USER DOCUMENTATION

PC LTAS

LIFE TABLE ANALYSIS SYSTEM FOR USE ON THE PC

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1.0 Introduction/Acknowledgments

The Life Table Analysis System (LTAS) was developed at the National Institute for Occupational Safety and Health (NIOSH) during the 1970's. [1] Until the present, LTAS was available only on IBM mainframe computer systems. This manual will refer to this as "PC LTAS", "LTAS", "the system", or "Life Table."

The current version of LTAS has been developed for use on IBM-compatible PC's. Programming was done by Stephen Spaeth with assistance from Patricia Laber and LihIng Chang. This PC version of LTAS is more interactive than the mainframe version and provides nearly instantaneous turnarounds. PC LTAS was written in **BORLAND® C++ 3.1**.

Faircom® c-tree® 4.3 Release C was used as the file manager.

LIANT C-scape® 4.0 was used for creation of the user interface (screens and menus). **Phar Lap® 286|DOS Extender™ 3.0** was used for improved memory utilization.

A glossary of epidemiological terms and terms specific to LTAS is included in Appendix A.

"Quick Start" is provided for new users who may wish to run the PC LTAS without studying its details or users already generally familiar with it who may need to refer to a summary of a Life Table run. "Quick Start" is included in Appendix B. However, the user will probably need to read sections 4.1.1 and 4.2 before attempting a quick start.

A sample study including a demographics file, a work history file, and other required files is distributed with PC LTAS. This sample study can be used for trial Life Table runs to familiarize the user with the system after long periods of disuse and to verify that PC LTAS is installed correctly and is functioning properly.

2.0 NIOSH Life Table Analyses: An Overview

Life table analyses originated as a form of survival analysis in which survival times are grouped into intervals. Hazard or incidence rates are calculated for each interval. Intervals might be constructed by age, calendar time, duration of exposure, or level of exposure (for example, ppm). [2] Rates for the cohort under observation might then be compared with external rates for some large (typically unexposed) population to obtain an estimate of the relative survival of the cohort compared with the external population.

The NIOSH Life Table was created primarily to analyze cohorts defined by occupational exposures. It therefore requires input of a work history file in addition to a demographic file. LTAS constructs rates by age, sex, race (usually white/non-white), calendar time, and duration or level of exposure. Rates are calculated as observed events, typically deaths, divided by person-time at risk in the interval. Additional information on the NIOSH life table may be found in Waxweiler et al. [1] and Steenland et al. [3] A useful overview of occupational life table analysis can be found in Checkoway et al. [4]

For simplicity we will refer to “death or disease incidence” as “death” in this manual. Person-time at risk of death usually begins when exposure begins and continues for each individual until death, the end of the follow-up period, or date-last-observed-alive, whichever comes first. “Lost to follow-up” means that the date last observed is before the end of the study. If an individual is lost to follow-up before the end of the follow-up period, then he or she is considered censored or withdrawn, and person-time for that individual may be truncated at that point. Optionally the user can choose to extend person-time until the study end date for individuals lost to follow-up.

Observed deaths (the numerator) and person-time at risk (the denominator) for all individuals in the cohort are grouped together within strata. These strata are age and calendar intervals that generally have a length of five years. Age intervals and calendar intervals are discussed in section 4.1.2. Further cross-stratification is done by time since first exposure/employment (TSFE) versus either duration of exposure or cumulative level of exposure. The user can determine the number and length of the intervals used for these strata. Finally, additional cross-stratification is also done by sex and race.

The Life Table can also create an export file containing observed stratified rates, including numerator, denominator, and the rate itself. This file may be used for analyses in which the referent group is internal (such as Poisson regression). An index for each record specifies the stratum of age, sex, race, calendar time, duration of exposure or level of exposure, and time since first exposure for that record. The export file format is in Appendix C.

Observed rates for the cohort under study are compared with the rates from an unexposed or referent population via indirect standardization and optionally via direct standardization. Rates for several referent populations are supplied with LTAS. Indirect standardization calculates standardized mortality ratios (SMR). Direct standardization calculates standardized rate ratios (SRR).

