on the menu and the underlying principles of map making in more detail. If you are in a hurry to get started, turn to the next chapter and make some maps. If you are a more experienced computer user or like to proceed systematically, you may prefer to turn to Chapter 9 and set up the file and printer configurations with the Setup menu before beginning to make maps.

Cases of AIDS Reported Africa



A Color/Pattern Map

Chapter 2

A Quick Introduction to Epi Map

Tutorial

For a quick introduction to Epi Map, run the program, choose the MAP menu by typing "M," and press the <Down arrow> key and then <Enter> to choose CREATE MAP FILE. Subsequent screens will lead you through the process of choosing a boundary file (use the <Down arrow> to move to DEMO.BND and press <Enter> *twice*) and a data file (choose DEMO.REC by the same method, but press <Enter> only once). Bypass the RANGE and TITLE screens by pressing <Esc> once for each. The completed map appears.

Choose MAP TYPE, and then DOT DENSITY. On the option screen that appears, enter 10 for the DOT VALUE and press <Esc> to display the dot map. Now choose MAP TYPE again, followed by CARTOGRAM <Enter> and then <Esc> to display a cartogram. Explore the other menus to see how the maps can be altered.

Overview

A map in Epi Map is stored in three types of files. *Boundary* (.BND) files contain the basic outline of the map. *Data* (.REC or .DBF) files are Epi Info or dBASE files containing summary data to be plotted on the map. Depending on the type of map chosen, the data will determine patterns and colors, densities of randomly-distributed dots, or the size of the features (regions) that make up the map.

The names of the boundary and data files and the details of titles, legends, extra lines, or other annotations are contained in *Map files* (.MAP). The .MAP file may be regarded as the supervisor of the others since it is able to load the other two types of files and produce a complete map, once all the information has been saved in the .MAP file.

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To make a map, you specify a boundary file (DEMO.BND), and a data file (DEMO.REC) and choose a field within the data file to be represented on the map. Each map displays data similar to that found in a frequency table in Epi Info with a single summary figure, such as "number of cases," for each geographic entity in the boundary file.

Identifying a boundary file, a data file, and a field is sufficient to display a map with the standard (default) settings of Epi Map. The map will show the data in patterns and colors by quartile for the values in the data file. The best way to discover the other features of Epi Map is then to experiment with MAP TYPES and with the choices on the ANNOTATIONS menu to see how the map can be varied. Further details are contained in the rest of this manual. This chapter offers a guided tour of the most commonly used features.

Running Epi Map

To run Epi Map, simply type EPIMAP any time a DOS prompt is visible:

>**EPIMAP** or, if you have a monochrome monitor, **EPIMAP/BW**

The words "Epi Map" should appear on the screen in large letters. (If not, try giving the command **CD \EPIMAP2** first).

The main menu at the top of the screen contains the following items:

Map Boundary Data Info Map Type Annotations Output Setup Help F10-Quit

The menu can be made to disappear by pressing <Spacebar> and will reappear if you press <Spacebar> again. Throughout Epi Map, either <Esc> or <F10> may be used to indicate that you are done with a particular screen. To avoid confusion, it is best to use <Esc> for this purpose except when leaving the program.

Guided Tour

The following instructions will provide a quick tour of Epi Map:

1. Run Epi Map by typing EPIMAP from the DOS prompt.

2. Choose the MAP menu by typing **M** or pressing <Enter>.
3. Choose CREATE MAP FILE by pressing **C** or <Down arrow> and then <Enter>.
4. Choose and load the boundary file DEMO.BND by pressing <Esc> to remove the list of files, typing **DEMO**, and pressing <Enter> twice.
5. Press <Esc> again, and then type DEMO or DEMO.REC for the data file and press <Enter>.
6. Bypass the RANGES and MAP OPTIONS screen for now by pressing <Esc>.
7. Accept the default values on the TITLES screen by pressing <Esc>.
8. The map will be displayed.

The tour continues with a brief explanation of the operations you may perform most often in Epi Map.

To see and edit a boundary file:

1. From the main menu choose BOUNDARY and then CREATE/EDIT BOUNDARY.
2. Choose SELECT.
3. Select a country by placing the cross hairs over the country and pressing <Enter> or the mouse button. The country should turn blue and/or be filled with a striped pattern. Press <Esc> to bring the menu back.
4. Now choose MOVE and follow instructions to move the selected country into one of the ocean areas. Press <Esc> to bring the menu back.
5. Choose EDIT. Press <F7> and follow instructions to enlarge an area on the map. Place the cross hairs over a country and click or press <Enter>. The boundaries and vertices ("corners") of the country polygons should be highlighted. Place the cross hairs over one of the vertices and press <Enter> or click the mouse button. Now drag the point to the right or left and release it with another <Enter> or click. If

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you wish, change the shape of the region in several ways before pressing <Esc> to bring the menu back. Press <Esc> to return to the main menu.

At this point, you could save the results by choosing SAVE BOUNDARY from the BOUNDARY menu and then giving a name to the newly edited file.

To see and change values in the data file:

1. From the main menu, choose DATA and then ENTER/EDIT DATA. The countries of Africa are displayed with the name in the first column and the data field in the second column. The values are actually contained in an Epi Info .REC file. Note that there is only one set of values for each country; this is a summary file produced for mapping purposes and is analogous to a frequency table for each variable rather than to a file of individual cases.

2. With the cursor in column 2 (<Right arrow> if necessary), change one of the values to something much larger. Press <Esc> to display the map and observe that the value represented has changed.

The ENTER/EDIT DATA feature can be used to enter data from the screen if there is no suitable data file. Once a boundary file has been loaded, choose ENTER/EDIT DATA. Epi Map allows you to enter a data value for each country or other region in the boundary file. If you choose SAVE DATA and name the file, it will become a permanent file in the Epi Info format.

To display a dot-density map:

1. Return to the main menu. Choose MAP TYPE. There are three choices. The maps displayed previously were Color/Pattern maps.

2. Choose DOT DENSITY. On the screen that appears, change the DOT VALUE from 1 to 10. Press <Esc> to display the map. The dots will be placed randomly within each country, each dot representing 10 cases.

To display a cartogram:

1. Choose MAP TYPE again and this time select CARTOGRAM. On the OPTIONS screen, change MINIMUM SIZE to 10% so that countries with low values will be somewhat identifiable. Press <Esc> to display the map.

A cartogram is not the best way to display the data in DEMO.REC, but this method does highlight the countries with the most cases.

To edit the titles or legends:

1. From the main menu, choose ANNOTATIONS and then select TITLES or LEGEND.
2. You may change the wording of the titles or legend heading by deleting words and typing your own choices in the boxes provided.
3. Press the <Tab> key and then change other features such as FONTSTYLE, FONTSIZE, or COLOR. Pressing <Spacebar> will cycle through the available options.
4. Press <Esc> to display the map.

To display labels:

1. From the main menu, choose ANNOTATIONS and then LABELS.
2. Press the <Space bar> to turn SHOW LABELS ON.
3. Change any other features of the label text that are available.
4. Press <Esc> to display the map and see the labels.

To change the patterns and colors:

1. From the main menu, choose MAP TYPE and then COLOR/PATTERN.
2. Press <F5> for COLORS.

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3. Each range of values is displayed at the left of the screen with its own color and pattern. Move the marker to the first value with the <PgUp> key. Now select another pattern and color by positioning the highlighted square with the arrow keys. Do the same for the other values if you like.
4. Press <Esc> twice to display the map.

To change the location, size, color, or font of annotations, and to draw additional lines arrows, markers, boxes, or text on the map:

1. Choose ANNOTATIONS and EDIT ANNOTATIONS.
2. Move the cursor to one of the country labels, such as ETHIOPIA.
3. Click the mouse button or press <Enter> twice. A dotted rectangle will appear around the label. Now move the cursor. The label moves with it. When you have positioned the label in a new location, click again or press <Enter> to release the label. Try the same thing with one of the titles.
4. Select a label or title with a single click or <Enter>. Now move the cursor to the OPTIONS menu and click or <Enter> again. Choose one of the options, and then select a new color, size, or font.
5. Try the "tools" represented as a cursor arrow, a text character, a line, a rectangle, and a bullet or marker above the left side of the map. If you are not using a mouse, use function keys <F2> to <F6> to select the tools. After selecting one of the tools other than the cursor arrow, draw the represented object on the screen and "decorate" the map as you wish. Experiment with these tools until you are skillful.

To print a map:

1. Before printing, use the SETUP menu to select the proper settings for your printer, as described in Chapter 9. From the Setup screen, press <F2> to save the settings.
2. From the main menu select the OUTPUT menu. Choose the printer desired for output. You may have to make or confirm another choice about the resolution and size of the image to be printed. The first time, choose low or medium resolution until you see that everything works. Then experiment with the other choices until you have a feeling for the

trade-off between print quality and the time it takes the printer to produce the image.

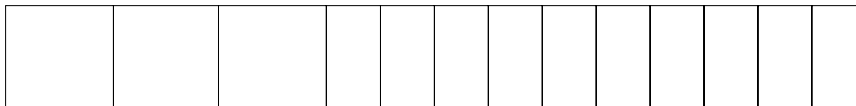
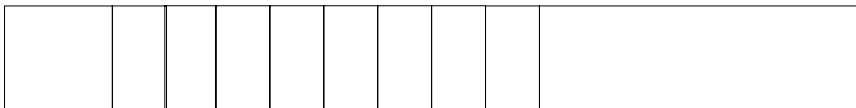
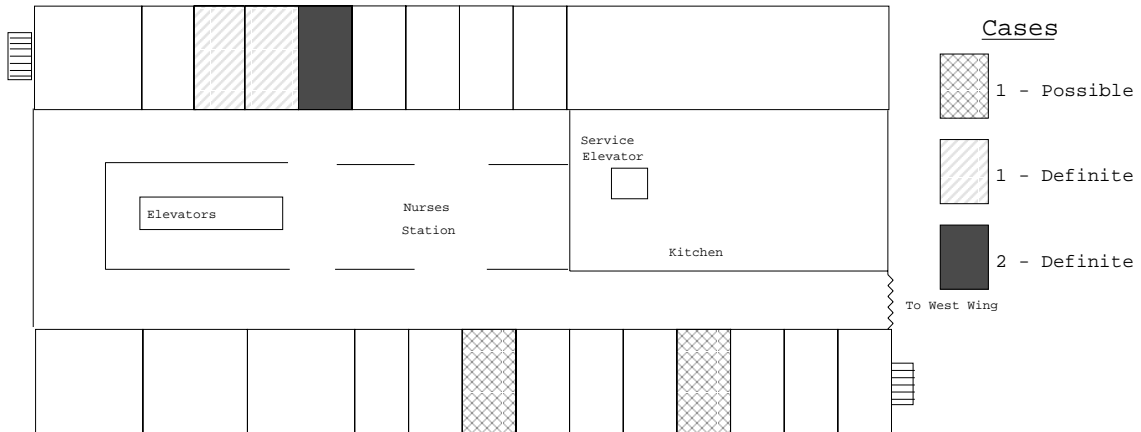
This concludes the introductory tour of Epi Map. You have become acquainted with the major features of the program. Many more refined operations, such as producing shadowed maps, multiple maps on a screen, producing your own boundary files, and setting up Epi Map to display a new data file whenever it is altered, are explained in the next few chapters. Even now, however, you know enough to produce some very useful maps. Congratulations!

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Cases of Aspergillosis

Hospital A, Ward 1C

February 9 - May 1, 1992



A Map of a Hospital Ward and Its Boundary File

EPI MAP USER'S GUIDE



The Screen Display

```
"Madagascar" ,17
23.35544,8.71676
23.49856,8.27213
23.41380,8.07204
23.39852,8.08872
23.22344,7.41759
22.90386,6.79233
22.66487,6.74647
22.49396,6.89515
22.50647,7.35229
22.57733,7.39675
22.62041,7.48707
22.58150,7.85111
22.70933,8.11651
23.06504,8.26240
23.19287,8.45137
23.22066,8.58198
23.35544,8.71676
"Namibia" ,22
18.25464,8.07621
18.40610,8.08038
18.52698,8.02347
etc.
```

The .BND File

Two Views of a Boundary File

Chapter 3

Boundary Files

Tutorial

Choose **BOUNDARY** from the main menu and then **LOAD COMPLETE**. Choose the **DEMO** boundary file and press <Enter> twice. A map of Africa will appear. Several contiguous maps can be loaded by giving several names to **LOAD COMPLETE**.

Suppose, however, that you want to show only two countries from the map. Choose **BOUNDARY** from the main menu again, and then **LOAD PARTIAL**. Choose the **DEMO** boundary file and press <Enter> twice. A list of the countries of Africa will appear. All have been selected. Deselect all by pressing <F8>. Choose **ETHIOPIA** and **SOMALIA** by moving the bar cursor and pressing <+> when it lies over the correct choices. Press <Esc>. Only these two countries will appear on the screen.

Choose **CREATE/EDIT BOUNDARY** from the **BOUNDARY** menu. A new menu appears at the top of the screen. Choose **EDIT** and then place the cross hairs over Ethiopia. Press the mouse button or <Enter>. The vertices ("corners") of Ethiopia are highlighted. Place the crosshairs on one of these or on a line and click or press <Enter>. Now move the cursor to a new location and you will see the line or point follow. Click again to place it permanently in its new location. Experiment further with the **EDIT** feature, pressing <Esc> to return to the editing menu when done.

Choose **SELECT** and then click when the crosshairs are over Ethiopia. The interior of the country will change color or pattern. Press <Esc>. If you choose **DELETE** at this point, the country will be deleted from the map, but choose **MOVE** instead. Now click on the selected country and move the crosshair cursor to a new location. The country will also move. Click again to finalize the new position.

Countries can be combined into a single region, such as East Africa by loading DEMO.BND, selecting the East African countries, and using the COMBINE command to produce an East African map, with or without the internal boundaries between countries. If a value for East Africa is added to the data file and values for the individual countries are changed to missing, the shading or dots for East Africa will then reflect the value for East Africa rather than for individual countries.

To make a new boundary file, follow the directions under CREATING A NEW BOUNDARY FILE in this chapter. Note that a new map might be any area containing closed regions such as townships, houses, or hospital rooms. You can even map your desktop or an ant farm, as long as it consists of closed polygons, perhaps combined with annotations to represent non-polygonal objects.

A map of a hospital floor is included with Epi Map as an example. Choose LOAD MAP from the MAP menu and load HOSPITAL. To see the boundary file that was constructed in Epi Map for this map, choose CLEAR on the MAP MENU and then LOAD COMPLETE on the BOUNDARY menu to load HOSPITAL.BND, the boundary file, without its associated annotations or data.

Overview

Boundary files are the basic skeletons from which complete maps are built. They consist of numbers and labels describing regions. The regions may represent countries, states, provinces, counties, blocks, rooms, buildings, or any other entities that can be represented as closed spaces. Epi Map contains facilities for creating, editing, displaying, and printing boundary files with or without associated shading or dots. The BOUNDARY program supplied with Epi Map transforms boundary files in a number of ways, including rotation, simplifying those too detailed to display efficiently, changing formats for greater display speed, and performing "projections" to make the map appear to be viewed from a different perspective or with a different treatment of the earth's curvature. The BOUNDARY program is described in Chapter 8.

Epi Map saves boundary files in an efficient "binary" format, but files in ASCII form (readable with the DOS TYPE command) are also

accepted. The boundary files supplied with Epi Map include most countries in the world, with subdivisions of larger countries, and every state in the United States by county. Additional boundary files can be obtained from public or commercial sources or entered into Epi Map with a digitizer tablet, a mouse, or even (with patience) by using the cursor keys.

The Structure of Boundary Files

Boundary files are supplied as files with names like AFRICA.BND. The suffix or file name extension .BND is suggested but not required. Each part of a boundary file such as the one for AFRICA consists of a label like MADAGASCAR, then a number telling how many points (vertices or "corners") make up the polygon (region) called MADAGASCAR. In the example below, there are 17 points in MADAGASCAR, and the 17 lines that follow contain 2 numbers each describing these points. When Epi Map draws AFRICA on the screen, each of these number pairs represents a horizontal (X) and vertical (Y) location on the screen. Epi Map constructs straight lines between the points to draw the map. Here is the first part of the AFRICA.ASC file distributed with Epi Map. It was converted to ASCII form by using the BOUNDARY program supplied with Epi Map, since AFRICA.BND is in binary form not suitable for easy viewing.

```
"Madagascar",17
23.35544,8.71676
23.49856,8.27213
23.41380,8.07204
23.39852,8.08872
23.22344,7.41759
22.90386,6.79233
22.66487,6.74647
22.49396,6.89515
22.50647,7.35229
22.57733,7.39675
22.62041,7.48707
22.58150,7.85111
22.70933,8.11651
23.06504,8.26240
23.19287,8.45137
23.22066,8.58198
23.35544,8.71676
"Namibia",22
```

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18.25464,8.07621
18.40610,8.08038
18.52698,8.02341
etc.

The numbers here represent arbitrary coordinates rather than latitude and longitude, but many boundary files, such as those for the States of the U.S., contain latitude and longitude. Note that the last two numbers under MADAGASCAR are the same as the first two, thus closing the polygon.

Most of the files distributed with Epi Map are in the "binary" or compiled format rather than the plain text or ASCII format shown above. The binary format contains 256 possible characters rather than the standard 128, and looks like nonsense ("hearts and faces") when displayed on the screen or in a word processor, but is more efficient and therefore faster when being loaded into Epi Map. The BOUNDARY program, described later, will convert files to either binary or ASCII format.

Loading and Viewing Boundary Files

Epi Map can display all or part of a boundary file. Several boundary files, such as those for adjacent countries in a region, can also be combined in a single display. The BOUNDARY menu appears when you type B from the main menu or place the cursor over the word BOUNDARY on the menu and click the left mouse button:

Load complete.. F2
Load partial..
Create/Edit boundary..
Save boundary..
Save Cartogram..
Clear boundary file

LOAD COMPLETE allows you to load one or more boundary files in complete form. In the U.S., for example, you might want to load the State of Georgia, contained in the boundary file USGA.BND by itself, but you could also load adjacent states, USFL.BND (Florida), and USAL.BND (Alabama) to produce a regional map. To perform either task, choose LOAD COMPLETE from the menu and then enter the name(s) of the boundary files desired, pressing <Enter> twice after the last one. To see the available files, press <F9> from the LOAD screen

and a list will appear. You can choose one or more files from the list by moving the cursor and pressing enter or the mouse button.

LOAD PARTIAL presents a list of the subdivisions within a boundary file so that you can choose those that are to be displayed on the screen. If you give the names of several boundary files, the subdivisions of all are displayed. You are then invited to select or deselect subdivisions with the <+> and <-> keys. You could make a map of East Africa, for example, by selecting only the countries in this region from DEMO.BND.

Loading a Boundary File from the DOS Prompt

When running Epi Map from the DOS prompt, a boundary file may be loaded by specifying the name, as in:

```
>EPIMAP AFRICA.BND
```

Epi Map will recognize Africa as a boundary file by the extension, .BND. If no extension is given, Epi Map will look for AFRICA.MAP, AFRICA.BND, and AFRICA.REC in order and load the first one found.

Editing a Boundary File

The CREATE/EDIT BOUNDARY choice from the BOUNDARY menu will show the current boundary file in a frame, with a new menu displayed across the top. The menu contains the items:

New Edit Select Delete Combine Move Utilities eXit

With the boundary file DEMO.BND loaded, the menu commands are used as follows: (Note: If you are not using a mouse, the instruction "click" means press the <Enter> key.)

NEW The command "Enter Region Name:" appears. Supply the name of a new geographic entity to be added to the map (not the name of the boundary file). This might be "Newlandia." Move to an area of the map not already occupied, and click the mouse. Move the cursor to the next vertex of the intended region and click again. Proceed in this way to trace the entire outline of the new region, being careful not to cross any lines. When you have marked the last point, but not yet

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closed the polygon, press <F4> (or <Esc>), and Epi Map will complete the polygon by drawing a line to the first point. Additional regions can be added in the same way. The use of the "Divide Region" and "Common Boundary" functions for adding new regions is explained below.

EDIT This command is used to alter or add to existing boundaries. After choosing EDIT, place the cursor within any region and click the mouse button. The points around the periphery of the region will be highlighted. Now click on one of the points, and drag it to a new location. Clicking again will release it. Clicking on a line will create a new point that can also be moved.

If you press <F5> for "Divide Region" after choosing a region to edit, you can divide one region into two. A prompt will ask first for the end point and then the start point of the new border. One of the two new regions will be selected. Enter the name for this region, and then enter the name for the other region, noting that the existing name of the highlighted region appears in the upper right corner of the screen. Draw the remaining points on the new border by clicking a series of points. When the last has been indicated, press <F4> to complete the line and join it to the end point. You now have created two new regions from one initial region. The process may be repeated for further subdivision if necessary.

During editing, the image can be enlarged by pressing <F7> to "zoom in," and then selecting the upper left and lower right corners of the rectangle to be enlarged. Pressing <F6> moves an enlarged image of a selected rectangle to the center of the screen. To "zoom out" to the normal sized image press <F8>.

Note that <F7> may be used repeatedly to give great enlargements for precision in editing or entering points. At the upper right side of the screen appear the name of the boundary file, the number of regions, the name of the one currently being edited, the number of regions with the same name, the number of vertices in the current region, and the X and Y coordinates of the current cursor location. These features allow fine control in editing or drawing a map.