Indirect standardization is done by comparing observed deaths within each stratum with expected deaths, where expected deaths are computed by multiplying the referent population death rates (stratified appropriately) by the observed person years at risk in each stratum. The observed and expected deaths are then summed across all strata. This is done for each of the cause-of-death categories, and the results are printed in a summary table. Chapter 7, **Analyze**, shows examples of the printed reports. The summary table is shown in Figure 7.11. The summary table also lists confidence intervals for the ratio of total observed to expected deaths (the SMR) and p-values. P-values are calculated under the assumption that the observed deaths are Poisson variates (random variables with a Poisson distribution) and the expected deaths are invariate. Exact confidence intervals (90% or 95%) and p-values (one-sided or two-sided) are calculated when the number of observed deaths is less than or equal to five. For greater numbers of observed deaths, an approximation suggested by Byar is used. [5] When one-sided p-values are requested, LTAS restricts testing to SMRs greater than 1.00

and calculates 90% confidence intervals. Comparisons of observed and expected deaths are also available by calendar periods versus age groups (see Figure 7.7), or exposure (duration of exposure or cumulative level of exposure) versus time since first exposure (TSFE) (see Figure 7.8). All of the reports are available by gender and race or by combined genders and races.

Note that the ratio of observed to expected deaths is equivalent to a ratio of weighted rates, in which the weights for each stratum are the person years in the exposed group. This ratio is shown in three of the reports. In the second report, "Distribution of Observed and Expected by Age/Calendar period" (Figure 7.7), observed deaths, expected deaths, and SMR are shown in columns. In the third report, "Distribution of Observed and Expected by TSFE/Exposure" (Figure 7.8), shows cells. Observed deaths, expected deaths, and SMR are shown from top to bottom within each cell. The fourth report, "Summary of Observed and Expected" (Figure 7.11) shows these values in columns.

The SMR is calculated by the following formula:

$$SMR = \frac{\sum_i W_i R_{i1}}{\sum_i W_i R_{i0}}$$

where R_{i1} = the stratum-specific rate in the observed cohort (the exposed cohort)
R_{i0} = the stratum-specific rate in unexposed population
W_i = stratum-specific person years in the exposed cohort.

The numerator in the above fraction is a weighted sum of observed deaths, and the denominator is a weighted sum of expected deaths.

Two or more indirectly standardized rates are not mutually comparable because the weights will be different. This makes internal comparison of SMRs for different groups, whether cumulative level of exposure groups or duration of exposure groups, unsatisfactory. This provides the motivation for using direct standardization.

Direct standardization is done by PC LTAS for internal comparison, to compare low duration or low cumulative level of exposure groups to higher ones. A directly standardized rate ratio (SRR) is a ratio of weighted rates in which the weight for each stratum-specific rate is the combined person years for the observed cohort across all duration (or cumulative level of exposure) categories. The formula given above is applicable, but the weights are different. PC LTAS gives the SRR for each duration (or cumulative level of exposure) group compared with the baseline or lowest group. The cutoff points for the categories must be specified by the user (for example, 0-100 ppm-years might define the baseline group, 100-200 ppm-years might define the next group, etc.). Taylor-series-based confidence intervals [6] and a chi-square test of significance [7] (based on the binomial distribution) are also given for each specific SRR. A trend is calculated in a regression of directly standardized rates according to the formulas presented by Rothman. [6] This uses the midpoints of the categories as the independent variable. The cutoff point plus 50% is used for the midpoint of the highest category. Direct standardization must be requested by the user. This can be done for one death category or several categories simultaneously. SRR results are given along with the usual SMR results (See the bottom row of cells in Figure 7.9).

2.1 Lagging exposures

Another feature of the NIOSH Life Table is the ability to "lag" exposures. Under some circumstances, an investigator may wish to lag exposure such that most recent exposure does not contribute to the cumulative level of exposure at any given point in time. Such a lag assumes that an exposure requires a minimum induction period before it can cause disease.[4,6] This time is called the "lag" period. .

The lag is a **moving** exposure blackout window which discounts any exposure occurring for a specified amount of time prior to the time point being considered. When the user specifies a nonzero lag time (in the **Stratify** step), this length of time is used to lag

the exposure. As a worker moves through time, at any given point of time x, exposure which occurs during a specified lag (e.g., 10 years) prior to time x is ignored when calculating cumulative exposure at time x. Such a worker (and all their person-time) would be considered nonexposed until he/she had been followed for 10 years after first exposure, at which time his/her exposure would start being accumulated. Note also that at the **end** of followup for this worker a 10 year lag would mean that no exposure in the 10 years prior to his/her end of follow-up would be counted in his/her final cumulative exposure.

As noted above, if all of a person's exposure occurs within the lag period, that person (and their person-time) will be considered to have never been exposed. His or her person years at risk, and his or her death, should that occur, are placed into an unexposed category for which a separate SMR is calculated by PC LTAS. If exposure does not increase risk of disease or death during the lag period, then this unexposed group should not have an elevated SMR. Figure 7.10 shows the output for lung cancer with a 5-year lag on duration of exposure. The data at the bottom of the figure give the SMR for those who never fulfill the lag and therefore are considered "unexposed" (all their person-time is nonexposed).

2.2 Proportionate Mortality Ratio

LTAS also calculates proportionate mortality ratios (PMR), which are ratios of the proportion of deaths from a specific cause in the exposed compared to the comparable ratio in the nonexposed (often the U.S. population). For example, the proportion of lung cancers among the exposed among all deaths could be compared to the proportion of lung cancers among all deaths among the nonexposed. PMR are useful when only deaths are available for an exposed population, without a complete enumeration of the cohort which permits calculated of rates. A typical situation might be when death certificates are available from a union, but no complete list of all union members is available. For analyses to be valid, the available observed deaths must be representative of all deaths in the base population [4].

Adjustment for age, sex, race, and calendar time is done (as in SMRs) by stratification and indirect standardization (a weighted average of proportions is calculated for exposed and nonexposed across strata of the stratification variables, with the weights being the observed deaths in the exposed population in each stratum). Hypothesis testing and confidence intervals are calculated as in the SMRs, based on an assumed Poisson distribution. Standard proportion files for the U.S. population (stratified like the rate files by age, race, sex, calendar time) are available with LTAS for underlying causes for 1940-1999 (92 causes) and 1960-1999 (99 causes), and for multiple causes for 1960-1999 (92 causes). Dummy rates are provided for 1995-1999 which are copies of the 1990-1994 rates. PMR runs are chosen in LTAS via selection of proportion files instead of standard rate files when selecting unexposed or referent rates/proportions.

Cause-specific PMR have the disadvantage of being mutually dependent, unlike SMRs. An elevations of the proportion of death from one cause in the exposed population must in turn result in a decrease in the proportions of deaths from some other cause. This inter-dependence of cause-specific results may be over-come by an internal analysis in which the data are analyzed as a case-control study, calculating mortality odds ratios (MOR) [8]. While LTAS does not do this directly, MOR may be calculated easily using the stratified data on the observed deaths in the exposed population produced by LTEXPORT.

Some investigators may wish to calculate proportionate cancer mortality ratios (PCMR) which are the ratio of observed cancers to expected cancers, where the expecteds are calculated based on the proportion of cause-specific cancers among all cancer deaths, rather than all deaths as in the PMR. Cause-specific PCMR can be calculated from the corresponding cause-specific PMR by dividing the cause-specific PMR by the all-cancer PMR, which is given in the LTAS output. For example, suppose there are 20 observed lung cancers in the cohort, the PMR is 2.0, and the all-cancer PMR is 0.80. Then the lung cancer PCMR is 2.0/0.8=2.5. Exact or approximate confidence intervals for this PCMR can be derived based on the Poisson distribution. A test-based confidence interval for this PCMR can be derived using the normal approximation to the Poisson

distribution. First determine the expected cancers from the PCMR and the observed cancers. For example, the expected lung cancers in our example are 20/2.5=8. Then derive the approximate lower and upper confidence limits for the observed lung cancers via the method described by Vandenbroucke [9],

$$limits = [\sqrt{observed} \pm (1.96 * 0.5)]^2.$$

These limits are in turn divided by the expected cancers to get the lower and upper limits to the PCMR. In our example, these are 1.52, 3.71.