SELECT Before regions can be moved, deleted, or combined, they must be selected using this command. Choose the command and then move the cursor over the first area desired. Click once and the region (country) will be filled with a pattern. Repeat this for other countries if desired. Press <Esc> to return to the menu. Now you are ready to give a MOVE, DELETE, or COMBINE command.

DELETE After a region has been selected, DELETE will cause it to be erased. If this is done for a country on the interior of the continent such as Ethiopia or Sudan, the effect is not obvious because the boundaries of neighboring countries still remain. Deleting more than one adjacent country or a coastal country will show the effect better. In all cases, however, the name of the country will be deleted from the edited boundary file and data intended for that country will not be shown on a completed map.

MOVE After selecting a country, choose this command and then click on the country again. Now drag it to another location and click once more. The country has been repositioned.

COMBINE Select two or more adjacent areas with the Select command. Then choose Combine. Give a name to the new region, such as "Horn of Africa." You are then asked to choose whether to retain the boundaries between countries in the region. In order to see the effects, it is best to say no ("N"), but in practice you may prefer to leave the boundaries intact.

Values in a data file may be entered for a country, a region, or both. Suppose that you combine Somalia, Ethiopia, Djibouti, and Kenya to form the region called "Horn of Africa." Case counts entered for each individual country will override the value for the Horn of Africa. Any of the four countries without its own case count, however, will have the shading or dot pattern given for the Horn of Africa.

UTILITIES EDIT BOUNDARY NAMES brings up the list of names for all the regions in the current boundary file and allows you to change the names if desired. The changes become permanent if you save the file. CONFIGURE DIGITIZER is described below in the section on using a digitizer.

Creating a New Boundary File

You can make a boundary file from the beginning in Epi Map. This is useful in mapping a community or other region for which no computerized map was available. It is even possible to make "maps" of buildings or other diagrams in which cases of disease or other statistics will be related to regions.

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To make a new boundary file, return to the main menu by pressing <Esc> or choosing EXIT. Choose BOUNDARY and then CREATE/EDIT BOUNDARY. You will be asked for the X and Y coordinates of the lower left and upper right corners of the screen. These are useful when working from a grid with known dimensions or a map with latitude and longitude. Usually, it is enough to accept the default values by pressing <Enter> four times. Epi Map will insert corner markers in the boundary file so that the map will maintain the same scale when loaded into the program a second time.

Constructing the map is the same whether you use a mouse, the cursor keys, or a digitizer (see below). Choose CREATE/EDIT BOUNDARY from the BOUNDARY menu and then choose NEW from the editing commands. Give the name of the overall geographic region you will create, and draw an outline to represent it on your map, clicking at each corner or vertex. Press <F4> or <Esc> to complete the figure and draw the last segment.

To create subdivisions of the main outline, use DIVIDE REGION for the remaining regions. After completing an outline using NEW and giving it a name (e.g., EUROPE), chose EDIT from the same REGION menu. As instructed, click to select the outline of EUROPE. Then press <F5> for DIVIDE REGION (see choices on lower right). Following the prompts, choose the END and START points for the new subdivision. You will be asked for the "New region name," and might enter FRANCE. The "Other region name," should be left as EUROPE. Note that the name of the current region appears at the top right corner of the screen. Now complete the outline of FRANCE by clicking on successive points. At the last point press <F4> to close the subregion. Working systematically from one adjacent region to another, you can subdivide EUROPE to complete the final map with the same operation.

Drawing regions like the State of Michigan that consist of two or more separate regions with the same name requires a special technique. To draw a state with two regions, draw all the vertices for the first region, but do not close the region. Instead of using <F4> to close the region, press the <F2> key for ADD ISLAND. Draw the second region and press <F4>, or, if there is another island to add, <F2>. The regions will be completed automatically. If you make a mistake, DELETE ISLAND can be used to remove a region. Islands can also be internal to the main region, as a large lake or another country completely surrounded by the first. Lesotho, for example is surrounded by South Africa. Lesotho boundaries must also be created after an "island" is made for it in South Africa.

Using a Digitizer to Create New Boundary Files

A digitizer is a tablet with a pen-like stylus or other pointing device. It operates in nearly the same way as a mouse, but the locations on the tablet are constant. Every time you return to a particular point on the digitizer tablet, the cursor returns to the same point on the screen. A mouse measures only relative movement and is more difficult to use for tracing exact locations.

Many brands of digitizers are available. Epi Map supports those that operate with the Summagraphics II type of device driver, one of the popular standards.

To set up the digitizer, connect the digitizer to the computer through a serial port as described in the manual for your digitizer. Select SETUP from the main menu. At the bottom of the screen are settings for TYPE and PORT. Set TYPE to SUMMASKETCH II PROFESSIONAL with the <Spacebar>, and PORT to the port connected to the digitizer (usually COM1 or COM2). Save these settings and your current printer choices by pressing <F2>.

To make a new boundary file, first tape a paper map of the right size to the digitizer tablet. You will use the stylus of the digitizer to select points from the map for transfer to the screen.

Choose BOUNDARY and then CREATE/EDIT BOUNDARY. A series of four coordinates for the lower left and upper right corners of the screen will appear at the top of the screen. You may enter your own coordinates or accept the default values by pressing <Enter> for each.

Choose UTILITIES and then CONFIGURE DIGITIZER. Mark a point on the lower left corner of the paper drawing with a pencil and place the digitizer stylus on this point. Press the stylus or press the button on the digitizer pointing device. Now, as instructed on the screen, do the same with a point in the upper right corner of the paper map. The corner marks on the paper will allow you to reconfigure the digitizer and resume work if you do not finish the map at one sitting.

From this point on drawing boundaries with a digitizer is done as described in the preceding section. Be sure to save the map you have created at intervals during the work and after it has been completed to

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your satisfaction. Should it be necessary to exit from Epi Map before the work is completed, the marks on the corners of the paper map can be used to reconfigure the digitizer so that points on the screen and on the paper map correspond correctly.

A digitizer must have the following parameters in order to interact properly with Epi Map:

EMULATION:	Summagraphics mm
SAMPLING RATE:	150
DATA FORMAT:	binary
RESOLUTION:	500
PARITY:	none
DATA BITS:	8
COORDINATE MODE:	absolute
ORIGIN SETTING:	lower left
OPERATING MODE:	remote
BAUD RATE:	9600

For SUMMASKETCH II digitizers, use the SEND utility from the DOS command line, or from a batch file, to set the parameters:

```
send /1/m/o/cz8zr
```

For SUMMASKETCH III digitizers, use the SEND utility from the DOS command line, or from a batch file, in order to set the parameters:

```
send /1/m/cDcz8czr
```

In both instances , case is important.

For other digitizers, please consult the manual for your digitizer for methods to set parameters.

Saving a Boundary File

Whether created from the beginning or merely edited, a new boundary file must be saved before it can be considered permanent. At intervals during the work and after completion, return to the main menu with <Esc> and choose BOUNDARY and then SAVE BOUNDARY.

Combining Boundary Files and Renaming Regions

More than one boundary file can be loaded at one time using the LOAD COMPLETE choice on the BOUNDARY menu. If the boundaries are from the same coordinate system, they will load in the correct positions relative to one another. Saving the resulting multiple boundary will create a new and larger boundary file.

If boundary files loaded as a single boundary contain regions with similar names--for example, counties named MONROE in several adjacent U.S. states--the counties should be renamed in both the .BND and .REC files so that each region in the resulting map has a unique name. Boundary names may be changed with EDIT BOUNDARY NAMES on the UTILITIES menu in CREATE/EDIT BOUNDARY of the main BOUNDARY menu. Names in the data file may be changed from ENTER/EDIT DATA on the DATA menu.

Clearing a Boundary File

The CLEAR BOUNDARY FILE command in the BOUNDARY menu will remove the current boundary file and allow you to load another, even while a data file and map file remain active.

Related Topics in Other Chapters

Chapter 8 discusses map projections and further technical details of boundary files.

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REC	REGIONNAME	VARIABLE1
1	Algeria	32
2	Angola	0
3	Benin	57
4	Botswana	29
5	Burkina Faso	481
6	Burundi	809
7	Cabinda	
8	Cameroon	60
9	CAR	0
10	Chad	10
11	Congo	360
12	Cote D'Ivoire	1930
13	Djibouti	
14	Egypt	
15	Eq Guinea2	1
16	Equ. Guinea	1
17	Ethiopia	283
18	Gabon	24
19	Gambia	21
20	Ghana	899
21	Guinea	49
22	Guinea Bissau	123

F5-New Variable F6-Modify Variable F8-Sort File F4-Done

The Data Entry/Edit Screen

Chapter 4

Data Files

Tutorial

Data files in Epi Map can be created in Epi Info or in dBASE-compatible systems, or imported through Epi Info from a variety of other formats. In this tutorial, you will create a data file by entering values on the screen in Epi Map after loading a boundary file.

From the main menu, choose **BOUNDARY** and then **LOAD COMPLETE**. Load the **DEMO.BND** file.

Now choose **DATA** from the main menu, and then **ENTER/EDIT DATA**. A screen will appear that contains the names of the countries on the map of Africa. In the **VAR #1** column enter a number for each country, pressing **<Enter>** after each. The numbers may represent cases of a disease, for example, or disease rates.

Now press **<Esc>** to display the map. The data values will be displayed. Return to **DATA** and **ENTER/EDIT DATA** and change some of the values to verify that they are the ones shown on the map.

To save the data file, choose **DATA** and then **SAVE DATA**. Use your own first name (up to 8 letters) as the name of the file. *

Overview

Epi Map accepts data from Epi Info files or from files in the dBASE format. Each record to be displayed must contain a geographic name corresponding to one of the entities (regions) in the boundary file being used by Epi Map. The records also must contain at least one numeric field with the data to be displayed, e.g., Number of Hepatitis B Cases, or Cases of Cholera per Hundred Thousand Population. Epi Map will

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ask which field contains the boundary names and which field contains the data for each map displayed. Although the file may contain many numeric fields, each map represents data from only one field. As described later, however, more than one map may be placed on a single screen.

The names of regions must be spelled the same in both data and boundary files. To see spellings for the boundary file, choose ENTER/EDIT DATA on the DATA menu. To change names in the boundary file, use CREATE/EDIT BOUNDARY on the BOUNDARY menu and then EDIT BOUNDARY NAMES under UTILITIES.

If individual cases are the starting point, they must be processed in Epi Info or another system to produce a summary file, with only one record per geographic entity. This is done with the OUTPUT FREQ command in Epi Info's ANALYSIS program. A description of the OUTPUT FREQ command may be obtained in the reference section of the Epi Info manual or by typing OUTPUT in ANALYSIS and pressing the <F1> key for help.

If you prefer to enter data from the keyboard, Epi Map will construct an Epi Info file containing the geographic names and allow you to enter the corresponding data values.

The Content and Structure of Epi Map Data Files

Epi Map is designed to display data from both Epi Info and Epi Map files. Epi Info is a companion program for Epi Map that provides a complete database and statistics program for epidemiologic and other public health work.¹ Case or other individual records may be processed in Epi Info to produce summary data files for use in Epi Map. Similar processing must be done in dBASE systems before plotting the data in Epi Map. Although the actual file structure is more complicated, the files should contain the following information for each record:

Geographic Entity Name Variable #1 Variable #2 Variable #3
etc.

¹Dean AD, Dean JA, Burton AH, Dicker RC. Epi Info: A general-purpose microcomputer program for public health information systems. American Journal of Preventive Medicine 7(3):178-182, 1991.

To display a map of the State of Connecticut with each county showing cases of Hepatitis A, the records might contain:

<u>COUNTY</u>	<u>HEPCASES</u>
FAIRFIELD	3
HARTFORD	1
LITCHFIELD	0
MIDDLESEX	2
NEW HAVEN	1
NEW LONDON	0
TOLLAND	0
WINDHAM	1

There are eight counties in Connecticut and this data file would match the boundary file exactly. If the county names do not match, however, only data corresponding to the names in the boundary file will be plotted. Misspellings and synonyms cause data to be ignored. If this happens, change the names in the boundary file or in the data file so that they match. It is quite possible to have many fields of relevant or irrelevant data in the file, as long as the geographic name variable is first. If there are fields for several diseases, you can choose which one to map from within Epi Map at the time the data file is loaded or by choosing DATA VARIABLE from the DATA menu at any time.

Entering Data Directly in Epi Map

Sometimes the data values for a map are not available in Epi Info or dBASE file format, and you may want to enter them directly from the keyboard. To do this, first load the boundary file using BOUNDARY and LOAD COMPLETE as described in Chapter 3. From the main Epi Map menu, choose DATA and then ENTER/EDIT DATA. A data file containing the geographic names from the boundary file will appear on the screen. To enter data, move the bar cursor to the VAR #1 column and enter numeric values, pressing <Enter> after each. Then press <Esc> to display the map.

At the bottom of the data file screen are prompts for several additional functions. These are:

F5-NEW VARIABLE: Creates a column for a new variable.

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F6-MODIFY VARIABLE: Allows entry of a more descriptive name for the variable in the current column. Column width can be changed, and pressing the <Spacebar>, <+>, or <-> keys toggles between STRING (text) and NUMERIC field types. Data to be displayed must be numeric.

F8-SORT FILE: Sorts the data records on the screen to make it easier to find a given name or to correspond to an alphabetized list from which you may be entering data. Place the bar cursor in the column on which you want the sort performed before pressing <F8>.

F4 or <Esc>-DONE: Returns to the main menu and displays the map.

After data items have been entered, you must choose DATA and SAVE DATA from the main menu to save the file in permanent form. This command will create an Epi Info data file containing the geographic names and data values that appeared on the screen.

Processing Individual Cases in Epi Info for Display in Epi Map

Given an Epi Info file called SURVDB.REC, containing (artificial) data on individual cases, such as those commonly used for surveillance of reportable disease, the following ANALYSIS commands will produce a file suitable for use in Epi Map:

```
READ SURVDB
SELECT DISEASE = "HEP B"
ROUTE HEP.REC
OUTPUT FREQ COUNTY
QUIT
```

The resulting file will have a field called COUNT that contains the number of hepatitis B cases for each county.

Loading a Data File

After constructing an Epi Info summary file as described above, the file may be used in Epi Map. First load the boundary file USCA.BND and then use the LOAD DATA FILE command in the DATA menu to load HEP.REC. Give the file name when requested. If there is more than one text field (e.g., COUNTY) or more than one numeric field

(e.g., COUNT), Epi Map will ask for the names of the fields containing boundary names and data items and then display the map.

Epi Map will accept data files in either Epi Info or dBASE format. If a filename ending in .DBF is given, it will be loaded as a dBASE file.

Saving a Data File

After entering data from the keyboard, the data file must be saved by choosing SAVE DATA from the DATA menu. If a name has not yet been assigned, the name will be requested. Data files are saved in the Epi Info format and end in the suffix, .REC.

Choosing a Data Variable

A data file may contain many numeric fields with data useful for mapping. After a map has been constructed, you can map a different variable by choosing DATA VARIABLE from the DATA menu.

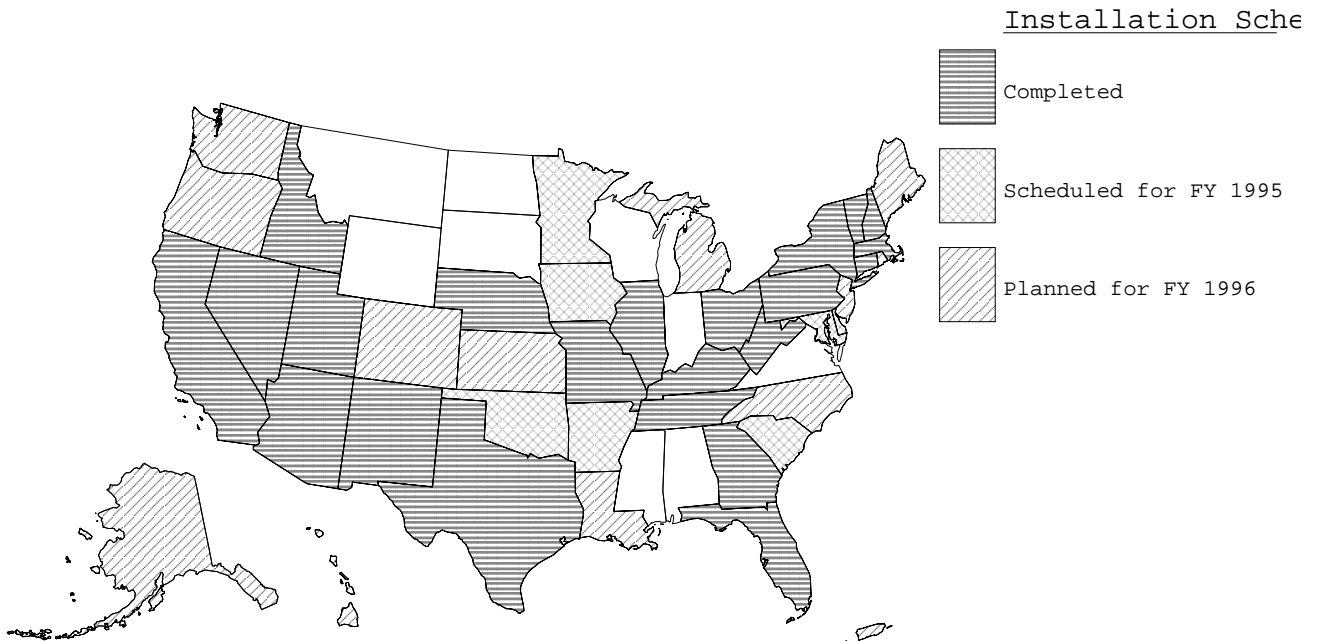
Clearing a Data File

A data file may be removed with CLEAR DATA FILE on the DATA menu, to allow loading another data file, even if a boundary file remains active.

Related Topics in Other Chapters

Chapter 12 discusses the use of Epi Info files to provide automatic mapping from within other software, for example, in a disease or injury surveillance system.

NETSS/VPD State Installations as of July 1, 1995



Chapter 5

Map Files

Tutorial

To construct a map, we have a boundary file and a corresponding data file, as described in the previous two chapters. Load a *boundary* file by choosing BOUNDARY from the main menu and then LOAD COMPLETE. Press <F9> to see the available .BND files, choose DEMO.BND boundary file with the <Down arrow> key, and press <Enter> twice.

Now choose DATA from the main menu and ENTER/EDIT DATA. A screen containing the names of the countries appears. In the column under VAR #1 enter a series of numbers representing imaginary cases or rates. Press <Esc> to display the map, and you should see the data displayed in several color or shading patterns. Choose DATA again and the SAVE DATA to save the file. Give the file a name. So far, we have repeated the tutorial for the previous two chapters.

To preserve this combination of boundary and data values, choose MAP from the main menu, and then SAVE MAP. Give the map a name such as TESTMAP.MAP. Then exit from Epi Map.

To examine the map file you have just made, use the DOS TYPE command (or EPED from Epi Info) to display the file:

```
>TYPE TESTMAP.MAP
```

Now run EPIMAP again, giving the name of the map file from the command line, as in:

```
>EPIMAP TESTMAP
```

Your map will appear, complete with data, on the screen. Rather than loading the map directly from the command line, you could have chosen MAP from the main Epi Map menu and then LOAD MAP followed by the name of the .MAP file to achieve the same result.

Overview

In previous chapters, maps have been described as derived from boundary and data files. Each map has at least one boundary file and a source of data. This chapter describes map or .MAP files that are used to record the names of boundary and data files for a map. They also contain details of titles, colors, labels, legends, lines, boxes, symbols, and other annotations. Once all these items are saved in the .MAP file, the map may be easily redisplayed by loading this file. This can be done from the MAP menu from within Epi Map. You can also display a map from the DOS command line by typing EPIMAP and the name of the .MAP file, thus providing a way to display maps from other programs or DOS batch files automatically.

The Structure of Map Files

The .MAP file may be regarded as a private set of notes kept by Epi Map as you construct and modify a map. The information is sufficient to reproduce the map at a later time, but is not designed to be modified except through Epi Map. If you are curious, however, you can view the inside of a .MAP file using Epi Info's EPED or another editor or word processor. The file is in ASCII or "plain vanilla" format, but contains many numbers representing locations on the screen and other parameters. Among the more easily understood items are BOUNDARY, the name of the boundary file; DATAFILE, the name of the data file; and MAPTYPE, the type of map to be produced. There are also entries for LABELS, RANGES, TITLES, and the LEGEND. BOUNDVAR and DATAVAR are the variables in the data file to be used for mapping. If you have created annotations or changed the location of labels, there will be entries to record the changes. The structure of .MAP files is described at the end of this manual for reference purposes.

Creating a Map File

As described in Chapter 2, CREATE MAP FILE on the MAP menu leads to choosing a boundary file and then a data file to make a first draft of a map. You can then use the ANNOTATIONS menu choices to adjust or add features and finally SAVE the .MAP file as described in the next section.

Saving a Map File

Before a map file can be retrieved, it must be saved using the SAVE MAP FILE command on the MAP menu. If you attempt to leave Epi Map without saving the file, the program will remind you to save the .MAP file.