3.0 Getting Started

3.1 Installation

1) Put Life Table installation diskette one into your computer's disk drive. For these directions we will assume that this is the “a:” drive.

2) At the DOS command prompt type “a:\install” and press “Enter”. The screen in Figure 3.1. will appear.

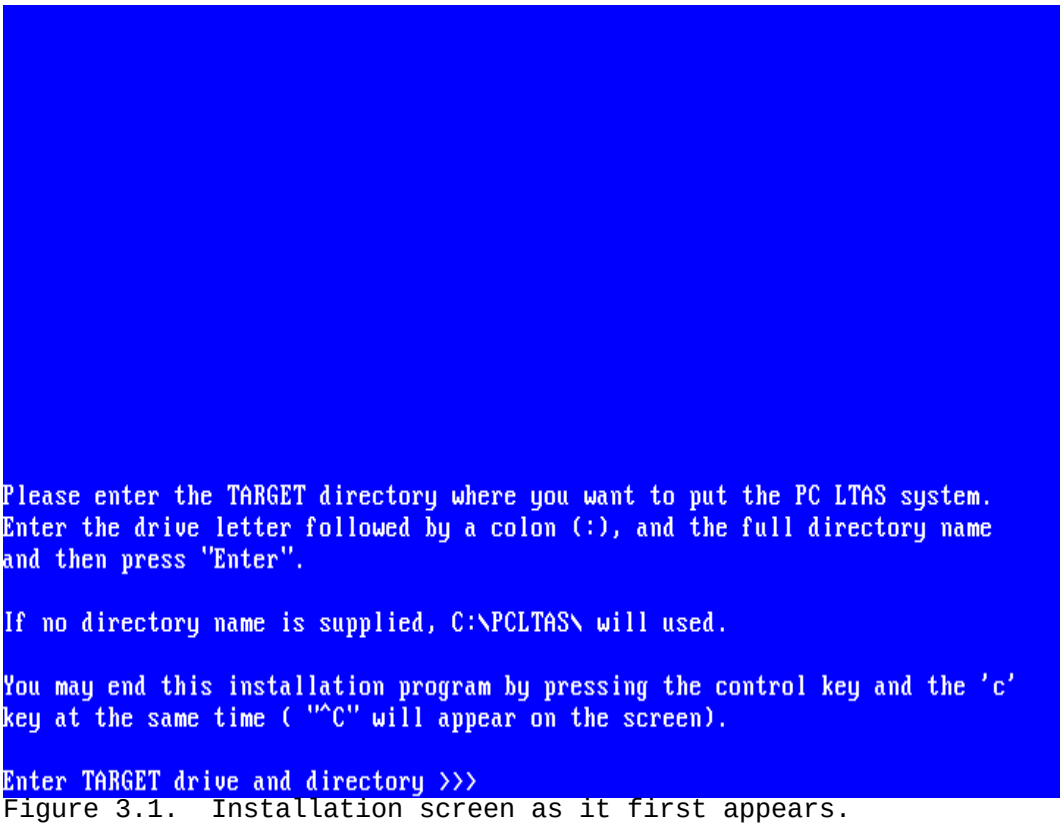

Figure 3.1. Installation screen as it first appears.

3) You will be asked to enter the disk drive letter and optional directory name where you want to install Life Table. You can accept the default directory, “c:\PCLTAS” by pressing the “Enter” key. Or you can choose a different directory by typing the drive letter and a directory name such as “c:\LTAS” and press “Enter” key.

4) Install uses PKUNZIP to install the files. PKUNZIP needs information from the last installation diskette before it can begin copying files from the first diskette. This is why you are asked to insert the last diskette, then asked to insert the first diskette. See Figure 3.2.

5) As the files are installed you can see the file names. When the installation program is ready for the next disk you will be prompted to remove the diskette and replace it with the next installation diskette.