Loading or Clearing a Map File

To load an existing .MAP file and display the map that it describes, choose the MAP menu and then LOAD MAP FILE. To see a list of available .MAP files, enter nothing and press <F9>, or enter a directory or wildcard filename like *.MAP, and press <Enter>. Choose or type the name of the .MAP file to be loaded and the map will be displayed. An alternative method for displaying a map is to call the .MAP from the DOS command line when running Epi Map. For example:

```
C:\>EPIMAP WEEKS
```

will run Epi Map and use the file, WEEKS.MAP to display a map. The command EPIMAP WEEKS.MAP will have the same effect.

Choosing CLEAR MAP FILE from the MAP menu will remove the map file and also the current boundary and data files from memory.

Copying Map Files: the COPYMAP Program

Map files contain the names of both boundary and data files, and copying all the files that belong with a given .MAP file can be a puzzling task. A program called COPYMAP is provided to make this easy.

To copy all the files associated with a map file called ATLANTIS.MAP, from the \EPIMAP2 directory on the C drive, for example to a floppy disk in the B drive, give the following command from the DOS prompt.

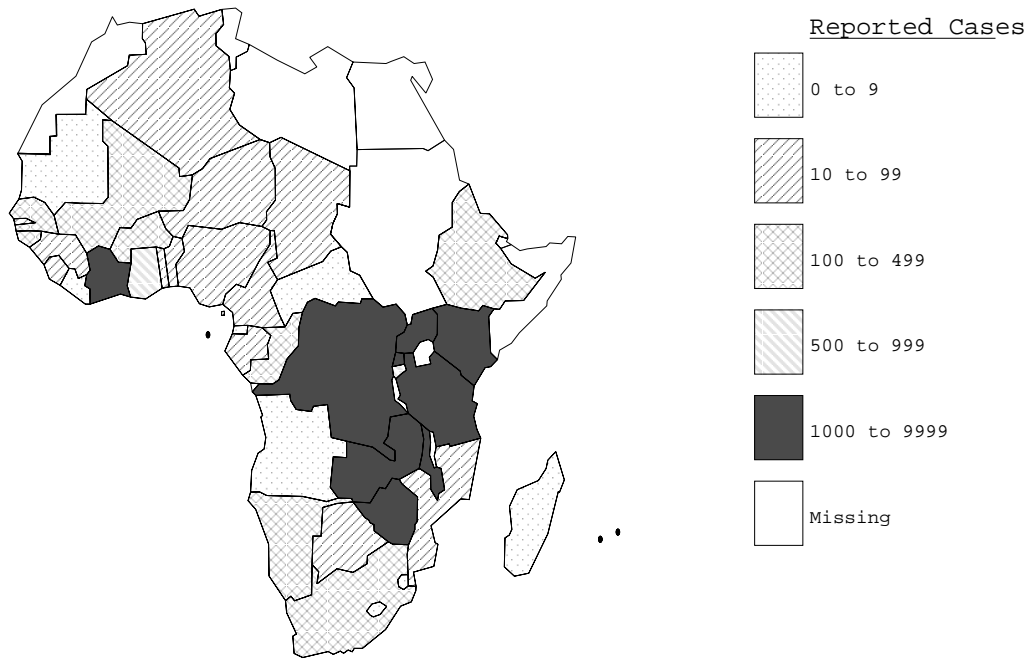
```
>COPYMAP C:\EPIMAP2\ATLANTIS B:
```

Generally, the format of the command is the same as that for the COPY command in DOS.

Related Topics in Other Chapters

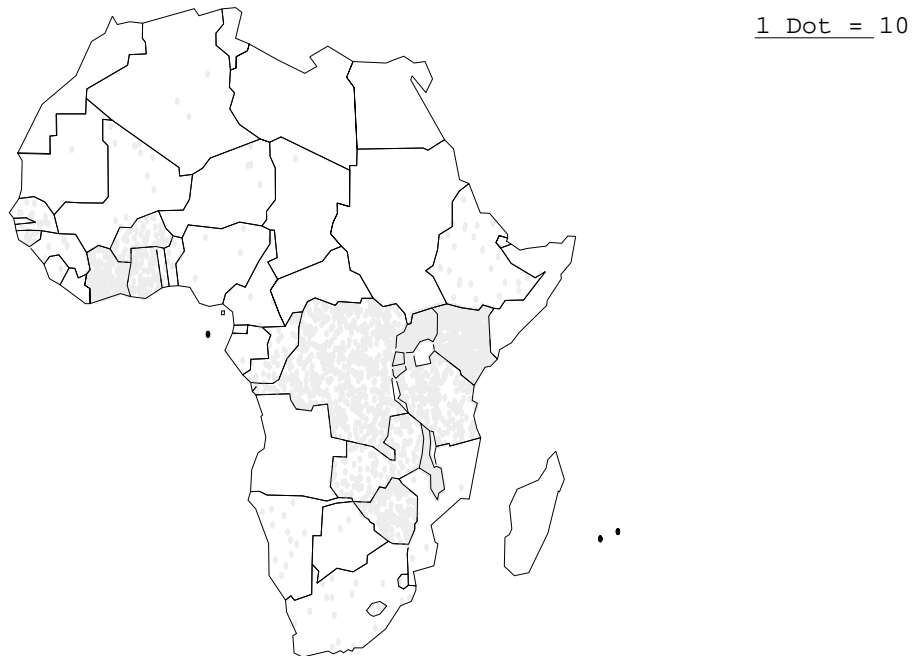
In Chapter 12, more information is given on running .MAP files from the command line. In Chapter 11, on drawing multiple maps on a single screen, the MAP MANAGEMENT command on the MAP menu is described fully. Chapter 7 describes creating and editing of annotations and labels that are stored in .MAP files. For those wishing to know more of the structure of MAP files, a complete description is found at the end of this manual, just before the index.

Cases of AIDS Reported
Africa



A Color/Pattern Map

Cases of AIDS Reported
Africa



A Dot Density Map

EPI MAP USER'S GUIDE

Cases of AIDS Reported in 1989 Africa



A Cartogram

AIDS CASES ON POPULATION CARTOGRAM Africa, 1989



A Dot Density Map on a Population Cartogram

Chapter 6

Map Types

Tutorial

Create a map by loading the boundary file DEMO.BND and the data file DEMO.REC. Now choose MAP TYPE from the main menu and then COLOR/PATTERN. On the screen that appears, the cursor will be in the left column under "Ranges." Press the down arrow and change the numbers in the right column to even numbers. Note the number of countries in each range on the left under "#R." If you like, change the MAP or BOUNDARY options on the right. Press the down arrow to move the cursor to these options. Try setting the two shadow offsets to 2 for a three-dimensional effect. Note the statistics on the lower right. Press <F5> for COLORS. Select a range with <PgUp> and <PgDn> to move the arrow on the left. Now choose the color and pattern by moving the bold rectangle with the arrow keys. Press <Esc> or <F4> twice to display the map. The results can be saved using SAVE MAP on the MAP menu.

Now choose MAP TYPE and then DOT DENSITY. Set the DOT VALUE to 100 and the DOT DIAMETER to 4. Change the DOT COLOR with the <Spacebar>, <+>, or <-> keys. The other options are similar to those for Color/Pattern maps. Display the map by pressing <Esc>. Try adjusting the dot value, diameter, and color until you get a map you like.

Now choose CARTOGRAM from the MAP TYPE menu. Set the MINIMUM SIZE to 10% and the MISSING SIZE to 5% so that countries with zero or missing values will be visible. Press <Esc> to see the map. This kind of map is most useful when many countries have similar values. The Cartogram can be enhanced by selecting the LABELS entry on the ANNOTATIONS menu and turning on LABELS to put the names of the countries on the map (see Chapter 7).

Overview

There are three Map Types in Epi Map--COLOR/PATTERN, DOT DENSITY, and CARTOGRAM. Each is produced by choosing MAP TYPE from the main menu and then choosing the desired type. A screen of optional settings appears for setting ranges, dot-to-case-ratio, appearance of text, three-dimensional shadowing, and other special effects for each map type.

The Color/Pattern Map Type

In this type of map, data values are grouped into ranges and each level is assigned a particular color and pattern combination. When you choose Color/Pattern from the MAP TYPE menu, a screen of choices appears. Epi Map supplies an initial set of ranges, based on quartiles in which the number of values falling into each range is as nearly the same as possible. The values in the ranges can be changed on the screen. Note that the number of values falling into each range is displayed to the left of the range. The function keys at the bottom of the screen have the following effect on the ranges:

<F5>-COLORS: The colors and patterns chosen for the ranges will greatly influence the usefulness of the map. Pressing <F5> presents another screen containing available colors and patterns. The ranges are displayed on the left with their current colors and patterns.

Use the <PgUp> and <PgDn> keys to choose a range, placing the arrow opposite the range desired. Now with the mouse or the arrow keys, move the highlighted box to the color and pattern desired. If you plan to use a black and white printer, patterns are more important than colors. For screen display, color slides, or transparencies, the colors may be used alone.

<F6>-DELETE: The range indicated by the cursor is deleted and those around it are adjusted to include its values.

<F7>-ADD: This command copies the range indicated by the cursor, providing another line so that you can enter appropriate numbers for the new range. Choose EVEN RANGES or EQUAL COUNTS to have them calculated automatically.

<F8>-EVEN RANGES: This recalculates the ranges so that each spans an equal range of values. If there are four ranges, each value would be one-quarter of the way further from the minimum toward the maximum value.

<F9>-EQUAL COUNTS: This recalculates the ranges so that equal numbers of regions have values in each range. If there are values for 48 countries, for example, and 4 ranges have been set up, each range would contain values for 12 of the countries. For most purposes this gives the best distribution for mapping. You may want, however, to adjust the ranges so that they also represent even numbers or correspond to meaningful ranges by other criteria, such as biological concepts of "normal" or ranges set on previous maps of the same area.

The best maps tell their story without having the reader consult the legend. This means that high ranges should be represented by intense colors or heavier patterns and low ranges by those with less impact. Generally colors presented on a map as red, yellow, green, and blue are viewed as having high values to low values. Red/green colorblindness is common enough so that it is best to avoid expressing values solely through red and green colors by including patterns that will reinforce the message given by the colors. When you have finished selecting colors and patterns, press <Esc> to return to the previous screen.

On the right side of the RANGES and MAP OPTIONS screen, options are provided to display or not display TITLES, the LEGEND, and a rectangular FRAME around the map. The TITLES and LEGEND options must be ON to display these features after alteration in the ANNOTATIONS menu, as described in Chapter 7.

Boundary Options allow altering the color and thickness of the boundary lines. The SHADOW instructions allow a shadow to be placed behind and offset from the main map to give a three-dimensional effect. The values for the offsets in the X (horizontal) and Y (vertical) directions are arbitrary. Values of 2 to 6 are a good starting place for experimentation. Shadows cause the entire map to be drawn twice and thus increase the display time. It is best to turn the shadow feature on after all the other items in the map have been finalized.

In the lower right corner of the screen is a box of useful statistics on the data, including the number of records, the number of missing values, the minimum, maximum, mean, mode, median, and standard deviation.

Dot Density Maps

Dot density maps give a quick visual impression of numbers on the map. Unlike shaded maps they do not require that ranges be constructed, since each dot represents a fixed number of cases.

The dots for each geographic entity are randomly distributed within its borders. If you would like to locate dots more precisely, in a major city, for example, there are two options: 1) Place dots individually using the symbol tool in EDIT ANNOTATIONS 2) Construct a new region representing the city, using CREATE/EDIT BOUNDARY.

To make a dot density map, choose MAP TYPE from the main menu and then DOT DENSITY. The right half of the screen that appears is similar to that for color/pattern maps. On the left are three choices for dot density maps:

DOT VALUE: The number 1 in this field means that each dot represents one case. If there are many cases, you may wish to have each dot represent 10 or 100 cases by entering 10 or 100.

DOT DIAMETER: The size of the dots can be controlled by entering a number from 1 to 10 in this blank.

DOT COLOR: With the cursor in this field, use the <Spacebar>, <+>, or <-> keys to choose the color desired for the dots. An arrow points to a sample of the color selected as you toggle the colors with the <Space bar>.

Cartograms

Cartograms are perhaps most useful for representing population or other values in which none of the areas have extremely low values. They may be used to make a point that most of the values are in a few areas. They are easier to interpret if the shapes of the areas are familiar to the audience so that easy identification is possible without labeling.

Epi Map produces a noncontiguous AREA cartogram: areas are shown near their original locations, with their outlines enlarged or reduced so that an area is proportional to its data value. Thus, a region with 400 cases will be shown as having twice the area of a region with 200 cases, regardless of the original areas involved.

In public health, the most useful application of cartograms is to construct a cartogram with population values for each of the graphic entities. This can be saved as a boundary file with the SAVE CARTOGRAM command on the BOUNDARY menu, and used to show cases with a dot density map. The result is that an impression of rates is conveyed (dots per unit population), but the number of cases is also visible, something that is not possible with color/pattern or dot density maps alone. At the beginning of this chapter is a population cartogram of Africa, combined with dot density representation of AIDS case reports.

To make a cartogram, choose CARTOGRAM from the MAP TYPE menu. The right side of the screen that appears is similar to that for the other map types. On the left are three choices that control the appearance of the cartogram:

SCALE: Usually this is 100% or normal size. The area with the largest numeric value is left at normal size and the others are proportionately reduced. If the appearance of the map would be improved by changing the scale for polygon sizing, you may enter another percentage from 1 to 1000. Those over 100 will enlarge the regions; anything less than 100 will reduce their size.

MINIMUM SIZE: Because many data sets contain small values, some of the regions may become mere points. To prevent this, you can set a minimum value so that they will retain their shape--usually between 5 and 20%.

MISSING SIZE: The same principle applies to areas with missing values. If you do not want them to become points, the MISSING SIZE may be set to a suitable value--usually 5 to 20%.

Area cartograms can result in regions drawn too small to be useful, particularly if the largest data value occurs in a region with a small true area. In this case, it may be useful to increase the values of MISSING SIZE, MINIMUM SIZE, and/or SCALE. The maximum value for SCALE is 1000%.

SCALE values greater than 100% can result in areas being drawn overlapping each other. In this case, the BOUNDARY menu's CREATE/EDIT BOUNDARY choice can be used to SELECT and MOVE regions as required.

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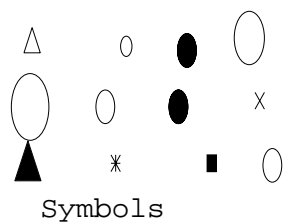
After achieving a useful arrangement of regions, the BOUNDARY menu's SAVE CARTOGRAM choice will store the current sizes and arrangement of regions in a boundary file.

Related Topics in Other Chapters

In Chapter 11, on drawing multiple maps on a single screen, the MAP MANAGEMENT command on the MAP menu is described fully. The next chapter describes creating and editing of annotations and labels that are stored in .MAP files.

Reference

Olson, J.M. Non Contiguous Area Cartograms, *Professional Geographer* **28**: 371-380, 1976.

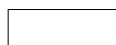


Editing of Annotations



Change Boundary Scale

Lines



Boxes with colors or patterns



Chapter 7

Titles, Legends, Labels, and Other Annotations

Tutorial

Load the DEMO boundary and DEMO data file as in the tutorial for the previous chapter. Choose MAPTYPE from the main menu and then COLOR/PATTERN. Display the map by pressing <Esc>.

Choose ANNOTATIONS from the main menu and then TITLES. Change the main title to "Cumulative Estimate of Imaginary Cases" and the subtitle to "AFRICA: Prior to 1990." Press the <Tab> key and then use the arrow and <+> and <-> keys to change the text styles. Press <Esc> to display the map. Repeat this process until you are satisfied with the appearance of the titles, striving especially for simplicity and clarity.

Choose ANNOTATIONS from the main menu and then LEGEND. Change the LEGEND HEADER to "Cumulative Cases." You may want to press <Tab> and change the TEXT STYLE and other options before using <Esc> to display the altered legend. Changing the location of the legend will be described below.

Choose ANNOTATIONS and then LABELS. Set SHOW LABELS to ON by pressing the <Space bar>. Adjust the other settings as desired. Press <Esc> to display the labeled map.

Now choose EDIT ANNOTATIONS from the ANNOTATIONS menu. Move the cursor to one of the labels and click or press <Enter> twice until a dotted rectangle appears around the label. Now move the cursor, dragging the label to a new position, and release it by clicking or pressing <Enter>. Try repositioning the titles, legend, and the map itself in the same way.

Now add a text comment to the map by choosing the "A" symbol at the top of the screen, clicking or pressing <Enter> at the location where you want to place the text, and then typing the text. Draw a line from the text to a part of the map using the line tool at the top of the screen. Choose the tool marked by a small triangle and click or press <Enter> at a point on the map where you want a special marker, such as the location of a hospital or clinic. Try changing the type of symbol with the OPTIONS MENU.

To save the changes, choose MAP and SAVE MAP.

Overview

A completed map may include labels, legends, titles, and various kinds of graphic or textual overlays that are not produced by the boundary and data procedures described so far. In Epi Map, most of these "extras," collectively called annotations, are produced from the ANNOTATIONS menu and saved in the .MAP file for later use.

Titles

Every map should have a descriptive title. It is important to indicate not only what is plotted (e.g., "Typhoid"), but over what time period ("First 6 Months of 1991") and in what units ("Cases of .." or "Cases of .. per hundred thousand population"). Epi Map constructs a title from the name of the field being plotted and the current date, but in many cases this will require editing.

Titles will be displayed only if the TITLES feature is ON in the appropriate MAP TYPE screen. To enter or edit a title, choose the ANNOTATIONS menu and then TITLES. Use the <Tab> key to move from one large box on the screen to the other and the <+> or <-> keys to view and choose the options. Press <Esc> to display the results.

The first box on the titles screen allows you to enter up to four lines of text to be centered at the top of the map (See "Editing Annotations" below if you would rather place the text somewhere else). To change

the font, size, color, justification, or underline status of the titles, press the <Tab> key. The cursor jumps to the other box on the screen and allows choices for each of these items. Several fonts are offered in arbitrary sizes ranging from 4 to 48, with a choice of 15 colors. They may be underlined and right, center, or left justified. It is best to use the font chosen by the program at first, but you will want to experiment with the others. Reserve Gothic for Halloween or other occasions of humor, remembering that the simplest is often the best in graphic displays. Colored text will print as various shades of gray on monochrome printers capable of printing gray scales.

The Legend

Legends are necessary for most Color/Pattern maps to give information about the ranges of values represented by each color or pattern. A legend will be displayed only if the LEGEND feature is ON in the appropriate MAP TYPE screen. To edit the legend that is constructed by the program, choose the ANNOTATIONS menu and then LEGEND. The screen that appears allows you to alter the text in the legend, define the appearance of the text, and set several options for spacing, order and content of items, and box color. Use the <Tab> key to move from one large box on the screen to the other and the <Spacebar>, <+>, or <-> keys to see and choose the options.

The box in the middle of the left column displays the ranges that are currently in effect (set on the MAP TYPE--COLOR/PATTERN screen). The text in the legend for each can be altered by typing the desired phrase in the LEGEND TEXT column. Note that this does not change the values used by the program, only the text displayed in the legend. Text style is set in the same way as described above for titles, by pressing <Tab> and making choices within the TEXT STYLE box.

OPTIONS include NORMAL and COMPRESSED for LEGEND SPACING. The order of items in the legend is set by their order in the box in the middle of the left column of this screen, but the order may be reversed by choosing DESCENDING ORDER. Legend entries for ALL OTHERS and MISSING values may be included or excluded from the display. BOX COLOR offers a choice of sixteen colors for the legend boxes.

When you have completed the choices, press <Esc> to display the results.

Labels

Labels are the names of the geographic entities in the map, taken from the boundary file. They may be suppressed or displayed in a variety of options indicated on the LABELS screen under ANNOTATIONS. The first choice determines whether the map will SHOW LABELS. For many maps the reader may be familiar enough with map outlines so that labels are unnecessary. Turning this option ON displays a label for each region in the map, but the next two options allow you to select only the important labels. You may choose not to display labels for regions with missing data values, for example, or to be even more selective and show only those for regions with values of at least a certain minimum number.

The appearance of the labels can be altered by placing a box around each label or by changing the type, size, or placement of text in which the labels are displayed. Individual labels can be moved as described in the next section.

Editing Annotations

Epi Map makes many choices automatically, including the placement of labels, titles, and legends, that may not satisfy your own artistic sense. You may wish to move these items or supplement the standard annotations with lines, rectangles, or text. Epi Map provides facilities for creating and editing such features when you choose ANNOTATIONS and then EDIT ANNOTATIONS. This feature also allows you to change the size of the map or even to place several copies of the same map on the screen. In a later chapter, you will see how to use the map manager to place several similar or different maps on the same screen.

The EDIT ANNOTATIONS screen shows the map in a frame. On the upper left are five "tools" that may be chosen for editing. The arrow on the left represents the *selection tool*, used to select items for moving or other editing. The letter "A" is the *text tool* that allows overlaying text on any part of the map. The *line tool* creates solid or dotted lines of any length and orientation in varying thickness. The small box is a *frame tool* for drawing rectangles anywhere on the map in varying sizes and line widths. The small triangle represents the *symbol tool*, offering a variety of symbols for marking the location of hospitals, clinics, individual cases, or other items requiring individual markers.