6) Installation is complete. Save the installation diskettes.

```
You may end this installation program by pressing the control key and the 'c'
key at the same time ( "^C" will appear on the screen).

Enter TARGET drive and directory >>>

Drive C: has 16171008 bytes available
Put the LAST installation disk in the install drive if you are installing from
diskettes and press any key when ready. Change the disks when prompted to do so.

PKUNZIP needs to read information from the LAST diskette before it can install
the files.

PKUNZIP (R)    FAST!    Extract Utility    Version 2.04g  02-01-93
Copr. 1989-1993 PKWARE Inc. All Rights Reserved. Shareware Version
PKUNZIP Reg. U.S. Pat. and Tm. Off.

▪ 80486 CPU detected.
▪ EMS version 4.00 detected.
▪ XMS version 3.00 detected.
▪ DPMI version 0.90 detected.

Searching ZIP: A:/LTAS.ZIP
Insert the LAST disk of the backup set - Press a key when ready

Insert disk #1 - Press a key when ready
```

Figure 3.2. Install asks for the last diskette before it asks for the first diskette.

```
▪ 80486 CPU detected.
▪ EMS version 4.00 detected.
▪ XMS version 3.00 detected.
▪ DPMI version 0.90 detected.

Searching ZIP: A:/LTAS.ZIP
Insert the LAST disk of the backup set - Press a key when ready

Insert disk #1 - Press a key when ready
  Inflating: C:/PCLTAS/BLDRATE.EXE
 Extracting: C:/PCLTAS/SAMPLES/
  Inflating: C:/PCLTAS/LTAS.HLP
  Inflating: C:/PCLTAS/INSTALL.EXE
  Inflating: C:/PCLTAS/LTAS.EXE
  Inflating: C:/PCLTAS/LTEXPORT.EXE
  Inflating: C:/PCLTAS/LTPRATES.EXE
  Inflating: C:/PCLTAS/NEWPRTRS.EXE
  Inflating: C:/PCLTAS/STRATIFY.EXE
  Inflating: C:/PCLTAS/VERFY.EXE
 Extracting: C:/PCLTAS/RATES/
  Inflating: C:/PCLTAS/PRINTERS.LT
  Inflating: C:/PCLTAS/SCREENS.LT
  Inflating: C:/PCLTAS/BP286.EXE
Insert disk #2 - Press a key when ready
```

Figure 3.3. Install asks for the second diskette.

3.2 File List

The following files will be installed. This list assumes that PC LTAS was installed in a directory called “\PCLTAS”.

\PCLTAS\BLDRATE.EXE
\PCLTAS\BP286.EXE
\PCLTAS\LTAS.EXE
\PCLTAS\LTAS.HLP
\PCLTAS\LTEXPORT.EXE
\PCLTAS\LTPRATES.EXE
\PCLTAS\NEWPRTRS.EXE
\PCLTAS\PRINTERS.LT
\PCLTAS\READ.ME
\PCLTAS\SCREENS.LT
\PCLTAS\STRATIFY.EXE
\PCLTAS\VERFY.EXE

\PCLTAS\RATES\99MINORS.DAT
\PCLTAS\RATES\99MINORS.ICD
\PCLTAS\RATES\99MINORS.IDX
\PCLTAS\RATES\99MINORS.RDF
\PCLTAS\RATES\MCODPMR.DAT
\PCLTAS\RATES\MCODPMR.IDX
\PCLTAS\RATES\MCODPMR.RDF
\PCLTAS\RATES\MCODSMR.DAT
\PCLTAS\RATES\MCODSMR.IDX
\PCLTAS\RATES\MCODSMR.RDF
\PCLTAS\RATES\READ.ME
\PCLTAS\RATES\SEER.DAT
\PCLTAS\RATES\SEER.ICD
\PCLTAS\RATES\SEER.IDX
\PCLTAS\RATES\SEER.RDF
\PCLTAS\RATES\USPROPS.DAT
\PCLTAS\RATES\USPROPS.IDX
\PCLTAS\RATES\USPROPS.RDF
\PCLTAS\RATES\USPRPS99.BAK
\PCLTAS\RATES\USPRPS99.DAT
\PCLTAS\RATES\USPRPS99.IDX
\PCLTAS\RATES\USPRPS99.RDF
\PCLTAS\RATES\USRATES.DAT
\PCLTAS\RATES\USRATES.ICD
\PCLTAS\RATES\USRATES.IDX
\PCLTAS\RATES\USRATES.RDF

\PCLTAS\SAMPLES\DEMOGRFX.LTI
\PCLTAS\SAMPLES\HSTORY.LTI

3.3 Recommended Computer System Configuration

Installation of PC LTAS requires 8 megabytes of hard disk space. Additional space for the user's study data must also be available. To this end, the user should estimate 110 bytes per worker demographic record, 39 bytes per work history, and 49 bytes per exposure record. The minimum required memory is 4 megabytes. The maximum memory used by PC LTAS is 16 megabytes.

It is highly recommended that a mouse be installed.

Software that can create an ASCII file is needed for generating the demographics, work history, and exposure files. This can be the “edit” program in DOS. If a more sophisticated word processor is used be certain that you are saving the file in ASCII text format. Other file formats will not be recognized by PC LTAS.

The processor should be an 80286 or higher. A numeric coprocessor (Intel 80287, or equivalent) is recommended for improved system performance and will be used if present. Intel 80386 and higher processors already include a numeric coprocessor. A color monitor is required, and an EGA monitor or better is recommended. The operating system should be DOS Version 3.0 or higher, or Windows or OS/2. PC LTAS will also run as a DOS application under Microsoft Windows and as such can use virtual memory if needed and available. Virtual memory is the use of part of the hard disk storage to behave as memory chips. PC LTAS will not run under versions of Microsoft Windows prior to 3.1; nor under OS/2 1.x.

3.4 Performance

Verify step takes the longest of the three main steps in PC LTAS.

Because PC LTAS requires a large amount of I/O (input from and output to the disk drive), the faster the hard drive, the better the performance of the system will be. Generally larger input files will take longer to run. Dose runs take considerably longer because of the extra work to lookup the rate from the exposure file and to calculate the dose. You may choose to have Verify exclude all gender/race combinations save one. Execution speed will improve if you remove unwanted records prior to Verify.

A PC LTAS run using PMR (proportionate mortality ratio) only analyzes dead workers.

This will run faster if the input data has the living workers removed from the demographic and work history files.

PC LTAS depends on clean data for accurate results. Workers and work histories are thrown out for some kinds of errors. Use the error messages in the output files from **Verify** step to correct the data. Errors are shown in the exceptions report (except.rpt). Correct the input data and run **Verify** step again. Correcting the input data before rerunning **Verify** will speed execution.

Verify cannot use overlapping work histories. However, it will accept a one day overlap, ignoring the first day of the second record of the overlapping histories. If a worker has overlapping work histories, you must correct the data before running LTAS to insure accurate results.

Verify and **Stratify** steps have a progress report window showing how many input records have been processed. It is helpful to know the number of worker demographic records in the input file so that you can judge how far the program has completed. For the **Stratify** step it is useful to get the total number of accepted workers from the summary.rpt from **Verify** step.

The **Analyze** step allows the selection of up to fifty major and minor disease categories for analysis, within the limits of memory. Choosing fewer combinations of gender/race and disease category will require fewer resources and execute faster. There are four reports to select from; selecting fewer reports speeds execution. Sending output to a file is much faster than sending the output to a printer.

4.0 How to Run a Life Table Analysis

This chapter describes the main menu and the needed files. The main program steps each have their own chapter. The **Verify** step is described in chapter 5. The **Stratify** step is described in chapter 6. The **Analyze** step is described in chapter 7. The **Utilize** step is described in chapter 8. Chapter 9 is an alphabetical list of the options selected by the user.

4.1 Required Files

4.1.1 The Study Files

Two user-created ASCII Study Files (the **demographics** and **work history** files) are required for every PC LTAS run. In addition, a third Study File (the **exposure** file) is required unless all exposed jobs/departments are assumed to be exposed equally (typically when job-specific levels of exposure are not available). The study files describe each subject in the study. These files are described in more detail below.