To use the tools, if you have a mouse, place the cursor over one of the tools and click once. The function keys <F2> - <F6> may be used to select the tools from left to right. The OPTIONS menu in the upper right corner of the screen, selected with <F8> or by clicking, will display options appropriate for the currently selected tool. After selecting a tool and setting the options, move the cursor to the location where the tool will be used and click or press <Enter>. Individual tools are used as follows:

SELECTION TOOL (Arrow symbol): Place the mouse pointer or cursor over a title, the legend, the map, or an individual label on the map and click or press <Enter>. The item selected will be highlighted by four blocks at the corners. Clicking again on the item will allow you to drag it to any point on the map and then release it by clicking again. The entire map, or the titles, legend, and individual labels can be repositioned in this way.

TEXT TOOL (Letter "A" symbol) This tool allows you to type text at the location chosen by clicking. The appearance and placement of future or currently selected text is controlled by choices that you make in the OPTIONS menu, including COLOR, SIZE, FONT, and JUSTIFY.

LINE TOOL (Line symbol) Drawing a line requires two clicks, one for each end of the line to be drawn. The appearance of the line is controlled by the choices in the OPTIONS menu, including COLOR and STYLE for width and various types of dashes.

FRAME TOOL (box symbol) Click once for the upper left and once for the lower right corner to create a box. The STYLE and COLOR of the border lines and the COLOR and PATTERN FILLing the frame are controlled from the OPTIONS menu.

SYMBOL TOOL (triangular symbol) Each click will place a symbol of the type selected on the OPTIONS menu at the cursor location. The TYPE (shape and solidity), COLOR, and SIZE of the symbols can be changed from the options menu.

OPTIONS: When an object is selected, the following options may be available, depending on the type of object:

DELETE removes previous annotations that have been selected. This command will not delete boundaries; this can be done with

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CLEAR BOUNDARY on the BOUNDARY menu or for individual regions within CREATE/EDIT BOUNDARY.

DUPLICATE makes a copy of the object on the screen. The copy may be selected with the selection tool and moved or deleted. Note that the copy is only on the screen and in memory. The SAVE MAP command in the MAP menu must be used to save it on the disk.

FRONT, BACK move the selected image to the front or back of the screen. The front image appears to lie in front or cover up the one that is in back.

If the entire map is selected, it may be moved by clicking and then dragging from the center, or the size may be changed by clicking on and then dragging one of the corner markers.

Saving Annotations

Annotation choices and additions are saved in the .MAP file along with the names of the boundary and data files when you use the SAVE MAP command on the MAP menu. Choose MAP and SAVE MAP and then enter the name of the map file, if necessary, to save the annotations.

Related Topics in Other Chapters

Some features described in this chapter require that legends and titles be turned on in the MAPTYPE screens described in Chapter 6. Annotations for multiple maps on the same screen are discussed in Chapter 11.

Latitude-Longitude Without Project

United States of America



Albers Equal-Area Conic Projection

United States of America

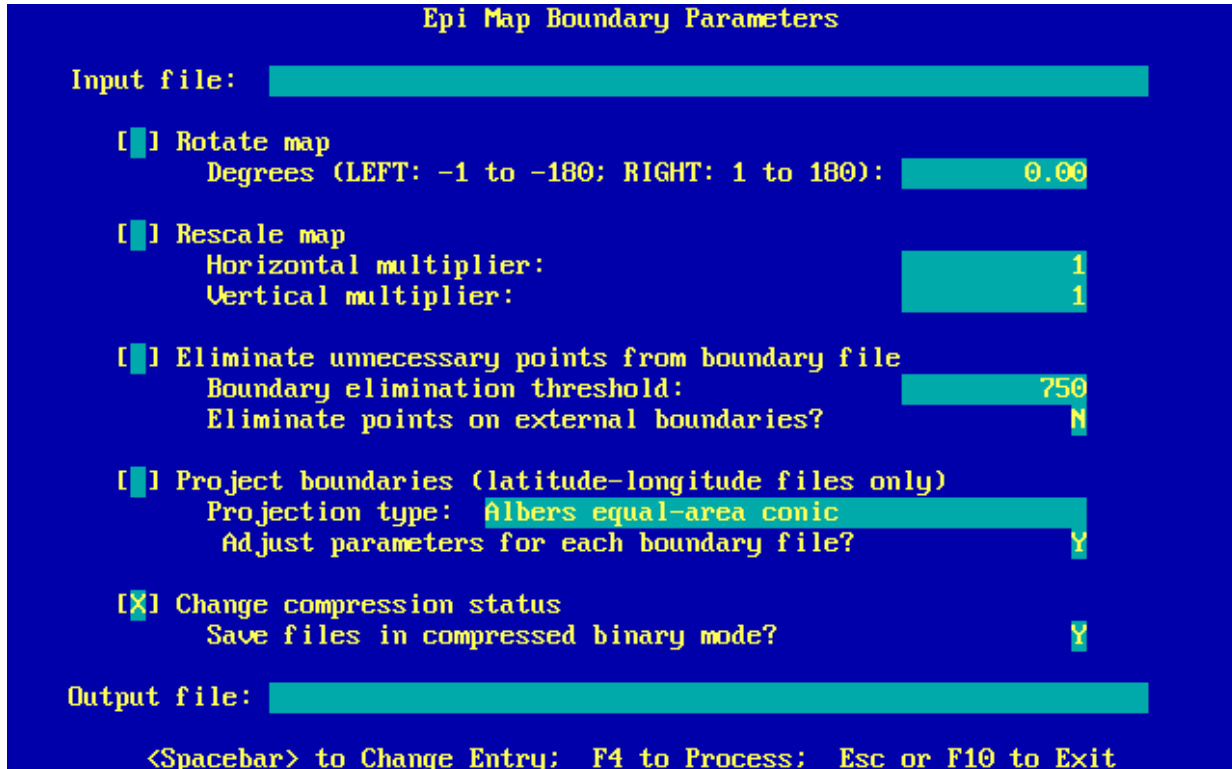


Lambert Equal-Area Conic Projection
United States of America



Miller Cylindrical Projection
United States of America





BOUNDARY: A Utility for Manipulating Boundary Files

Chapter 8

Simplifying, Projecting, Importing, Exporting, and Rotating Boundary Files

Tutorial

Boundary files can be manipulated by a utility program called **BOUNDARY.EXE** (or, for computers without extra memory available or 8086 processors, **BOUND64.EXE**). From the DOS command line, run this program by typing **BOUNDARY** (or **BOUND64**).

Choose **CHANGE FORMAT OF EPI MAP BOUNDARY FILES**. For the **INPUT FILE**, type **DEMO.BND**. Press <Enter> five times to move the cursor to **CHANGE COMPRESSION STATUS**. Press the <Spacebar> so that an **X** appears. Press <Enter> and enter "N" for **SAVE FILE IN COMPRESSED BINARY MODE**. Specify **DEMO.ASC** for the **OUTPUT FILE**. Press <F4> and the file will be converted to ASCII (plain text) format so that it can be examined. Use the **TYPE** command or **EPED** from Epi Info to examine **DEMO.ASC** and see the country names, the number of points for each country, and the **X** and **Y** coordinates for each point on the country outline. Note that the last and first points for each country have the same values.

Run **BOUNDARY** again and use **USA.LL** as the **INPUT FILE**. Move to the **PROJECT BOUNDARIES** field and press the <Spacebar>, <+>, or <-> key. Press <Enter> and then choose the **LAMBERT EQUAL-AREA CONIC** projection by pressing the <+> key until it appears. Leave **ADJUST PARAMETERS FOR EACH BOUNDARY FILE** as "Y." Move to **OUTPUT FILE** and enter **USA.LAM**. Press <F4> to make the conversion.

Now use Epi Map to load first the **USA.LL** boundary and then the **USA.LAM** boundary. Note that the latitude-longitude (**LL**) file looks squashed, but that the projection is like those that usually appear in an atlas. All the **.BND** files supplied with Epi Map have been projected. Projections should only be performed from **.LL** files.

The ELIMINATE UNNECESSARY POINTS choice will reduce the number of points in each region if you have an overly detailed boundary file obtained from an outside source. This allows it to load faster and to fit in memory with Epi Map. If you intend to load several contiguous maps together as a single unit, you should answer N to ELIMINATE POINTS ON EXTERNAL BOUNDARIES or load and save all the boundaries first before eliminating the unnecessary points. This assures that points on the contiguous boundaries will match.

Overview

Boundary files consist of names of regions and numeric coordinates defining the location of the vertices. Many boundary files are supplied with Epi Map in "binary" form. They can be converted to ASCII (readable) form with the BOUNDARY program described in this chapter.

Boundary files are available from a variety of public and commercial sources in various formats. BOUNDARY provides facilities for importing files in other formats and for simplifying those that are too large and detailed to be useful.

For boundary files containing coordinates in latitude and longitude, BOUNDARY will do several different kinds of *projections*, changing the perspective and methods of portraying the earth's sphere on flat surfaces.

The BOUNDARY.EXE program can use higher memory (beyond 640 K) in computers that have more than 640 K of RAM memory and central processors of at least the 286 type. It will not function on IBM-PC and PC/XT style (8086) computers, and a special program, BOUND64.EXE is supplied for such computers. If BOUNDARY does not function well in your computer, try BOUND64.

Importing Boundary Files

BOUNDARY and BOUND64 are able to convert files from either the MapInfo format or the Atlas Graphics format to the Epi Map format.

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The file to be imported must be in ASCII format. When viewed in an editor or with the TYPE command from DOS, it should display on the screen as a combination of region names and numerical coordinates of points. You may have to use a special utility that accompanies the commercial program to convert its normal "binary" files into the ASCII or printable format.

To import a file for use in Epi Map, choose the correct format from the initial screen of BOUNDARY or BOUND64. The second screen offers a number of choices. If the coordinates in the file being imported are very large or very small numbers, they may be divided by constant horizontal and vertical scaling factors with the IMPORT SCALING function. This may also be used to change the horizontal-to-vertical scale of a boundary or to shift its coordinates in relation to those for another boundary. The other choices are described below, as they may also be used to modify Epi Map files.

Simplifying a Boundary File

Some boundaries, particularly those imported from other systems, may be too detailed and occupy too much Random Access Memory (RAM) to use with Epi Map. These boundaries can be simplified using the BOUNDARY utility. BOUNDARY.EXE will allow simplification of more detailed boundaries than will BOUND64.

To reduce the size and detail of a boundary file, choose CHANGE FORMAT from the initial menu of BOUNDARY or BOUND64. Select ELIMINATE UNNECESSARY POINTS and then set the BOUNDARY ELIMINATION THRESHOLD to a lower number than the default 750. The numbers are arbitrary; 750 is the default; 10 will make a very simple map indeed. Unless you plan to join two maps together at the edges, answer "Y" to ELIMINATE POINTS ON EXTERNAL BOUNDARIES, as coastline detail can add considerable bulk to boundary files.

Projections: Changing the Point of View

Map projections are discussed in textbooks of cartography. Since the earth is (almost) a sphere, many ingenious ways of projecting it onto a flat surface have been tried. In computerized mapping, this means applying a mathematical formula to relocate the vertices of all the regions in a boundary file. They require that you begin with a boundary file in which the points represent latitude and longitude. Since latitude-longitude files make very distorted maps without projection, they are supplied with file names ending in .LL to avoid confusion.

All projections involve some compromise in distortion of angles (shapes), areas, directions, or distances. Selecting the right projection requires choosing the least damaging kinds of distortion for a particular purpose.

When making maps with an epidemiologic theme, it is desirable to represent a given area of the earth's surface by the same amount of space on the plane of the paper regardless of its location on the map. Such projections are called "equal-area" projections. The ones that can be produced by BOUNDARY include the ALBERS EQUAL-AREA CONIC projection and the LAMBERT EQUAL-AREA CONIC projection. For situations in which the world may be represented in a form closer to the much maligned, but familiar, Mercator projection, the MILLER CYLINDRICAL projection also is available. This greatly distorts the representation of areas near the poles, although countries near the equator are more evenly represented.

The United States of America, as represented in Epi Map without projection and in the three projections, is shown in the figure at the beginning of this chapter. The boundary files ending in .BND that are supplied with Epi Map are already projected. Those with file names ending in .LL are latitude-longitude files from which you can do projections by using BOUNDARY.

Each type of projection requires a different set of parameters for the calculations. BOUNDARY will supply reasonable values for the parameters, and in most cases, you should choose to accept these. The parameters and some general advice on their values are given below for those who wish to experiment further. Further information is contained in Snyder's book on map projections (1).

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Latitude begins at 0 degrees at the equator and reaches 90 degrees at the North Pole and -90 degrees at the South Pole. Longitude begins at 0 degrees at Greenwich (near London), England, and is negative west of Greenwich and positive east of Greenwich, reaching 180 degrees near the Fiji Islands.

For all projections: The latitude and longitude of the center of the projected area are required. This might be looked upon as the location directly under a satellite from which you are viewing the earth. A default value near the "center" of the territory is provided.

The Radius of Sphere at Map Scale: It is usually best to leave this as set, but experiment to see how it changes the projection if desired.

For the Albers Equal-Area Conic Projection: Two parallels of latitude can be chosen so that the scale (e.g., miles per inch) will be the same along these two parallels. Usually these two parallels are chosen so that they lie near the top and bottom of the area of interest, e.g., one-sixth and five-sixths of the way from the bottom to the top.

For the Lambert Equal-Area Conic Projection: One parallel of latitude is chosen so that the scale (e.g., miles per inch) will be that stated for the map. The scale is constant along any parallel, but not necessarily the same as that for other parallels.

The Epi Map Boundary File Format

Boundary files for Epi Map exist in two forms--ASCII and binary. ASCII files are readable in a word processor and contain names of polygons (regions) and numbers. Binary files are compressed and will load more rapidly, but cannot be viewed or edited in most word processors. In order to see the format of a binary file, first convert it to an ASCII file by using SAVE BOUNDARY from the BOUNDARY menu. Press <F5> as indicated at the bottom of the screen to Save Boundary In Uncompressed (ASCII) Format. Examining the file in an editor, or using TYPE <Filename> to display it in DOS, it may look something like this:

```
"Lesotho",8  
20.41529,6.34074  
20.53062,6.26710  
20.41946,6.13927  
20.30552,6.10314
```

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```
20.25550,6.12537
20.19159,6.19207
20.28329,6.30462
20.41529,6.34074
"Swaziland",7
20.88911,6.59502
20.81130,6.53666
20.73071,6.57973
20.71403,6.68673
20.77656,6.76732
20.88633,6.76870
20.88911,6.59502
"Botswana",19
etc.
```

To convert boundaries to the ASCII or to the binary format with the BOUNDARY or BOUND64 program, select CHANGE COMPRESSION STATUS and enter "Y" to SAVE FILES IN COMPRESSED BINARY MODE to produce a binary Epi Map file or "N" to produce an ASCII file.

The first line of the description of each region contains the name of the region and the number of points (vertices). The coordinates for each point occupy a single line, with the horizontal coordinate followed by the vertical coordinate. The coordinates may be units of latitude or longitude. Those given above are not, since they are from a projected map. Any arbitrary but consistent system will do, and Epi Map automatically adjusts the positioning of the map to include the maximum and minimum values in each direction on the screen.

Note that the first and last points or vertices in each region must match so that the region is closed. When you draw regions in Epi Map, this is accomplished automatically when you press <F4> to close the region.

If a single region consists of more than one polygon, e.g., the two parts of the State of Michigan, the parts must be closed regions with the same name, "Michigan." They are then treated as being part of the same entity for data-display purposes.

If a region is contained within another region by the same name that is immediately adjacent in the file, it is treated as a "hole" in the larger region--a lake, for example, or a space for another country, as for Lesotho within South Africa. Lesotho would have its own region defined to fit within the "hole" in South Africa.

Rescaling a Map

When Epi Map loads a boundary file, it automatically rescales it to fill the space allowed on the screen. If two boundary files are to be loaded together, however, it may be desirable to change the scale of one to match that of the other. If you have a map of the United States, for example, and wish to combine it with maps of Alaska and Hawaii that are originally in another scale, the RESCALE MAP feature of BOUNDARY is useful. Enter numbers for rescaling and the coordinates of the boundary will be multiplied by these numbers to rescale the map.

This feature might be used to correct latitude/longitude coordinates that have been multiplied by a constant, such as 100, by using 0.01 as the multiplier. If the horizontal and vertical multipliers are different, of course, the effect is that of “stretching” the map in one direction.

Rotating a Boundary

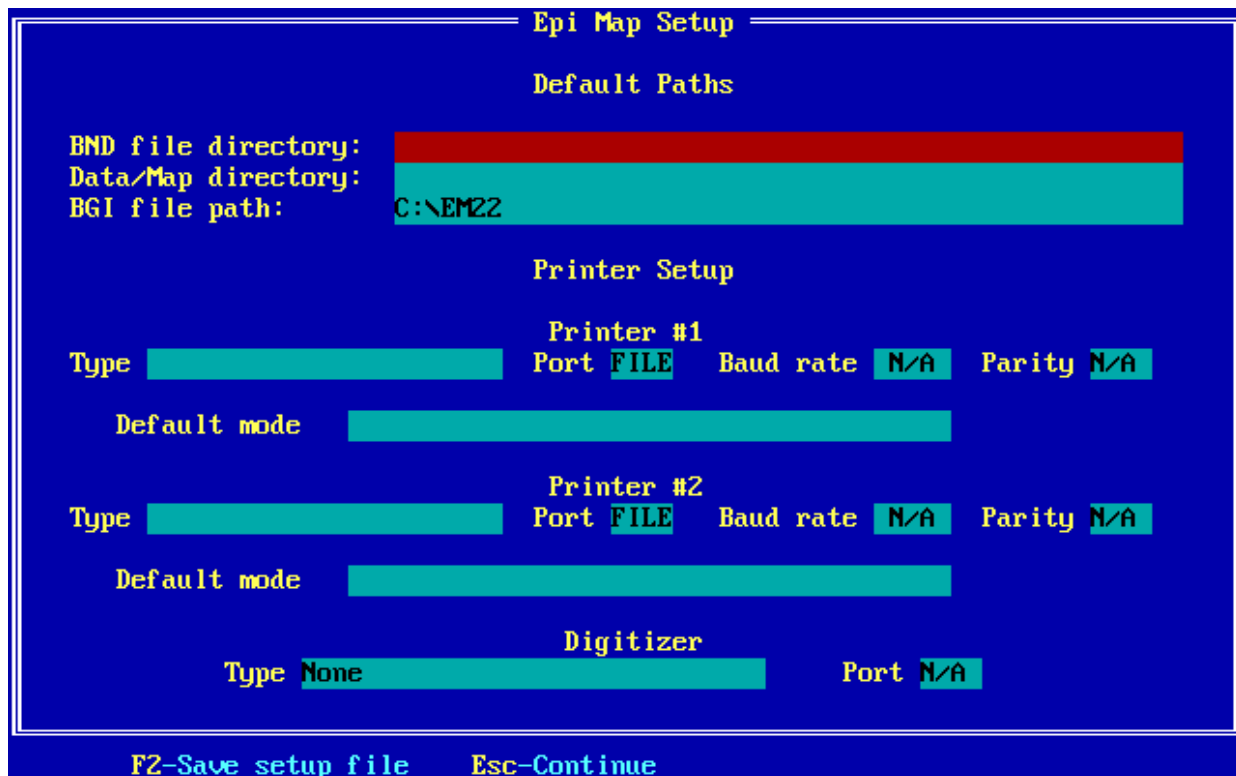
Some boundaries may not be oriented squarely with the screen. BOUNDARY and BOUND64 may be used to rotate boundary files. Choose CHANGE FORMAT and then select ROTATE MAP, giving the desired number of degrees of rotation.

Related Topics in Other Chapters

Chapter 3 describes the use of boundary files in Epi Map.

References

1. Snyder, John Parr. An album of map projections. (U.S. Geological Survey professional paper: 1453). U.S. Supt. of Documents no: I 19.16:1453, 1989.



The Printer Setup Screen

Chapter 9

Printing Maps

Tutorial

Choose SETUP from the main menu of Epi Map. On the screen that appears, use the arrow keys and <+> and <-> to select a printer type. If you have only one printer, configure the second printer as CGM (Computer Graphics Metafile) with FILE as the PORT. Press <F2> for SAVE SETUP FILE.

To print a map, choose OUTPUT from the main menu and then choose the desired printer and resolution mode. Use low resolution first until you are sure everything works. Higher resolutions look better but take longer.

Overview

Epi Map can print maps on Epson, IBM, Toshiba, and OkiData dot matrix printers, Hewlett-Packard plotters (7470, 7475, 7550, 7090, 7595, 7585), Hewlett-Packard Laserjet-compatible printers, Postscript printers, and Hewlett-Packard PaintJet, DeskJet, and color DeskJet printers. Image files can be produced in several formats, including Computer Graphics Metafile (CGM), TIFF, AutoCad DXF, GEM IMG, PCX, ANSI NAPLPS (Video Show), and WordPerfect Graphics formats. From one of these formats, the images can be imported into Lotus Freelance, Harvard Graphics, WordPerfect, and many other commercial programs, and then sent to other devices to produce colored slides or printed images.

The DOS versions of Lotus Freelance and Harvard Graphics have severe limitations on the size of files that can be imported. Removing text from maps in Epi Map will reduce the size of exported files.

You need to choose the type of printer or file output and tell Epi Map enough details to set up the output only once. This is done from the SETUP command on the main menu. The following instructions will assist in configuring Epi Map to match the type(s) of printer or file you will be using. You can alter the setup at any time and save the setup file for routine use.

Setting Up File Directories, Printers, or a Digitizer

Run Epi Map as described above. When you see the main menu bar across the top of the screen, choose SETUP by typing "S" or by moving the cursor with the mouse until it is over the word SETUP and pressing the left mouse button. A screen called "Epi Map Setup" will appear.

BND FILE DIRECTORY, DATA/MAP DIRECTORY, and BGI FILE PATH are the names of directories where you keep map outlines ("boundary files"), the Epi Info or dBASE files that contain data to be represented on the map, and the drivers for various printers. If you plan to keep these in directories other than the one where Epi Map resides, fill in the disk letter, a colon, and the complete directory names, for example:

C:\EPIMAP2\BND

C:\EPI6\DATA

C:\EPIMAP2\BGI

If you leave these items blank, Epi Map assumes that boundary, data, map, and .BGI files are kept in the same directory with Epi Map. If directories are specified, the files will be assumed to exist in these directories.

The rest of the screen allows you to specify two different printers and a digitizer tablet for use with Epi Map. To set up the first printer, move the cursor to the TYPE field under "Printer #1" using the mouse or the <Down arrow> key. Press <F9> to see the possible choices. Move the cursor bar to the one desired, and press <Enter> or click the (left) mouse button. If you do not press <F9> the choices can be seen one at a time by pressing the <+> or <-> keys.

The choices are printers or graphic file formats for which drivers are supplied with Epi Map (as files called _LJ.BGI and _HP7550.BGI, for example). Note that the driver files for EpiMap 2 are different from the ones for Epi Map 1 and are distinguished by the initial underline instead of a dollar sign (as in \$LJ.BGI for Version 1).

The CGM, POSTSCRIPT, and other file options allow finished maps to be sent to files in the Computer Graphics or other formats, ready for display, printing, or editing in Harvard Graphics, WordPerfect, Lotus Freelance, and other commercial programs. If you have only one printer, choose one of the file formats, such as CGM, for "Printer #2."

A PORT must be specified for each "printer." This is LPT1 or LPT2 for parallel printers and COM1 or COM2 for serial printers. The other option, FILE, allows *any* type of output to be sent to a file. You might use this option to make an output file to carry down the hall to print on someone else's computer or in certain cases, send it through a network to a printer.

It is rarely necessary to set PARITY to values other than N/A or NONE, but this option is provided in case a serial printer requires it. Neither PARITY nor BAUD RATE is applicable to parallel port communication.

The DEFAULT MODE choice determines the mode that will be highlighted when you request output. All of the available modes are displayed each time you make a request, however, and it is a simple matter to override the default option.

Most printers offer a variety of "modes" that range from rough draft (fast but crude) to highest resolution (satisfying but slo-o-o-w). Some printers, particularly laser printers, will only print in the higher resolution modes if they contain large (optional) amounts of memory. Start with a low-resolution setting and advance to others as you gain experience.

A DIGITIZER or graphics tablet is an input device that functions somewhat like a mouse, but allows finer control for drawing original maps on the screen. Generally you would tape a paper copy of a map on the digitizer tablet and then outline the various entities of the map by touching each "corner" with the digitizer stylus. Since a number of digitizers accept input compatible with the Summasketch II Professional, a driver for this digitizer is supplied. Since digitizers are serial devices, the PORT should be designated as COM1 or COM2.

When you have completed all the SETUP choices, be sure to SAVE the configuration file by pressing <F2> as indicated at the bottom of the screen. Then press <Esc> to return to the main menu.

Related Topics in Other Chapters

Chapter 3 gives further instructions for setting up and using a digitizer.

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Chapter 10

Producing Slides and Transparencies

Overview

Full-sized transparencies can be produced by most printers or made from paper output on a photocopying machine. The best 35 mm color slides are made on a slide digitizer costing thousands of dollars, but satisfactory slides can often be made by photographing the screen with a camera and telephoto lens.

Transparencies

Page-size transparencies for overhead projectors can be produced on many devices that print on paper, including laser printers and plotters. Commercial photocopy shops can produce color transparencies from color output produced by Epi Map, and most photocopy machines can produce black-and-white transparencies from paper output if transparency material is placed in the paper feed bin. Be sure to buy the correct type of transparency material for any device that produces heat, such as a laser printer or photocopy machine, as the wrong kind can fill the inside of the machine with a mass of molten plastic glue.

Slide Systems

Digitizers for producing color slides directly from computer output are available, costing several thousand to several tens of thousands of dollars. They may accept output in CGM, Postscript, or other formats as produced by Epi Map, but many require special "drivers" specific for each model and brand of device. In this case, a CGM file can be produced in Epi Map and transferred to a suitable program, such as Harvard Graphics for Windows, that has a wide variety of drivers for different devices. It is then sent to the slide digitizer from the second program.

Photographing the Screen

Those with professional slide digitizers often gasp at the thought of merely photographing the screen of a monitor, and there are many ways to produce unsatisfactory results with this inexpensive method. Nevertheless, we have had good results by employing the following techniques:

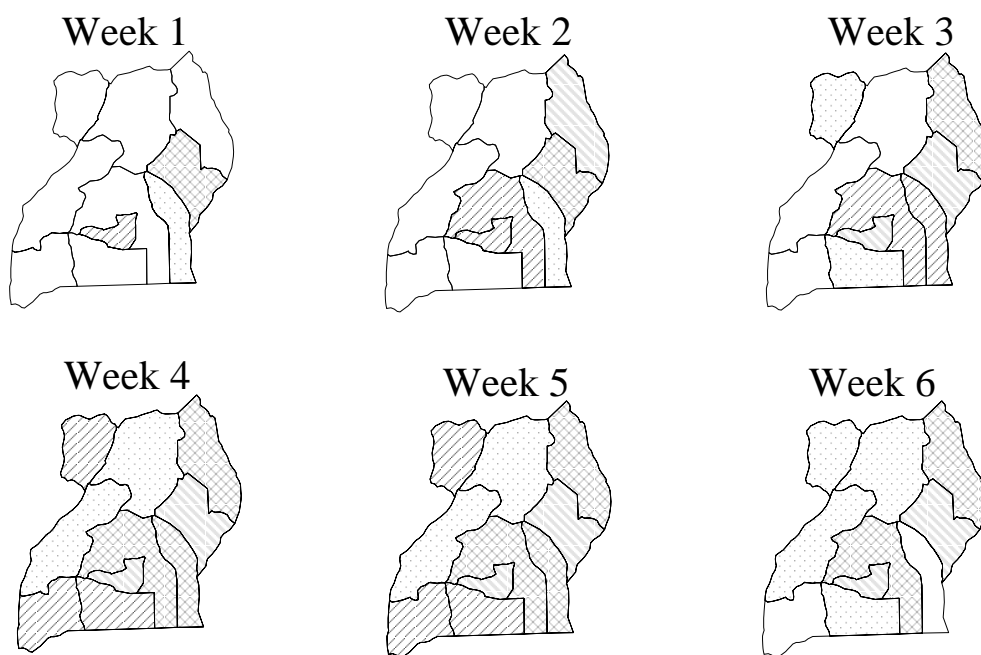
- 1) Remove the Epi Map menu by pressing the <Spacebar>. Pressing <Spacebar> again will bring it back.
- 2) Use a tripod and a cable release to prevent camera movement.
- 3) Take the photographs in a completely dark room to avoid screen reflections.
- 4) Use a single-lens reflex camera and a telephoto lens (about 135 mm for a 35 mm camera). The telephoto lens has the effect of flattening the curvature of the monitor screen.
- 5) Use a long exposure relative to the 1/60- or 1/30-second retrace time of the screen. One-eighth of a second works well.
- 6) Mark the position of the contrast and brightness settings on your monitor so that they can be the same each time and determine the exposure empirically with a test roll. Use this exposure rather than trying to measure the screen with a meter, unless you have a standard display that can be used for the measurements. Our exposure is 1/8 second for ASA 200 color film with the lens diaphragm set to f 5.6.
- 7) Set up the screen and the camera so that the screen is perpendicular to the axis of the lens and so that the screen margins but not the screen housing are included in the photos. Marking a satisfactory position for the tripod on the floor will facilitate setup next time.
- 8) When in doubt about exposure, take extra exposures one stop above and below the one estimated to be correct. Extra film is cheaper than the time spent to reshoot.

Related Topics in Other Chapters

Chapter 9 gives the details necessary for producing transparencies or printed copy suitable for photographing by sending Epi Map output to printers or plotters or to a file for transfer to other programs.

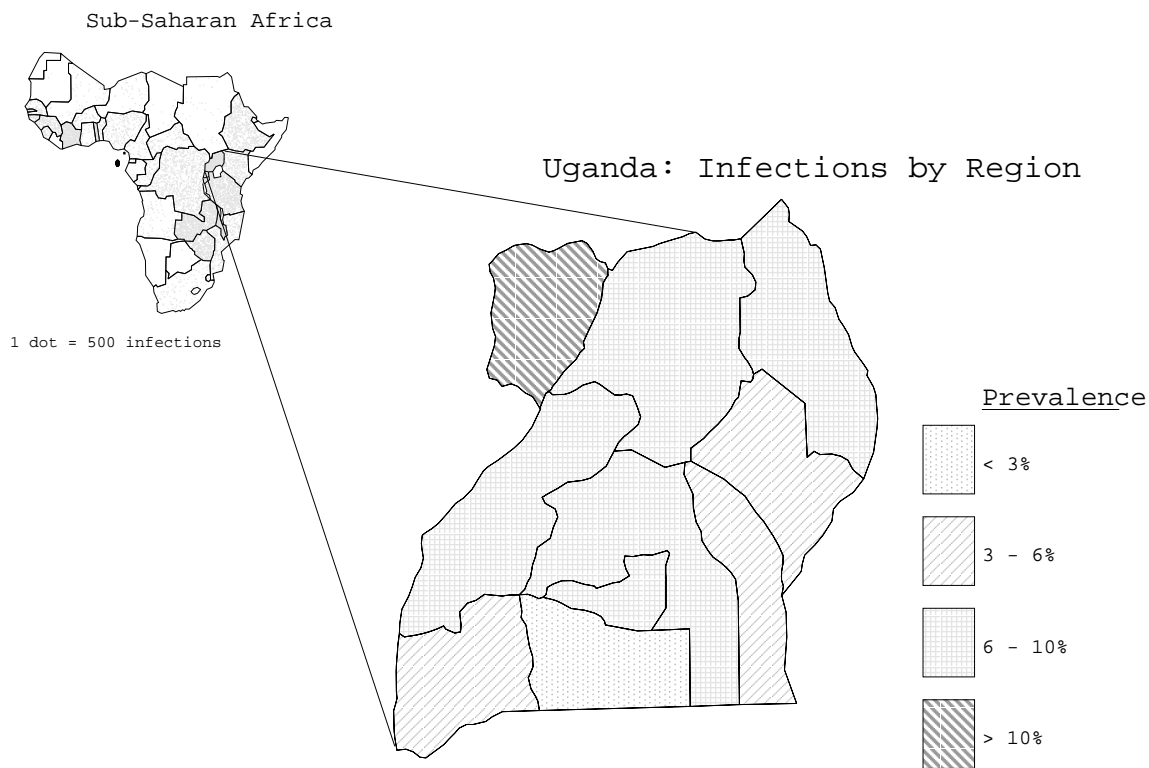
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Progression of Disease in Uganda



EPI MAP USER'S GUIDE

Estimated Number of Infections



Chapter 11

Multiple Maps on One Screen: The Map Manager

Tutorial

To place several similar maps on the same screen, make the first one as usual, loading first the boundary file and then the data file. Use DEMO.BND and DEMO.REC. Now choose the MAP TYPE menu and COLOR/PATTERN. Move the cursor to "Titles" in the upper right corner of the screen and press the space bar to turn titles OFF. Turn off the legend display also.

Choose EDIT ANNOTATIONS from the ANNOTATIONS menu and then press <Enter> or click on the arrow box in the upper left corner of the screen. Move the cursor down over the map and click or press <Enter> to select the map. Small rectangles will appear at the corners of the map.

To make the map boundary smaller, move the cursor so that it is exactly over the small solid mark at the upper right corner of the map. Click or press <Enter> so that a dotted rectangle surrounds the map. Now move the cursor down and to the left to make the map smaller, until it occupies about one-sixth of the screen. Click or press <Enter> again and you should have a miniature of the map that you made. Click or press <Enter> in the center of the map and move the entire map up to the upper left corner, clicking again to release it. Press <Esc> to bring back the main menu.

Choose MAP from the main menu and then MAP MANAGEMENT. Press <F7> twice to make two copies of the map you just created. Use the down arrow to move the bar cursor to "Map 2," the first of the two new maps. Actions you take in Epi Map will affect only this map from now on, not the other two. Press <Esc> to see the three maps.

In this exercise we will assume that each map represents data from a different year. You should therefore edit the data in maps 2 and 3 so that it differs from that in the first map. To do this select a map and then use DATA and ENTER/EDIT DATA from the main menu to edit the data.

After editing the data for each map, save it under a new name, such as DEMO2.REC or DEMO3.REC. If you would like to add a legend, this can be done by turning on legends for one of the maps and moving it to a suitable location. Titles can be added either as free text annotations or by turning on titles for one of the maps and editing and moving the title. Save the completed triple map by choosing SAVE MAP from the MAP menu.

To see two examples of multiple maps, choose MAP and LOAD MAP. Load DOUBLE to see a map of Uganda on the same screen with a map of sub-Saharan Africa. Now load WEEKS, a series of maps (with imaginary data) that might represent the progress of an epidemic over a six-week period. Examine the map manager after each map is loaded to see how the various files are used. To see how the information is stored, look at DOUBLE.MAP and WEEKS.MAP in an editor such as EPED from Epi Info.

Overview

Any of the maps described so far can be combined with others on a single screen. Epi Map is capable of displaying multiple copies of the same boundary file with different data sets, or a number of entirely different related or unrelated maps at one time. This is done with the MAP MANAGER choice on the MAP menu. With this feature you can map more than one variable at a time, or the same variable at different times. If you have six maps on the screen, the data can come from six different files or from six different fields in the same file.

With the map manager you can show data for a number of different diseases, or for one disease over a number of weeks or months. You can also show a map of a continent with an enlarged country pulled to one side for a more detailed display. Each separate map in the display can be edited at any time by selecting it from the map manager.

The Map Manager

To use the map manager, select the MAP menu and then choose MAP MANAGER. A screen appears that displays details of the currently

selected map. On the left side of map manager is a list of MAPS that are linked to the current screen. At the bottom of the screen are listed the function-key commands.

If you have already created one map, you will probably want to reduce its size to accommodate another map on the screen. Return to the main menu by pressing <Esc> and choose ANNOTATIONS and then EDIT ANNOTATIONS. Place the cursor over the map whose size is to be reduced and click or press <Enter>. Small white rectangles will highlight the corners of the map. Return to the map and click *on one of the highlighted corner markers* to display a dotted rectangle at the edges. Now move the cursor and you will see the size of the image change. When the size has been reduced adequately, click or press <Enter> again. Now click again until the rectangle appears and move the map to an appropriate location on the screen. You may also want to return to the main menu (<Esc>) and choose the appropriate MAP TYPE so that you can turn off the legend or title. Now you are ready to use the map manager to make another map.

The available commands are:

<F3> **DELETE**: To delete the currently selected map from the series, use this command.

<F5> **CREATE ADDITIONAL**: This command creates an additional map, by loading a boundary file and then loading or creating a data file. You will be led through the process just as with CREATE MAP from the MAP menu.

<F6> **LOAD ADDITIONAL**: This command loads another .MAP file that has already been created in Epi Map, allowing you to create several separate map files and then combine them into a single display.

<F7> **DUPLICATE**: Pressing this key produces a duplicate of the current boundary image and asks for a choice of fields in the same data file. If you have several fields in a data file, you can display each in a separate small map on the same screen. This is useful to show surveillance data for several diseases in the same time period, for example.

<F8> **TOGGLE ON/OFF**: Pressing this key makes the current map disappear from the screen. Press the same key again to restore the map.

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<F9> **RENAME:** With this command, you can give new labels to the maps, titling each map with a meaningful label, such as March, April, and May, or Hepatitis, Salmonellosis, and Shigellosis.

Multiple Copies of One Boundary Showing Different Data Values

Suppose that you have data on cases or rates of influenza in a continent. You would like to show the progress of the epidemic by week over a 6-week period to illustrate its geographic distribution over time. You will be creating a "movie" made with maps.

The procedure varies depending on whether you have one data file with a different field for each week or 6 separate data files--one for each week. In either case, produce the first map as in any Epi Map interaction. When it is complete, turn off the legend and title displays through the MAP TYPE choices. Reduce the size of the map to about one sixth of the screen and move it to the upper left corner as described in the tutorial at the beginning of this chapter.

Now enter the MAP MANAGER screen through the MAP menu. Press <F9> for RENAME and change "Map 1" to "Week 1." This change is for convenience only and has no effect on the final results. Press <F7> for DUPLICATE. If your data file has more than one numeric field, you will see a choice of fields for the data in the second map. If you want to use a field from this data file, move the cursor bar to this field and press <Enter>. If you prefer to use another data file, press <Esc>. Press <Esc> again to see the two maps, side by side, on the same screen.

Since the second map is the one selected, you can now perform operations like loading a data file on this map alone. Do this if you are using different data files for each map.

If, for any reason, you need to perform operations on the first map, return to the MAP MANAGER. Move the cursor bar to the first map, and then return to the main menu to perform the operation. You can use EDIT ANNOTATIONS at any time to add text or graphics to tie maps together or explain their meaning. An example called DOUBLE.MAP is supplied with Epi Map.

Different Maps on One Screen

Suppose that you would like to have Africa shown on the left side of a screen, with Uganda highlighted. On the right side will be an enlarged map of Uganda by region showing current rates for a particular disease. Straight lines connect the top and bottom of the Uganda map with the image of Uganda within the sub-continent.

First, create a map of Africa by loading the DEMO.BND file. Then to highlight Uganda, enter a single data value for Uganda by using ENTER/EDIT DATA. Reduce the size of the map and place it on the left side of the screen as described above. Turn off the Title and Legend displays. In the MAP MANAGER, change "Map 1" to "Africa" by using the <F9> RENAME function for convenience in identifying the parts of the screen. Now press <F5> for "Create additional," and load the boundary (UGAND.BND) and data (UG1.REC) files for Uganda. Use EDIT ANNOTATIONS to draw lines from the larger Uganda map to the smaller. Further examples are given in the tutorial at the beginning of this chapter and in the demonstration files DOUBLE.MAP and WEEKS.MAP.

Editing Multiple Maps

When multiple maps have been constructed, EDIT ANNOTATIONS can be used to draw lines, text, boxes, and other embellishments. Each element of individual maps can be moved with EDIT ANNOTATIONS.

Titles can be added or suppressed for each map in a series. An overall title can be constructed using the text tool or a title for one of the individual maps. Each title can be moved to an appropriate location by using EDIT ANNOTATIONS. The text of each can be altered in appearance or content by choosing the appropriate map from the MAP MANAGER and then using TITLES from the ANNOTATIONS menu.

Usually only one legend will be necessary. This can be edited from the appropriate map and moved into place with EDIT ANNOTATIONS. Legends for the other maps can be turned off from the MAP TYPE screen.

Overlays

Two maps representing different features--for example, county boundaries and regional boundaries within a state--can be superimposed on one another. The file REGIONS.MAP illustrates this feature. Run Epi Map and then choose LOAD MAP from the MAP menu. Select REGIONS as the map to display.

Note that broad boundaries are shown for (arbitrary) Districts (or regions) of Georgia, and that each is made of several Counties with narrower boundaries. The width of lines in boundaries is set on the MAP TYPE screen for COLOR/PATTERN maps (right side, near the middle).

By choosing first Map 1 and then Map 2 in the MAP MANAGER in the MAP menu, you can display the names of the files involved in the two maps making up this image, and then follow the logic for making the display.

The Regions map must be Map 1, with the overlay of County boundaries being Map 2. A few experiments should enable you to use the same principles to simulate hierarchies of the general type primary subdivision/secondary subdivision. It is also possible to separate ("explode") the Districts by a space using BOUNDARY | CREATE/EDIT BOUNDARY | SELECT | MOVE to move some of the regions; but overlays in some cases give a better appearance.

An additional benefit of the overlay approach, is that both maps can have data files, and data values for Districts will be displayed if no data item exists in the County data file for a particular county.

Related Topics in Other Chapters

Techniques explained in previous chapters can be applied to each map in a series after it is selected with the map manager.

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```
@ECHO OFF
REM Batch file to run an Epi Info ANALYSIS program, produce rates
REM  and then display the rates in Epi Map using HEPRATES.MAP
ANALYSIS HEPRATES.PGM
REM Produces the necessary data file containing rates
CLS
ECHO The HEPRATES.REC file containing rates has been produced.
ECHO Press Enter to run Epi Map and display the map
PAUSE
EPIMAP HEPRATES.MAP
REM Runs Epi Map to show the map
```

A DOS Batch File That Runs Epi Info and Displays the Results in Epi Map

Chapter 12

Linking Epi Map to Epi Info Databases

Tutorial

This exercise assumes that Epi Info is present in the same computer with Epi Map, and that the PATH statement in the AUTOEXEC.BAT file contains the correct directory for Epi Info, for example, C:\EPI6. To see how your PATH is set, type the word PATH from the DOS prompt, and the path will be shown.