IMPORTANT: LTAS must sequentially match records from the demographics, work history and personal exposure files, therefore both these files must be sorted by ascending SSN (social security number or similar worker identification). The work history and exposure files should be sorted by begin date within SSN. The SSN field should be padded with leading zeros so that these files can be matched properly. SSN fields are compared as character strings instead of numbers.

4.1.1.1 The **demographics file** contains information about the worker such as gender, race, vital status, and cause of death. Table 1 and Figure 2 detail the records contained in the demographics file.

Table 4-1: Summary of Demographics File[$]

Field Name	Alternate Names	Required ?	Type	Len	Location
SSN or other ID		Yes	character	9	1 - 9
Last name		No	character	20	10 - 29
Gender	sex	Yes	numeric	1	30
Race		Yes	numeric	1	31
Vital Status	status, VS	Yes	numeric	1	32
Date of Birth	DOB	Yes	numeric	8	33 - 40
PY Begin Date		Conditional*	numeric	8	41 - 48
Date Last Observed	DLO	Conditional@	numeric	8	49 - 56
Date of Death	DOD	Conditional#	numeric	8	57 - 64
Underlying Cause of Death	UCOD	No	character	4	65 - 68
Contributing Cause of Death	CCOD	No	character	4	69 - 72, 73 - 76, 77 - 80, 81 - 84, 85 - 88, 89 - 92, 93 - 96, 97 -100, 101- 104, 105- 108

[$]See Appendix D for additional information.
*Required only when the user desires to specify a unique person years begin date for each worker.
[@]Required only when the DLO option is used (as opposed to the study end date).
[#]Required only when the subject is deceased.

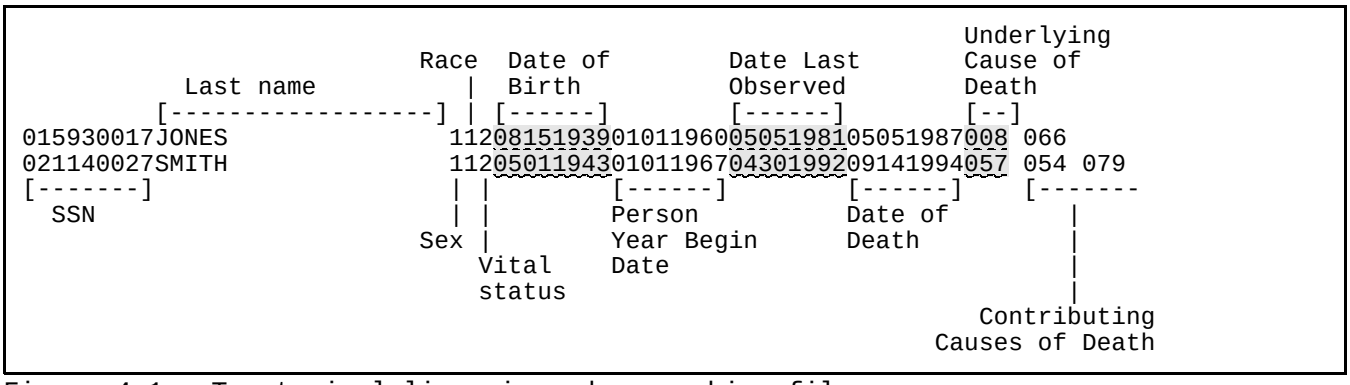

Figure 4.1. Two typical lines in a demographics file.

4.1.1.2 The **work history file** lists each worker's relevant jobs. Each subject must be represented by at least one record. Multiple jobs for the same worker require one record for each job for that worker. Each work history record includes an SSN, a begin date, and an end date. For studies using personal exposure files (see Section 4.1.1.3) or duration of employment with no exposure file, no other data are required. For studies with (1) area exposure files or (2) duration of exposure runs without an exposure file but with specification of exposure only in certain plant/department/operation combinations, each work history must include at least plant, and usually will also include department or department and operation. Work history records are detailed in Table 2 and Figure 4.2. Plant, department, and operation

fields will be ignored for duration of exposure runs or runs with personal exposure files.