From the DOS command line, type:

```
>EPIMAP DOUBLE
```

If you have a printer connected and ready and have set up Epi Map for this printer in the SETUP menu, type

```
>EPIMAP DOUBLE /P
```

If you have Epi Info, type:

```
>HEPRATES
```

After you have seen the results, examine HEPRATES.BAT and HEPRATES.PGM until you understand how Epi Map is used to produce this automatic system.

Overview

Although Epi Map does not have built-in facilities for rate calculations or other mathematical manipulation of data, it is designed to work with other database and statistics programs that provide these features. Epi Map can serve as the "mapping engine" for any set of programs that produce an Epi Info or dBASE file. Since the IMPORT program in Epi Info will convert Lotus 1-2-3 or fixed-field or comma-delimited ASCII files to the Epi Info format, it may be used to produce complete systems for automatic mapping in conjunction with other programs by embedding the necessary commands in DOS batch files.

Running Epi Map from DOS Batch Files or Other Programs

Epi Map may be run from the DOS command line by typing EPIMAP followed by the name of a .MAP file, as in:

```
>EPIMAP DOUBLE
```

The DOS prompt is represented here by ">," but would usually include the letter of the current disk drive, such as "C." If the command is followed by a slash and the letter "P" (/P), the map will be loaded and printed, with an automatic exit from Epi Map after the printing is complete. To load a boundary file or a data file from the DOS command line, give the extension of the name, as in:

```
>EPIMAP DEMO.BND
```

or

```
>EPIMAP DEMO.REC
```

The .MAP file contains the names of boundary and data files that comprise the map. If the map file called THISWEEK.MAP specifies that the data file is called THISWEEK.REC, a program calling Epi Map can produce a new data file called THISWEEK.REC each week in order to display or print the most current data. The other settings for the map, including the boundary file name, are contained in the .MAP file. When the program producing the data is run, a new THISWEEK.REC is produced. A DOS batch file or the Epi Info menu can then run EPIMAP THISWEEK.MAP to display a map with the most current data.

For convenience in running Epi Map from DOS batch files or other programs or from the DOS command line, "command-line switches" are provided. These follow the command-line that runs Epi Map, as in EPIMAP WEEKS/P

The available command-line switches are:

/P	Print using printer number 1 in its default mode
/Px	Print using printer number x (x= 1 or 2) in its default mode
/Pxy	Print using printer number x (x=1 or 2) in mode y (y=number of one of the modes displayed in Setup or Output for this printer)

Note that more than one file can be listed on the command line, and that the print commands apply to all files on the command line.

- /BW Use monochrome colors (same as MODE BW80 in DOS)
- /CO Use color mode (same as MODE CO80 in DOS)
- /Q Slide show mode. Several maps may be specified. Each will be displayed until any key is pressed. When the last has been displayed and a key pressed, there is an automatic exit from Epi Map.
- /LO Force low resolution

An example of such an automatic system called HEPRATES.PGM is supplied with Epi Map. HEPRATES.PGM is a program for the ANALYSIS portion of Epi Info. To see it operate, type HEPRATES from the DOS command line. A DOS batch file called HEPRATES.BAT will run ANALYSIS with the HEPRATES.PGM program and process data from a surveillance database called SURVDB.REC. A map of the State of California will be displayed showing (artificial) hepatitis counts for one week. Maps of several diseases on one screen can be made by using the techniques in Chapter 11, placing the values for each disease either in separate files or in different fields in the same .REC file.

Other, more complex examples are included with Epi Info, Version 6, in the NETSS surveillance system.

Preparing Data Files to Show Rates or Other Calculations in Epi Map

The most common calculation needed for mapping is the production of rates. The use of Epi Info to produce rates will be described. Other systems such as dBASE can be used to produce rates in similar fashion.

Calculating rates requires that the population for each geographic entity be available as the denominator. The easiest way to do this in Epi Info is to keep the population in a separate file with just two fields. For the State of California, these would be COUNTY and POPULATION. In ANALYSIS, the following commands will calculate rates and produce a file called HEPRATES.REC for

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Hepatitis B for the time period covered by the database. The commands are contained in an ANALYSIS program file called HEPRATES.PGM and may be run from a DOS batch file called HEPRATES.BAT.

```
*An Epi Info ANALYSIS program to calculate rates for
*mapping
READ SURVDB
SELECT DISEASECOD=10
*Select Hepatitis B records
ERASE TEMP.REC
*Erase previous file
ROUTE TEMP.REC
OUTPUT TABLES COUNTY
*Produce a file with fields COUNT and COUNTY
ROUTE SCREEN
*Close the file
ECHO TEMP.REC contains one count per county.
?Press <Enter> to continue?
CLS
ECHO We could use this file to map the counts
ECHO but we want rates, so we READ and RELATE it to the
ECHO POP.REC file containing county populations and then
ECHO calculate the rates.
?Press <Enter> to continue?
READ TEMP.REC
RELATE COUNTY POP.REC
*Relate the population file, using county name as the
*link
DEFINE RATE   ###
*Define a new variable
RATE=100000 * (COUNT/POPULATION)
*Calculate the rate
ERASE HEPRATES.REC
*Erase HEPRATES.REC in case it exists
ROUTE HEPRATES.REC
WRITE RECFILE
*Write the new file, including the rates, as
HEPRATES.REC
ROUTE SCREEN
CLS
ECHO Just for clarity we will READ and LIST HEPRATES.REC
ECHO so that you can see what Epi Map will use as data.
?Press <Enter> to continue?
```

```
READ HEPRATES.REC
LIST
ECHO Now we will leave ANALYSIS and run EPIMAP
HEPRATES.MAP
ECHO It contains instructions to load the boundary file
ECHO CA.BND and the data file HEPRATES.REC and to
ECHO display these together with a customized title
ECHO and legend.
?Press <Enter> to continue?
*Close the file
QUIT
*Leave ANALYSIS
*Now run EPIMAP HEPRATES.MAP to see the results
```

Dealing with Small-Number Problems

Rate calculations are a great help in dealing with variable denominators such as those encountered in mapping disease patterns on geopolitical map boundaries. The populations of the defined areas vary greatly. U.S. counties, for example, may have populations from a few thousand to several million, roughly a thousand-fold difference. In mapping disease cases, the condition is often relatively unusual so that one or two cases can make an enormous difference in rates. A map of rates, therefore, may give the false impression that great elevations have occurred in a particular area without conveying that the rate is based on a small number of cases.

There are several solutions to this problem:

- 1) If the counts being plotted have small numbers, avoid plotting them as rates--map only the counts. This solution is often used in communicable disease surveillance.
- 2) Extend the time period for the map so that larger numbers are obtained.
- 3) Eliminate or mark the rates or elevated rates based on small numbers. You could, for example, decide that rates based on less than five cases would be recoded to 999, and then employ a special color or pattern in Epi Map to display the "999"'s. The new "range" can be set on the Range screen after choosing MAP TYPE and COLOR/PATTERN.

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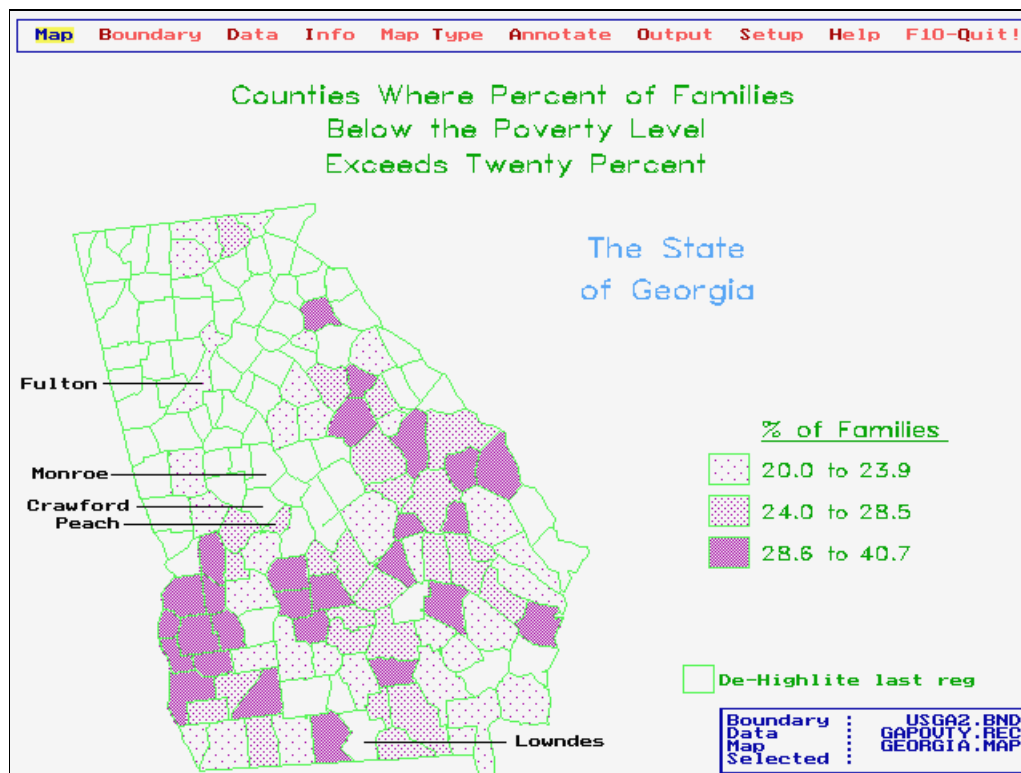
4) Plot only the rates exceeding a statistical limit, such as two standard deviations from the mean. The calculations would be done in Epi Info or another statistics program before the file is sent to Epi Map.

5) Use a population cartogram as the boundary file and then display cases as a dot-density map, giving both an impression of rates and a representation of the number of cases on the same map.

Related Topics in other Chapters

An example producing a data file for Epi Map by entering values from the keyboard is given in Chapter 4.

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Chapter 13

Point-and-Click Information Display

Tutorial

Run EPIMAP from the DOS prompt. From the MAP menu choose LOAD MAP FILE and then the .MAP file GEORGIA. A map of the state of Georgia will appear.

In the lower left corner of the screen is an icon with a picture of the world to indicate that information attached to it is “global,” and applies to the entire map. Click on this icon with the left mouse button to see text describing the entire State of Georgia. Use the arrow keys or the mouse cursor to move among the highlighted choices, and then make a choice by clicking or pressing <Enter>. Press <Esc> to return to the main map.

Now place the cursor over the county labeled FULTON and press the left mouse button. Epi Info records will appear containing data for this county in spreadsheet format. Press <Esc> to return to the map.

MONROE County has many Epi Info records of census data attached. Click once to display the questionnaire. Use the <F8> and <F7> keys as indicated at the bottom of the screen to browse through the records for this county, each record showing, in this case, data for a different race/age group. Press <Esc> to leave the Epi Info display. A text file appears, showing additional information, but only that relevant to MONROE county. Explore that information and then press <Esc>.

Select CRAWFORD county. This time a new map appears, a more detailed map of the county showing census tracts. Click again on Census Tract #702 . A detailed map of a hospital floor appears, showing numbers of cases in an epidemic. You would probably not set up the maps in exactly this sequence, but we wanted to make the point that maps for special situations can be constructed in Epi Map, and may not need to be obtained from other sources.

Click on the "back-out" icon on the lower left, shaped like a "U" turn. Click again to return to the state map.

Click on PEACH county. This time, a menu appears, offering a choice of CENSUS INFO (in Epi Info questionnaire format) or a DETAILED MAP of Peach County. Choose either one and see what happens.

Click on any other county several times. The default activity programmed for counties having no special information is a change in color for the shading.

Overview

In Epi Map, Version 2, placing the cursor in a region and clicking the left mouse button can display data, text, or other maps relevant to the region. Any region in a map, such as a state, county, canton, or province, can be made "active" so that selecting the region leads to one of the following activities:

Displaying Epi Info records for the same region name, either in questionnaire format or as a listing (spreadsheet).

Displaying a block of text specific to the region

Displaying another map, perhaps a more-detailed map of the region

Performing commands that are contained in an Epi Map Program (.EMP file) similar to a .CHK file for data entry in Epi Info.

A map in Epi Map 2 is a collection of active entry points on a database of Epi Info records, text blocks, and/or other maps. The .EMP file provides a means of specifying exactly what will happen when someone chooses a particular region, just as the .CHK file specifies what happens when a field is entered on a questionnaire.

The main features of active regions are illustrated in the tutorial at the beginning of this chapter.

Removing the Main Menu

In Epi Map, Version 1, pressing the <ESC> key (or the right mouse button) makes the main menu disappear so that the screen can be photographed directly. In Epi Map, Version 2, use the <Spacebar> to remove the main menu bar from the screen. Pressing the <Spacebar> removes the main menu, the mouse pointer, and the Whole Map Icon and Back Out Icon if they are present (these things are described later). Pressing the <Space> bar again brings them back.

Using Active Regions

This section documents what the map user needs to know to use a map with active regions. This includes interacting with the active regions and any information brought up as a result of clicking on an active region. Information on setting up and adding functions to active regions in a map starts in the section called “Setting Up Active Regions.”

Selecting An Active Region

To select and activate an active region simply point at the desired region with the mouse pointer and click the left mouse button once. This is the most basic way of activating an active region, but there are variations on it: selecting more than one active region, selecting active regions by region name, and selecting active regions without a mouse. Each of these variations is described below.

Selecting More than One Region

Clicking on a map region causes it to do something immediately. Sometimes, however, you will want to select several regions in the map before the action is performed, to see all the records that apply to Fulton, Dekalb, and Cobb counties, for example. This is called multiselecting.

To multiselect, you use the right mouse button to click on each region you want to select, except for the last one. As you click on each region with the right mouse button, it is highlighted in blue to indicate it has been selected. For the last one, you should click with the left mouse button to finalize your

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selections and activate the active regions. Clicking the right mouse button on a map region that has already been highlighted as a selected region will de-select it.

Selecting more than one region doesn't make sense for all types of active region activity. Some actions tied to an active region will ignore all the regions you clicked on except the first.

Selecting Active Regions By Region Name

You can also select regions by name. In the INFO submenu, there is an option called SELECT REGIONS BY NAME. When you select this menu item, a window pops up listing all of the regions in the map. This is the same window that pops up when you are in BOUNDARY | CREATE/EDIT and are selecting regions by name there. Use the cursor keys to move around, use <+> and <-> keys to tag and untag the selection status of individual regions, and <Enter> to finalize your selections and close the window. Notice that marking several regions in the list has the same result as multiselecting by using the map itself.

You can also mix your methods of selecting. You can start out multiselecting by clicking on regions in the map itself, and if you get stuck on a region and don't know where it is, you can select INFO | SELECT REGION(S) BY NAME. When the region list pops up, all of the regions you've already selected in the map will be marked as selected in the list. At this point you can mark more regions as being selected. Once in the region list window, however, you cannot go back out to the map to select more regions graphically. Getting out of the region list finalizes your selections.

Selecting Active Regions Without A Mouse

If you do not have a mouse, Epi Map 2 allows you to do everything through the keyboard. When the main menu bar is displayed, the cursor keys control the highlighting of options in the menu bar (i.e., they move the highlighting left and right in the menu bar). In order to "click" on an active region, you should select INFO in the main menu and then pick SELECT MAP REGION (a shortcut key <F5>, is provided). The menu bar will disappear and a cross-hair cursor will appear in the map area. You can then use the arrow keys to

move the cross-hair. When the cross-hair is on top of the desired region, press <Enter> to make the selection.

To select multiple regions without a mouse, press <F5> (or select INFO | SELECT MAP REGION(S) from the menu) to get the cross-hair cursor. For each region you want to select except the very last, press <Ctrl-Enter> to select. Each region on which you use <Ctrl-Enter> will be highlighted in blue. For the last region, finalize the list by pressing just <Enter> with the cross-hair on it. Just as with multiselecting with the mouse, hitting <Ctrl-Enter> or <Enter> on an already-highlighted region will de-select it.

The INFO | SELECT MAP REGION(S) menu item will appear only if no mouse is installed on your machine. Also, <F5> will only work if no mouse is installed. The rest of the Epi Map 2 documentation assumes you have a mouse and will describe doing things in Epi Map as if you did. If you don't have a mouse, though, you'll know what to do.

The Whole Map Icon

On a map with active regions, you'll notice a little gray square down at the bottom left of the screen with a picture of a green globe in it. This is the Whole Map Icon. When a map has at least one active region, the Whole Map Icon appears automatically. It is as an active region for information that applies to the entire map rather than to any of the individual regions.

For example, you might have a map of New York on the screen where each region is a county in New York. Each county might act as an active region to bring up a list of county's health officials' names, addresses, and phone numbers. The Whole Map Icon might bring up a list of New York state health officials' names, addresses, and phone numbers. Of course, the Whole Map Icon might not do anything when selected; it depends on what the map designer specified when building the active regions.

You can select the Whole Map Icon along with several individual regions in a multiselect just as with other regions in the map. However, the Whole Map Icon will not appear in the region list you get when you pick INFO | SELECT REGIONS BY NAME"; the Whole Map Icon must be selected graphically.

If you might find that the Whole Map Icon in the location at the bottom left corner of the screen is getting in the way of your map or text, you can move it. Pick INFO | MOVE ICONS from the menu and the Whole Map Icon will disappear. A box outline will appear. You can use the mouse or cursor keys to move the outline. Click (or press <Enter>) when you've moved the outline to a place you're happy with; the Whole Map Icon will be placed there. You'll probably notice that the outline box is actually a little wider than the Whole Map Icon. This is because the outline also includes space for another icon that occasionally appears to the right of the Whole Map Icon.

What Happens When You Select An Active Region?

The Epi Info SHOW module

When you click on an active region, the Epi Info SHOW module may display one or more Epi Info database records pertaining to that region. The SHOW module shows records either in the standard questionnaire format used by the ENTER program in Epi Info, or as a columnar listing of records like a spreadsheet. To exit the SHOW module, press <Esc> (or press <Alt X> or click in the bottom left corner of the screen where it says "ALT-X Exit").

If the display is in questionnaire format, one record will be displayed at a time. As in ENTER, you can use <F7> or <F8> to go to the next or previous record, respectively. At the bottom of the screen where it says "F7 Prev" and "F8 Next", you can click on these areas as if they were buttons to move forward and backward or press the actual keys to page through records. If the questionnaire has multiple pages, you can use the <PgUp> and <PgDn> keys to move between pages. You can also use the vertical scroll bar on the right to move up and down along the questionnaire's length.

In the line listing format, each field in the database record is a column and the individual records are horizontal rows or lines. To see the fields outside the right or left hand side of the screen, you can use the left or right cursor keys, or the horizontal scroll bar at the bottom of the screen. To get to records that might be above or below the screen, you can use the up and down cursor keys (or the <PgUp> and <PgDn> keys to page up and down). You could also use the vertical scroll bar to the right of the screen.

Sometimes when the SHOW module pops up, you may get a message such as "No records meet selection criteria for key 'county'". This means that Epi Map was looking in a specific Epi Info database, but could find no records for the region you clicked on. This isn't necessarily an error. It just means that there were no records in the database for that region. Click on the OK button to return to the map.

Usually, clicking on a region will only display records for that region. As described later, however, you can program an active region to bring up records for several regions by clicking on one.

Text Screens

Text Screens are another kind of display that can be presented when you click on an active region. They show blocks of text related to the selected region. The text screens use the same mechanism as the Epi Map Help (<F1>) system and work exactly the same way. When a text screen pops up, you can exit by clicking the right mouse button or pressing <Esc>.

Information inside a text screen can, in a way, have its own active regions. Any text in white on the screen can be double-clicked to go to that topic. In the upper left corner of the screen is a small diamond shape. Clicking on this will take you back to the initial text screen. There is also a scroll bar on the right side for paging up and down.

Other Map Files: Drilling Down

Sometimes, clicking on an active region will cause another map to appear (usually a more detailed map of the region you clicked on). This is called drilling down. It allows you to start out with a high level map and get more and more specific. Drilling down isn't simply erasing the current map and loading a new one, however. When you drill down, Epi Map remembers each map that you have loaded before; when you're done with the map you've drilled down to, all it takes is a single mouse click and you're back in the map where you were before. This is done by way of the Back Out Icon, which looks like an upside-down U-turn symbol. The Back Out Icon appears next to the Whole Map Icon (if it's there) when you drill down. When you're ready to back out to the previous map, you just click on the Back Out Icon. If you've drilled down, say, three levels deep in your map, then clicking on the Back Out Icon will back you out, one level at a time.

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If the Back Out Icon is inconveniently placed on the screen, you can move it. Simply choose INFO | MOVE ICON(S) from the main menu. This will let you select a new home for the Whole Map Icon and the Back Out Icon.

Several things may be programmed to happen when you click on an active region. If, in the middle of that list of things to happen is a drill down command, then the rest of the things that were supposed to happen will wait until you drill back up (click on the Back Out Icon) from the more detailed map. Once you're back to original map, Epi Map finishes doing the things for the region you clicked on before you drilled down.

Going To DOS

There are two ways an active region might send you out to DOS. In the first, clicking on an active region causes Epi Map to "shell out" to DOS to run a specific command or program. When the command or program is done, you will return automatically to Epi Map.

In the second method, clicking on an active region causes Epi Map to simply shell out to DOS and leave you at a DOS prompt. Once there, you get to do anything you want (well, anything you have enough memory for, such as COPYing a file or FORMATting a disk) until you're ready to get back into Epi Map. Like most other programs that shell out to DOS, when you're ready to get back into Epi Map, you just type EXIT at the DOS prompt and you will be put back into Epi Map.

Choice Lists

Choice lists are another type of creature you might see pop up when you select an active region. A list of options will pop up on the screen and you get to select what happens. For example, if you have a map of the state of New York and you click on Albany county, you might get a choice list where you can pick from a more detailed map of Albany, or a text screen of tables showing census data for Albany, or a listing of health officials in that county. The up and down cursor keys let you move around, and <Enter> selects an option (using the mouse and double-clicking on an option does the same thing). If you press <Esc> no selection is made.

Removing The Main Menu

An active region may be programmed to remove the main menu (this could happen even when the map is loaded). This means that the main menu bar will disappear, removing the complexity of menu access, and changing the focus to revealing information by pointing and clicking. This would be useful at a county-fair exhibit, where the general public would select active regions to display information.

Note that this is different from pressing the <Spacebar> to remove the menu, mouse pointer, and icons. When the menu is removed by an EMP command, it does not reappear when the <Spacebar> is pressed a second time.

A disabled menu does not remove the mouse pointer and it does not remove any icons from the screen. What it does remove is the main menu and all of the functions you would access through it. The function key shortcuts will also be disabled, with one exception; <F10> will always be available for you to exit Epi Map. With the menu turned off, the only thing you can do with a map is use its active regions or exit from the program.

Setting Up Active Regions

This section of the document tells how to get an active region to do all the magical things it does. In the simplest case, active regions are driven by connecting an Epi Info or a special kind of text file to the map. If the file has records or blocks with names corresponding to regions in the map, those regions become active, and the records or text blocks are displayed when the region is selected. More complicated activities can be set up by placing commands in a .EMP file, in blocks having region names, just as .CHK files in Epi Info have blocks corresponding to particular fields in a questionnaire.

Four types of files may be used to display information in Epi Map 2: Epi Info data files (called REC files because they have .REC as a filename extension), text files in a special format (HLP files because of the .HLP extension), Epi Map .MAP files, and Epi Map Program files (EMP files because they have a .EMP extension). REC and HLP files can be connected to active regions without programming.

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Commands placed in .EMP files provide a way to control exactly what happens for each active region, including display of other .MAP files. They will be described separately in the EPI MAP PROGRAM FILES section.

Epi Info Data Files

In Version 2 of Epi Map, as in Version 1, an Epi Info data (.REC) file may be used to produce colors, patterns or dots representing numeric values. This function is set up through the DATA menu exactly as in Version 1.

When a REC file is associated with a map through the INFO menu, however, the records are displayed each time the user clicks on a region in the map. What actually happens is that Epi Map brings up the Epi Info SHOW module and selects the records from the REC file using a designated field (e.g., COUNTY) that contains the name of the selected region. When a REC file is associated with a map through the INFO menu, all regions in the map become active regions. When a region is selected, the SHOW module will appear. If there are no records in the database for that region, a message saying so will pop up on the SHOW module screen.

Unless something else has been specified in an .EMP file, the records that appear are only the ones for the selected region. EMP files are described in the next chapter. The user, however, can use a multiselect quite effectively with active regions based on REC files. If the map user multiselects, say, three counties in New York, then the SHOW module will bring up all three counties' records on one SHOW module screen.

Virtually any Epi Info .REC file with a field containing region names that match the current map can be associated with a map. To make the association you must provide three pieces of information:

- 1) Epi Map must know the name of the REC file that will be providing the data. The file could be the same file as the one used to generate the color/pattern or dot density pattern in the map itself, or it can be a completely different set of data.
- 2) Epi Map must know which field in the REC file contains the names of the regions (this is called the geographic variable). If the map user clicks on Albany county in New York, Epi Map needs to know which field in the REC file will contain the region name "Albany" so it can select the records to put

on the SHOW module screen. Also, the region name in the map must match exactly the region name in the REC file (yes, the match is case sensitive).

3) The final piece of information Epi Map has to have is the type of display format. Do you want the records to come up on the screen in the columnar line listing format or in the questionnaire format? We will describe how you give Epi Map this information in a minute (see the section called “The Information File List”).

The REC file SHOW module is a separate executable program distinct from Epi Map, and requires about 80 K of free space to run effectively; it will need more if you have a lot of records to display at one time.

If there are records in your database you would like to pop up when someone clicks on the Whole Map Icon, then you need to make sure that the geographic variable has a value of "GENERAL". Pretend that the Whole Map Icon represents a region of the map called GENERAL and build your database records accordingly.

Text Files

Text files contain static, text-based information, which may include numbers or tables. You can change the content of the text file, but there is a little effort involved. In general, it is best to include in text files information that changes only occasionally. To associate a text file with a map, the text file must be constructed in a special format, with one or more blocks named for regions in the map. You give Epi Map the name of the HLP file through the ASSOCIATE FILES command in the INFO menu.

The text files used by Epi Map are not actually ASCII (plain printable text) files; they are compressed and indexed files. You start by creating an ASCII text file that contains the information you want, along with some formatting commands, and then you run the conversion program HELPPREP to generate the compressed file (the HLP file) that Epi Map can use for presenting the text screens. Epi Map will run HELPPREP automatically if necessary.

The original ASCII text file should have a name with the .TXT extension; the converted file usually has the same name, but with a .HLP extension. Each HLP file is divided into TOPICS or blocks, and each topic has a name. A

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simple .TXT file can be created in an editor such as Epi Info's EPED, as follows:

!Topic DeKalb

This information will display when DeKalb county is selected.

!Topic Fulton

All the census information for Fulton County might be displayed in this block

!Topic Cobb

Health Department Name:

Name of Director:

Useful Telephone Numbers:

etc.

Other commands are available for controlling formatting and for setting up "hot links" (hypertext) that allow jumping from one block to another to access relevant information. These additional blocks do not have to have topic names matching regions in the map. There is a section in Chapter 14 called "Epi Map Help Files" that tells how to build your own HLP files to display information in Epi Map.

When a HLP file is specified as the basis for a map's active regions, all regions in the map become active. However, if there is not a topic in the HLP file for a given region in the map, then a message pops up indicating there is no information for that topic.

Multiselecting does not work with HLP files. If the user multiselects several regions, Epi Map will simply bring up the topic for the first region the map user clicked on in the multiselect and will ignore the other regions. If you want to add a topic that will appear when the user clicks on the Whole Map Icon, the name of the topic in the HLP file must be "GENERAL".

At the time the user clicks on a region, if the HLP file cannot be found, Epi Map will look for the same file with a .TXT extension. If one is found, Epi Map will run the HELPPREP conversion program to create the HLP file. Epi Map can then display the text screen if the appropriate topic is present.

The Information File List

There are four types of files (REC files, HLP files, MAP files, and EMP files) that may be associated with an active regions in a map. To associate one of these files with a map, you first add it to the File List by using the FILE LIST choice on the INFO menu. After the list is created, you can select one or more files as the active file for the map.

The ability to keep a list of these files was provided to save you effort in having to supply Info File information every time you want to change to a different file. With the list, you simply select the one you want from the list. The adding, deleting, and selecting activity is done through the menu option INFO | ASSOCIATE FILE(S).

To reach the File List, select the INFO menu and ASSOCIATE FILES(S). The File List screen is divided into two halves. The top half shows the current list of files that can possibly be used to drive the map's active regions. The bottom half is where new files are added to the file list. You can bounce between the two halves of the screen by using the <Tab> key.

In the top part of the screen, each file in the list gives the type of file (EPI INFO DB, TEXT, OR PROGRAM FILE) and the filename. For REC files the geographic variable and the display format used by the Epi Info REC file display program are also shown. The file selected to drive the active regions is marked with a '>' on the left hand side of the list. A file can be removed from the list by highlighting it (using the cursor keys or by clicking on it) and pressing the key. This actual file, is of course, not deleted.

Files in the list may be deleted automatically. When the map is loaded, Epi Map checks selected files to make sure that they do indeed exist (and, in the case of REC files, Epi Map also checks to make sure the geographic variable exists). If the file does not exist, it is automatically removed from the File list. When you try to select a file in the list, Epi Map verifies at that time that it does exist (and that the geographic variable is valid if it's a REC file). If not, it is deleted from the list.

To add a file to the list, <Tab> down to the file name field in the bottom half of the screen. Type in the name of the filename (or press <F9> and select it from the list). If the file is a REC file, you'll also need to fill in the

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geographic variable and display option fields. For the geographic variable, you can type in the name of the field or press <F9> to select it from a list. Press the <Spacebar> (or click on the field with the mouse) to cycle through the display options. If the file is not a REC file, the geographic variable and the display option field will be left N/A. Press F4 when the fields are correct to add the file to the list. The file will automatically be marked as selected when it appears in the Information File list.

Selecting Multiple Display Files

It is possible to have more than one file in the Information File list selected. In a situation such as this, Epi Map will execute the appropriate actions for each Information File in order, for each region selected. For example, if the Information files that have been marked as selected in the list are A.REC, B.HLP, and C.REC, in that order in the list, and the map user has multiselected Albany and New York counties in the New York map, here is what will happen: Epi Map will bring up the REC File SHOW module and display records for Albany and New York counties (together) from the file A.REC; when the user exits, a text screen will appear for Albany from file B.HLP (remember, HLP files ignore all regions in a multiselect except the first one); when the user exits the text SHOW module, the REC File SHOW module is brought back up with the Albany and New York records from file C.REC.

If there is an EMP file in the list of selected Info Files, processing stops with that EMP program. In the example above, if the second file was B.EMP instead of B.HLP, then processing would have stopped when Epi Map was done executing B.EMP. C.REC would not be active. If you need to rearrange the order of files in the list, you can highlight the file that needs to be moved up or down in the list and press the <+> or <-> keys, respectively.

Chapter 14

Epi Map Program (.EMP) Files

Tutorial

Use the Epi Info editor, EPED, or another editor to display the file GEORGIA.EMP. Examine the blocks and commands as you read this chapter.

Overview

EMP files are programs that control what happens for specific active regions in the map. If the active regions in a map are associated with a REC file only, then no matter what region the user clicks on, the Epi Info file display program will always pop up data from the REC file. With EMPs, however, one region might cause a SHOW module to pop up with some data, another region might cause a text screen to pop up, and a third region might cause Epi Map to drill down to a more specific map of that region. EMP files offer the map designer the most control over what happens when the user clicks the mouse button.

EMP files contain one or more blocks. Blocks are lists of commands that are executed when the user clicks on an active region. Most blocks are associated with one region in the map, have the name of that region, and are executed only when the user clicks on that particular region. The order of the blocks within the EMP file does not matter (with the exception of the special BEFOREFILE block, described under “Special Blocks” below). EMP files are quite similar to .CHK files in Epi Info, except that blocks of commands refer to geographic regions rather than fields in a questionnaire.

Notation

In the rest of the EMP section, there will be descriptions of the syntax of commands and structures used within EMP files. Here is the meaning of the various punctuations and symbols.

Anything that is part of the EMP file (commands, block headers, etc) is given in CAPITAL LETTERS (although case does not matter in the actual program). Things in <angle brackets> are values and need to be replaced by an appropriate literal, a variable, or an expression using a mixture thereof. For example, <rec file> in the SHOW command means that is where you put the name of the REC file you want the Epi Info display program to use. A command parameter inside of curly brackets { } means the parameter is optional, and a vertical bar | between parameters means you can use one or the other but not both. Three dots ... after a parameter means it can be repeated any number of times. Other symbols appearing in a syntax description are literal and should be typed as they appear.

Curly brackets ({ }) in this document mean that the item or items between the brackets is optional. They are not intended to be a literal part of the command. In fact, anything inside of curly brackets in an EMP file will be interpreted as a comment and will be completely ignored by Epi Map. Comments in an EMP are solely for the map designer's benefit; they let the designer add notes and annotations to the program for reference.

Commands generally must fit on one physical line in your EMP file and they will be shown as fitting on one line in the syntax descriptions here. However, there are exceptions to this. If a structure or command in this document is shown as split over several lines, then the real thing in an actual EMP file must be split over several lines in the same way.

Block Structure

An EMP file is made up of a series of blocks. Everything in an EMP file must be part of a block. The only things that can occur outside of a block are comments. Below is the general format for an EMP block:


```

BLOCK <block name>
  { <command> }
  { <command> }
  etc.
END

```

Each block starts with a block header statement and ends with the END statement. The name of the block should go where <block name> is. The <block name> should be enclosed in single or double quotes if it contains spaces, but may be left without quotes if the name is a single word. The <block name> cannot be a variable and it cannot be an expression. Between the block header and the END are <command>s. You can have zero to as many commands as you like inside the block. If you were using an EMP file to drive your active regions in the map of New York and you had defined a block as BLOCK ALBANY, then when the map user clicks on Albany county, the commands inside the block would get executed in order one by one until END is reached.

If, halfway down the list of commands, Epi Map hits the command that tells it to drill down to a different map, Epi Map will remember where it was inside the block. When the user finally drills back up to the current map, Epi Map will pick up with the command after the drill-down command and will complete execution of the remaining commands in the block.

Special Blocks

Most blocks have names that match a region name in the map for which they are designed. When the user clicks on the region, the corresponding block of commands and code is executed. There are a few special blocks that do not automatically correspond to regions in the map, however, and they are executed under special circumstances. These blocks are defined just like any other block using the specific name given. With the exception of the BEFOREFILE block, these blocks can be mixed in anywhere in the EMP file. As with all blocks, there can only be one of each of these special blocks in any EMP file.

DEFAULT The DEFAULT block is used when no other block specifically applies to the region clicked on. If the user clicks on New York and there isn't

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a block specifically for New York, but there is a DEFAULT block, then the DEFAULT commands are executed.

BEFOREBLOCK and **AFTERBLOCK** blocks are executed immediately before and after (respectively) blocks of code specified for regions, including the DEFAULT block.

If there is a block of code for Albany county in the New York map, and there is a BEFOREBLOCK and an AFTERBLOCK, then when the map user clicks on Albany county, the BEFOREBLOCK is executed, then the Albany block, and then the AFTERBLOCK.

BEFOREFILE If you're going to have one of these blocks in your EMP file, then it must be the first block in the file. Whenever a map is loaded into Epi Map, and the selected Information File is an EMP file, Epi Map looks to see if the first block is a BEFOREFILE block. If there is one, as part of the map loading process, Epi Map executes the BEFOREFILE block of code. This happens when you load a file using the MAP | LOAD MAP FILE menu item, but it also happens when you drill down to a more detailed map using an active region. If the more detailed map has its own EMP with a BEFOREFILE block, then when the more detailed map is loading, the BEFOREFILE block is executed. This is a good place to define variables and initialize them, since you're guaranteed this block will run before the user can click on any active region in a map (DEFINE is described in the "EMP Commands" section). BEFOREFILE can also be used to display a message or offer a choice with the CHOICE command before the map is loaded.

AFTERFILE Unlike BEFOREFILE, this block can be anywhere in the EMP. This block is run whenever the map file is being cleared out of memory. If you select the menu item MAP | CLEAR MAP FILE, then this block is executed as part of the clearing process. Also, if you are loading up another map without explicitly clearing out the one with the AFTERFILE, the AFTERFILE block is still executed before the new map is loaded. If you are simply exiting Epi Map, before Epi Map shuts down and the map with the AFTERFILE is still loaded, the AFTERFILE is executed. If you are drilling down to another map, however, the AFTERFILE block is not executed at that point. Epi Map expects that you will be eventually backing out to this map and will wait until you exit the map at that point before running the AFTERFILE block. If you drill down to a map with an AFTERFILE block

and then click on the Back Out icon, Epi Map will execute the lower level map's AFTERFILE block before returning to the original map.

Literal Values

When you need to give a value for a parameter in a command, you can certainly use literal values. By literal, this means that the value of the parameter is explicit and does not ever change unless someone physically edits the EMP and changes it.

There are three types of literal values: strings, integers, and reals. A string is a set of characters taken together as one item. A filename is a string, the title for a window is a string, etc. Strings must be enclosed in either single or double quotes (e.g., "example string" or 'example string'). Note that if you are using one type of quote to contain a string, you're welcome to use the other type of quote freely as part of the string. For example, "this string contains 'single quotes' and is perfectly legitimate". Usually, anytime the name of a region is used in an EMP, it is a string and must be enclosed in quotes. In the block header, however, quotes are optional if the region name contains no spaces. Similarly, quotes are optional for the name of the block in the DO command, unless it contains spaces or special characters, of course.

Integers are typical whole numbers (no fractions or decimal parts). They can be positive or negative values. Real numbers do contain decimal parts, and they can be positive or negative also. For example, 3 is an integer, 3.14159 is a real number; 3.00 is also a real number because it has a decimal part. There isn't much call for command parameters that are real numbers, but if you need them for something, you can sleep easily at night knowing that they are available. Numbers should not be enclosed in quotation marks if they are to be interpreted as numbers (can be added, subtracted, etc.).

Defined Variables

Defined variables can be quite useful in an EMP file. They allow you to keep track of information that can change. For example, it might be useful to keep a variable that contains the name of the last region clicked on. Or a variable

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with a certain filename. Or some variables representing the current colors you're using for one thing or another.

You can name a variable pretty much anything you like, except that you cannot name it the same as any keywords used in Epi Map. Those include all the command names as well as other words like BLOCK, ELSE, THEN, END, etc. The names of variables should be alphanumeric and start with a letter. The case used does not matter. Variable names are limited to a size of 20 characters.

The non-GLOBAL variables in an EMP file are kept in a list that only the current EMP can see. If you drill down to another map with another EMP, it's as if your original EMP's variables no longer exist. The new EMP file will have its own set of variables and will not be able to see the old EMP's variables at all. Once the map user drills back up to the original map, however, the drill down map's set of variables will be cleared out and the original map's variables will be restored, just as if the user had never left the original map.

If you need to make a variable defined in one EMP available to a different EMP in a different map, define the variable as GLOBAL so that the variable will be available to any EMP loaded on the system (that is, after the actual act of definition in the original EMP has been executed). See the details of the DEFINE command for an explanation of how to do this.

Once the definition of a variable has been executed, any further attempt to define it will be ignored. For example, if A.EMP defines the variable BUBBLES globally and then the user drills down to another map where B.EMP tries to define a local variable called BUBBLES, then Epi Map will not define the new variable since there already is a variable called BUBBLES. If A.EMP had defined BUBBLES locally, however, this would not be visible at all to B.EMP, and B.EMP would be free to define its own BUBBLES variable. When the map user drills back up to the map with A.EMP, the original BUBBLES would be restored.

System Variables

There are a few variables that are predefined for use by any EMP. They are called system variables and they do not need to be defined or initialized by the EMP. In fact, it does no good to try to change the value of a system variable. The new value will simply be ignored. The system variables are:

SYSTEMDATE - a string containing the current date

SYSTEMTIME - a string containing the current time

MAPFILE - a string containing the name of the map file of the current region

BNDFILE - a string containing the name of the boundary file of the current region

DATAFILE - a string containing the name of the data file of the current region

REGIONNAME - a string containing the name of the region currently being processed

Expressions

You can combine literals and variables and form mathematical, relational, and logical (Boolean) expressions if you like. Expressions can be used just about anywhere you could use a literal or a variable value. Exceptions are noted in the documentation for individual commands.

The +, -, /, and * operators are available for mathematical expressions. For example, $(3 + XMAX) / XSCALE$ is a perfectly good expression.

The + operator can also be applied to concatenate strings. "ONE" + "TWO" becomes "ONETWO". The expression `FNAME + '.REC'` is a good way to add an extension to a filename if the base part is in FNAME.

Relational and Boolean expressions are useful in the IF command. The relational operators are <, >, <=, >=, and =. The operands of the Boolean operators can be real, integer, or string values (or other expressions resulting in these values). Of course, the operands must make sense to test against one another. An expression like 'STRING' < 3.14159 makes no sense, and is illegal ('STRING' < '3.14159' is a legal expression, but is interpreted

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alphabetically. Since numbers come before letters in the computer (ASCII alphabet, “3.14159” is < “STRING”). The Boolean operators are AND, NOT, and OR. The operands to a Boolean expression must be relational or other Boolean expressions. An expression such as the following works just fine in Epi Map: $((3 + TCNT) / TSCL < TIDX) OR NOT ((TCNT > 0) AND (TCNT <= TMAX))$.

Note for experienced programmers: Priorities of the operators are arranged in a hierarchy of five levels. Operands on the same level are evaluated from left to right. The operands with the highest evaluation priority are - (unary minus) and NOT. The operands with the next-to-highest priority are * and /. Below that are + and - (binary). The operands with the next-to-lowest priority are the relational operators <, >, <=, >=, and =. Operands with the lowest priority are the Boolean operators AND and OR. As you can see from the example expressions, you can use parentheses to override the usual operator precedence.

EMP Commands

This section lists all of the commands that can be used inside a code block. Commands must fit on one line. You can put more than one command on a line, if they are separated with semicolons (;). If a command needs to be split across multiple physical lines, then the backslash character (\) must be used to indicate the command is being continued on another line. Some commands (such as CHOICE and IF) normally occupy several lines. You do not need to put the backslash at the natural break in these commands.

The use of indentation and white space within the command itself is up to you and is not used by Epi Map in the interpretation of the EMP. The use of both indentation and white space is encouraged, however, since it makes the programs much easier to read.

SHOW

Syntax: SHOW <REC file> {<geographic variable>: <Region name>}.} { :Q}

SHOW brings up the REC file SHOW module. Data from <REC file> is loaded. Specifically, the records where the field <geographic variable> contains the values in <Region name> are displayed. You can include several

<Region name> values to provide a list of regions to bring up in the SHOW module, but they must be separated by spaces. Without the :Q, the SHOW module brings the records up in the line listing format. If you include the :Q, the SHOW module comes up in questionnaire format.

TEXT

Syntax: TEXT <Text and Help file name without extension> <topic>

TEXT causes Epi Map to display a block of text for the user to browse. The information is loaded from the <text file> and <topic> determines the initial HLP file topic to display. If <text file>.HLP is not present, then Epi Map will look for a file with the same name but with a .TXT extension. If the .TXT file is present, it is converted into the .HLP file with the conversion program and brought up on screen for display. A topic must be defined in the .TXT or .HLP file that matches the topic requested. If not is specified, the current region name is assumed.

MAP

Syntax: MAP <map file>

This causes Epi Map to drill down to the map specified. The <map file> may be merely a more detailed map of the region clicked on, or any other map. When the user drills down to another map, he or she is free to use that map's active regions, etc., returning to the original map by clicking on the Back-Out Icon.

COPYFILE

Syntax: COPYFILE <src file> <dest file>

This command simply copies the <src file> to the <dest file>. However, it does it without bringing up a DOS screen. If the <dest file> is already present, it is overwritten. If the <src file> does not exist, then nothing happens (not even an error message). Be careful with this one, since it can permanently replace a file with another, and there is no way to reverse the process.

APPENDREC

Syntax: APPENDREC <src file> <dest file>

APPENDREC is designed for Epi Info .REC files. It copies the records in <src file> to the end of <dest file>. It does not, however, check to make sure the two .REC files have the same logical structure. If they do not, the resulting file will be unreadable.

MENU

Syntax: MENU ON
OFF

This command turns the main menu bar on or off. When the menu is turned off, no menu choices or F-keys are available except for F10, which quits Epi Map. If you start typing letters, Epi Map assumes you are selecting a region by typing its name. It will bring up the list of all regions in your map and match what you've typed so far to region names in the list. Pressing <Enter> then selects the region just as clicking on it with the mouse would have. Notice that ON and OFF are explicit parameters and cannot be specified using a variable.

DEFINE

Syntax: DEFINE <New Variable Name> {GLOBAL}

Any variable used in an EMP must be defined explicitly first to let Epi Map know that it will be used as a variable later on. The DEFINE command does not need to come first in the EMP program, but it must be executed before the execution of any other command using the variable. Generally, you should put DEFINES in the special BEFOREFILE block so that they are executed right away when your map is loaded. <New Variable Name> is the literal name of a variable (with no quotes around it).

If GLOBAL is not specified, variables are added to the local list. Local EMP variables are available only as long as the current map and EMP are being used. If the map user drills down to another map, he or she cannot use those variables in the new map/EMP. The variables will be restored for use,

however, when the user backs out to the prior map. If you specify GLOBAL, then the variable is added to the global list. Global variables are available to all maps and all EMPs as long as that session of Epi Map is running. See the “Defined Variables” section for more information. Until some other value is assigned, a DEFINED variable is considered to be an integer with value 0. Defining a variable that already exists (in either the local or global list) has no effect.

Variable Assignment

Syntax: <Variable Name> = <value>

This command places a specific value into a variable. The <Variable Name> must be DEFINED before it can be used in an assignment statement or in any expression. <Variable Name> must be the literal name of a variable (with no quotes around it). The value can be a string, integer, or real number literal, a variable containing one of those three things, or an expression resulting in one of those three things.

If the <Variable Name> currently holds a different type of value from what you are trying to assign (e.g., <Variable Name> contains a string, but <value> is an integer), then that is OK. Variables do not have types in Epi Map, other than GLOBAL or non GLOBAL. Whatever value <Variable Name> had before is simply thrown away and the new value is assigned to it. If <Variable Name> is not defined in this EMP though, you will get a message saying that a variable is not defined.

DO

Syntax: DO <Block name>

DO executes another block of code specified by <Block name>. <Block name> is a literal value (can't use variables or expressions here). <Block name> should only be enclosed in quotes if the <Block name> contains spaces or other special characters. During execution of a block, if Epi Map encounters this command, it will jump to the block specified, execute all of its commands, and then return to the original block and the command following the DO.

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DOS

Syntax: DOS {<DOS cmd>}

If <DOS cmd> is specified, Epi Map shells out to DOS, executes the given command and returns to Epi Map. If a <DOS cmd> is not been specified, then Epi Map simply shells out to DOS and lets the user do things until he/she types EXIT at a DOS prompt to return to Epi Map. <DOS cmd> is a valid DOS command or an expression or variable resulting in a DOS command.

HIGHLIGHT

Syntax:

HIGHLIGHT <Region name> {OFF} | {<Fill color> <Fill pattern> <Boundary color>}

HIGHLIGHT adds <Region name> to a list of regions to be specifically colored and shaded. If OFF is specified, then if that region was previously HIGHLIGHTed, then it is removed from the list and is redrawn with the color/hatch pattern or dot density pattern it would normally have.

If you HIGHLIGHT and give only the <Region name>, then Epi Map will use the default colors and pattern. Specifying <Fill color> <Fill pattern> <Boundary color> gives the fill color, the fill shade pattern, and boundary color (respectively) to be used in the map region. Each of these three parameters is an integer in the range 0 to 15. The fill pattern is the same as the fill patterns in the FILL PATTERN AND COLOR SELECTION screen accessed through MAP TYPE | COLOR/PATTERN | <F5> choices. The fill patterns 0 through 15 are the same as the patterns you see going down the screen (0 at top, 15 at the bottom).

The colors <Fill color> and <Boundary color> are consistent with the colors used through the rest of Epi Map. The colors 0 to 15 are also consistent with the colors going across (0 on the left, 15 on the right) THE FILL PATTERN AND COLOR SELECTION screen. The numbers of the colors are: 00-Black; 01-Blue; 02-Green; 03-Cyan; 04-Red; 05-Magenta; 06-Brown; 07-White; (Light Gray); 08-Gray; 09-Light Blue; 10-Light Green; 11-Light Cyan; 12-Light Red; 13-Light Magenta; 14-Yellow; 15-Intense White. A sample map file called COLORS.MAP is provided to demonstrate the colors.

PRINT

Syntax: PRINT {PRINTER1 | PRINTER2} {<Output File Name>} { <Print mode>}

Print causes the current map to be printed using the printer driver specified in the SETUP screen. You can select either the first (PRINTER1) or second (PRINTER2) printer in the SETUP screen. If neither PRINTER1 or PRINTER2 is specified, then PRINTER1 is assumed. PRINTER1 and PRINTER2 are both literals and cannot be replaced by variables (nor should they be in quotes). The filename <Output File> can be provided if output is to a file rather than to a printer. If the selected printer driver does not need a filename and one is provided, then it is ignored. If the driver does need a filename and one is not provided, then the user is prompted for one. <Print mode> is an integer 1 through 6 representing up to 6 choices you get when you try to print ('Low quality, half- page'...'High quality, full-page'). If specified, PRINTER1 or PRINTER2 must be the first parameter in the command, but <Output File Name> and <Print mode> can be reversed if desired.

IF

Syntax:
 IF <Expression>
 THEN
 <command(s)>
 {ELSE
 <command(s)>}
 END

IF allows you to execute commands only under certain circumstances (conditionally). The entire ELSE clause is optional, but with or without the ELSE clause, the IF command must end with the word END (this is in addition to the END required to terminate the EMP block).

There are three ways various parts of the IF statement may be executed. 1) The <Expression> is a true statement: all of the commands in the IF-part of the statement are executed. 2) The <Expression> is false and there is an ELSE-part in the statement: all of the commands in the ELSE-part of the statement are executed. 3) The <Expression> is false and there is no ELSE-

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part to the IF statement: processing skips to the next command after the IF statement. Again, any command listed here can be used for a <command>. This includes other IF commands and DO commands.

PICKLIST

Syntax:

```
PICKLIST {<choice title>}
    <choice item> <command>
    <choice item> <command>
    etc.
END
```

The PICKLIST command presents a list of choices and then executes a command based on the user's choice. The text of the choices is given in the <choice item>s. The title of the window where the choices appear is given by <choice title>. If the user selects a specific choice, then the <command> on the same line with the <choice item> is executed.

At least one <choice item> and <command> must be given. The full <command> must fit on the line with the <choice item> unless you use a \ to continue the <command> on the next line. Only a single <command> is allowed for each <choice item> (but there's nothing stopping you from using a DO command to get around this). If the user presses <Esc>, then none of the commands are executed.

Epi Map Help Files

Files for use in the TEXT command are created in an editor, such as EPED, in ASCII format. They must be run through a program called HELPPREP to compress the file and prepare it for use, but EPIMAP will do this automatically if the file is in the correct format.

Several commands are used within help files. They are preceded by an exclamation point on the left margin, as follows:

!WIDTH <Width of window on the screen, up to 78 characters>

This sets the width of the window that will be displayed. The actual width available for text display is this number minus four, since the edges of the window each take two characters.

!TOPIC <Topic number> <Region Name>

Each block of subject matter must begin with this command. The numbers are from 1 to 32,000, and the Region name may be any phrase, with or without spaces, that matches a region in the map. Quotation marks are not necessary unless you want them printed at the top of the help window with the topic name. If you wish to access a block of text from within another block, it does not have to have a name matching a region, and any name can be used.

!NOWRAP

Normally, the text is automatically word wrapped to fit the size window selected with the **!WIDTH** command. If you do not want this to happen, the **!NOWRAP** statement will turn off this feature. Lines longer than the window would simply be truncated in this case. The **!WRAP** command turns wrapping back on.

!PAGE

This command marks the end of a screen page, so that text above will be displayed and blank lines will appear below the line containing **!PAGE**. This allows a choice of places where pages break in blocks that are longer than one screenfull and therefore require scrolling with the <PgUp> and <PgDn> keys.

Highlighting in Help Files

Colors for highlighting are provided in the TEXT display. You can turn on a color by placing Ctrl-A, Ctrl-B, or Ctrl-C in the text, and turn off the highlight by placing the same character at the end of the highlighted text. To place these characters in a text file in EPED, first press Ctrl-P and then the desired character. <Ctrl-P Ctrl-A> will place <Ctrl-A> in the text, for example.

Hypertext

You can “program” sections of text to jump to another block in the file when the user presses <Enter> with the cursor on the highlighted text.

These “hot links” are an important feature of “hypertext” programs, and can be used to construct convenient cross references, or even an entire, active

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index like the one contained in the Epi Map help file that appears when <F1> is pressed.

To construct a cross reference, place <Ctrl-D>####<Ctrl-E> before the text you wish to make active, and place <Ctrl-E> after the text. #### is the number of the block you wish to jump to when the user chooses the active text. If you wish to return to the original block later, another active link must be placed in the second block.

Preparing the .HLP File

When the help file is complete, it may be run through the HELPPREP program before use, or this may be left for Epi Map to do automatically. To run HELPPREP, from the DOS prompt type:

```
HELPPREP <Text file name> <Completed help file name>
```

For example,

```
HELPPREP CENSUS.TXT CENSUS.HLP
```

HELPPREP will construct the binary file CENSUS.HLP that can be called from the TEXT command when an active region is selected.

A Sample EMP File

```
{ GEORGIA.EMP: A Demo Program for Epi Map 2}
{ Blocks with names matching counties define what will happen when}
{ a particular county is selected. Note the special-purpose blocks,}
{ BEFOREFILE, DEFAULT, and GENERAL}

BLOCK BEFOREFILE { Set up colors and define a variable for last region name}
  DEFINE BCOLOR { This block is executed as soon as the map is loaded}
  DEFINE FCOLOR
  BCOLOR = 3
  FCOLOR = 5
```

```

DEFINE LASTREG
* MENU OFF
END

BLOCK DEFAULT { This block defines what happens if no block is defined }
    { for a particular county. It changes the color of the }
    { county fill, cycling through colors 0-15 with successive}
    { mouse clicks }
HIGHLIGHT REGIONNAME FCOLOR 1 BCOLOR
LASTREG = REGIONNAME
FCOLOR = FCOLOR + 1
IF FCOLOR > 15 THEN
    FCOLOR = 0
END
BCOLOR = BCOLOR + 1
IF BCOLOR > 15 THEN
    BCOLOR = 0
END
END

BLOCK FULTON { When Fulton County is selected, displays the records}
    { from the Epi Info data file USGA2.REC in which the }
    { COUNTY field is equal to FULTON, in spreadsheet }
    { format on the screen.}
SHOW 'USGA2.REC' 'COUNTY': 'FULTON'
END

BLOCK GENERAL { When the GENERAL icon, representing the entire state}
    { of Georgia, is selected, a hypertext help file,}
    { GA.HLP, containing census statistics, is displayed}
TEXT "GA.HLP" 'GENERAL'
END

BLOCK MONROE { Selecting MONROE county first displays the data file,}
    { PEACHHI.REC in questionnaire format, letting the user}
    { scroll through all the records in which COUNTY is MONROE,}
    { using the F7 and F8 keys. Then a Help file called}
    { MONROE.HLP is shown, starting in the topic block, MONROE}
SHOW "PEACHHI.REC" "COUNTY": 'MONROE' :Q
TEXT 'MONROE.HLP' 'MONROE'

```

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END

BLOCK PEACH { Clicking on PEACH county first brings up a PICKLIST box,
 { with the items defined below. A user}
 { choice activates one of the items.}

PICKLIST 'PEACH COUNTY'

'CENSUS INFO' SHOW 'PEACHHL.REC' 'COUNTY': 'PEACH' :Q

 { Displays the data records in which COUNTY is PEACH}
 { in Questionnaire format. }

'DETAILED MAP' MAP 'PEACH.MAP'

 { Displays a more detailed map, called PEACH.MAP}

END

END

BLOCK CRAWFORD { Clicking on CRAWFORD County causes the map,
CRAWFORD.MAP}

 { to be displayed, showing census tracts.}

MAP 'CRAWFORD.MAP'

END

BLOCK 'CRAWFORD 702' { Within the CRAWFORD.MAP, clicking in the}

 { 702 census tract activates a map of one}
 { floor of a local hospital during an epidemic.}
 { Not a very practical example, but we wanted}
 { to show something REALLY local and specific.}

MAP 'HOSPITAL.MAP'

END

BLOCK COOK { Clicking on COOK county exits to DOS and executes}

 { ANALYSIS (you may need to change the directory info)}

DOS '\EPI6\ANALYSIS'

END

BLOCK LOWNDES { Clicking on LOWNDES County provides access to DOS.}

 { The user must type EXIT to return to Epi Map.}

DOS

END

BLOCK HLOFF {-----}

HIGHLIGHT LASTREG OFF

END

{ End of .EMP Program }



Chapter 15

EPIMAP and EPIMAP64: Using All of Random Access Memory (RAM)

Tutorial

If your computer has a 286 or better processor and more than 640 K of Random Access Memory (RAM), run EPIMAP from the DOS prompt. From the BOUNDARY menu choose LOAD COMPLETE and then the .BND file USACOUNT. A map of the United States showing the more than 3000 counties will appear.

Now pull down the MAP menu and choose MAP MANAGER. Note that the size of available RAM is shown in the upper right corner of the screen. In a 4 megabyte computer, the number shown will exceed two megabytes of *available RAM*, meaning that you can create and run an enormous map file or .EMP program, even after loading this large boundary file.

If your computer is of the 8086 variety like the original IBM PC and PC/XT, you can still run Epi Map, but you should use the program called EPIMAP64.EXE that is supplied with the system rather than EPIMAP, which is now designed for 286 and higher processors.

Overview

EPIMAP, Version 2, is able to utilize available memory above the usual DOS limit of 640 K. This allows large boundary files and .EMP programs to be loaded without running out of RAM space.

To run EPIMAP, you must have a computer that has at least a 286 CPU chip. This includes almost every IBM compatible microcomputer today except for the original IBM PC and PC/XT. You must have more than 640 K of Random Access Memory (RAM) installed in the computer, but most modern computers have 1, 4, or more megabytes.

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EPIMAP has its own memory management software and does not require that another memory manager (e.g., EMM386, QEMM) be present, although it coexists peacefully with other memory managers. The files RTM.EXE and DPMI16BI.OVL are needed by EPIMAP and BOUNDARY.EXE and must be present in the same directory or in a directory included in the PATH statement in the AUTOEXEC.BAT file.

Using EPIMAP

The large amount of memory available in Version 2 of Epi Map offers special opportunities. You will be able to load large, detailed boundary files from other systems, perhaps after converting them in BOUNDARY, the companion utility for EPIMAP.

It is possible to construct detailed maps of large areas, such as a collection of many U.S. States, by using LOAD COMPLETE on the BOUNDARY menu to load a number of boundary files on the same screen. Of course the files must be constructed with the same coordinate system, as are the U.S. States supplied with Epi Map.

Using EPIMAP64

If your computer is of the 8086 variety like the original IBMPC and PC/XT, you can still run Epi Map, but you should use the programs called EPIMAP64.EXE and BOUND64.EXE that are supplied with the system rather than EPIMAP and BOUNDARY, which are now designed for 286 and higher processors. If you plan to use EPIMAP64 regularly, you may want to delete or rename EPIMAP.EXE then and then rename EPIMAP64.EXE to EPIMAP.EXE. EPIMAP, BOUNDARY, a 286 or higher processor and more than 640 K of RAM will, of course, allow loading more complex maps and larger EMP files than the more limited version supplied for backward compatibility.

Epi Map .MAP File Structure, for Reference Purposes

```

HEADER="Epi Map Version 2.0 Map Description File"
{ SECTION="[ MapName<a> ]"
  OPTIONS="TitlesOn<a,1,+/->,LegendOn<a,1,+/->,BoundaryColor<n,2>,
    BoundaryStyle<n,2>,BoundaryShadowX<n,2>,BoundaryShadowY<n,2>,
    ShadowColor<n,2>,MapFrame<a,1,+/->"
  BOUNDARY=[ BoundaryFileName<a>]
  [ DATAFILE=DataFileName<a>]
  [ BOUNDVAR="BoundaryFileVariableName<a>" ]
  [ DATAVAR="DataFileVariableName<a>" ]
  [ MAPTYPE=MapTypeName<a,,((COLOR/PATTERN)/DOT-DENSITY/CARTOGRAM)>
    [ (CartogramBaseSize<n,4.2>,MinSize<n,3.2>,
      MissSize<n,3.2>/
      DotValue<n,4.2>,DotDiameter<n,1>,DotColor<n,2>) ] ]
  [ TITLES=
    { "Title<a>","TextFont<n,2>,TextSize<n,2>,TextColor<n,2>,TextJust<n,2>,
      TextBold<a,1,+/->,TextUnder<a,1,+/->" }
    END ]
  [ LABELS="LabelsOn<a,1,+/->,LabelIncMissing<a,1,+/->,LabelBoxOptions<n,1>,
    LabelIncValue<n,6.2>","TextFont<n,2>,TextSize<n,2>,TextColor<n,2>,
    TextJust<n,2>,TextBold<a,1,+/->,TextUnder<a,1,+/->" ]
  [ RANGES NumRanges<n,2>
    { RangeLo<n,7.2> RangeHi<n,7.2> Color<n,2> FillPattern<n,2> } (1 to 17)
    "All others"
    "Missing"
    END ]
  [ LEGEND
    "LegendTitle<a>","TextFont<n,2>,TextSize<n,2>,TextColor<n,2>,
    TextJust<n,2>,TextBold<a,1,+/->,TextUnder<a,1,+/->","
    "TextFont<n,2>,TextSize<n,2>,TextColor<n,2>,TextJust<n,2>,
    TextBold<a,1,+/->,TextUnder<a,1,+/->","
    "Spacing<n,1>,Order<n,1>,Decimals<n,1>,SpecialChar<n,1>,BoxColor<n,2>,
    IncOthers<a,1,+/->,IncMissing<a,1,+/->,DefLegTitle<a,1,+/->,
    DefRangeLabels<a,1,+/->"
    { "RangeLabel<a>" } (1 to 17)
    "All others"
  ]
}

```

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```
"Missing"  
END ]  
[ ANNOTATIONS  
{ AnnotationType<n,1>,AnnotationColor<n,2>MapLinked<n,1>,Xmin<n,(10/2.7)>,  
YMin<n,(10/2.7)>,  
(PointSize<n,10>,PointSymbol<n,2>/  
TextID<n,10>,TextFont<n,2>,TextSize<n,2>,TextColor<n,2>,TextJust<n,2>,  
TextBold<a,1,+/->,TextUnder<a,1,+/->,Text<a>/  
XMax<n,(10/2.7)>,YMax<n,(10/2.7)>,  
(LineStyle<n,1>/RLineStyle<n,2>,RPattern<n,2>,RFillPattern<n,2>)) }  
END ]  
}
```

EIDBLIST

```
{ Selected<a,2>,</blank>, Display Option <a,10,GEOGRAPHICNAMEVARIABLE  
<a,10,Filename <a,12>}  
END
```

KEY

{ iterations of }, a repeating pattern

[optional]

< type, [length], [range] >

<a> = alphanumeric

<n> = numeric, where <n,6.2> , means “numeric, with 6 digits and 2 decimal places,” as in 999999.99

x/y = x or y

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"

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