Table 4-2: Summary of Work History File[$]

Field Name	Required ?	Additional Attributes	Len	Location
SSN or other worker ID	Yes	character	9	1 - 9
WH Begin Date	Yes	numeric	8	10 - 17
WH End Date	Yes	numeric	8	18 - 25
Plant	Conditional[*&]	character	2	26 - 27
Department	Conditional[*&]	character	5	28 - 32
Operation	Conditional[*&]	character	5	33 - 37

[$]See Appendix E for additional information.
*Can be user-created if necessary.
[&]Some combination of plant/ department/ operation is required if an area exposure file is used or if no exposure file is used but the user specifies that only certain plant/ department/ operations combination are exposed. See Appendix E for details.

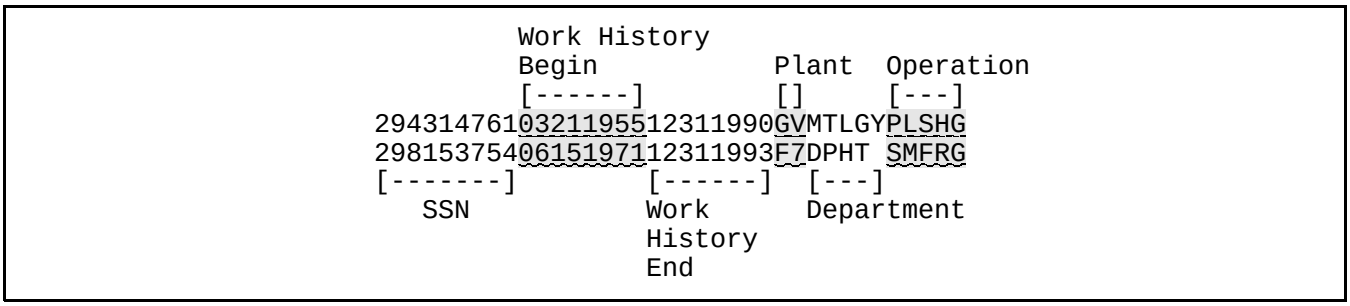

Figure 4.2. Two typical lines in a work history file.

4.1.1.3 The **exposure file** (See Table 3 and Figure 4.3 Figure 4.4) lists exposure levels per day. The exposure file is optional. There are two cases in which an exposure file is not needed: (1) all plant/ department/ operation combinations are exposed equally (exposure level not known), or (2) only some plant/ department/ operation combinations are exposed but again they are considered exposed equally at an unspecified level. Both of these cases lead to a duration of exposure run in which LTAS calculates cumulative duration instead of actual cumulative level of exposure.

If an exposure file is used and contains valid exposure information, then the Life Table run is called an exposure run. In an exposure run, the exposure levels of the various subjects (personal exposure) or jobs (area exposure) are assumed to vary over time, between jobs, or between people, and the exposure information is read from the exposure file. Each person-day at risk is assigned an exposure level and is also assigned to a cumulative level of exposure category. The plant, department, and operation fields in the work history file are used to look up the exposure level in the exposure file.

If no exposure file is used then the Life Table run is called a duration run. (See also “default exposure level” in chapter 9, “Options Selected by the User,”) In a duration run the cumulative duration, rather than cumulative level of exposure, is calculated for each person-day.

Table 4-3: Summary of Exposure File[$]

Field Name	Required ?	Type	Length	Location
Exposure Begin Date	Yes	numeric	8	1 - 8
Exposure End Date	Yes	numeric	8	9 - 16
Exposure Level	Yes	numeric	10	17 - 26
SSN	Conditional.[#]	character	9	27 - 35
Plant	Conditional.[@]	character	2	36 - 37
Department	Conditional.[@]	character	5	38 - 42
Operation	Conditional.[@]	character	5	43 - 47

[$]See Appendix F for additional information.
[#]Required for personal exposure
[@]Some combination of Plant/Department/Operation is required if an area exposure file is used. See Appendix F for details.

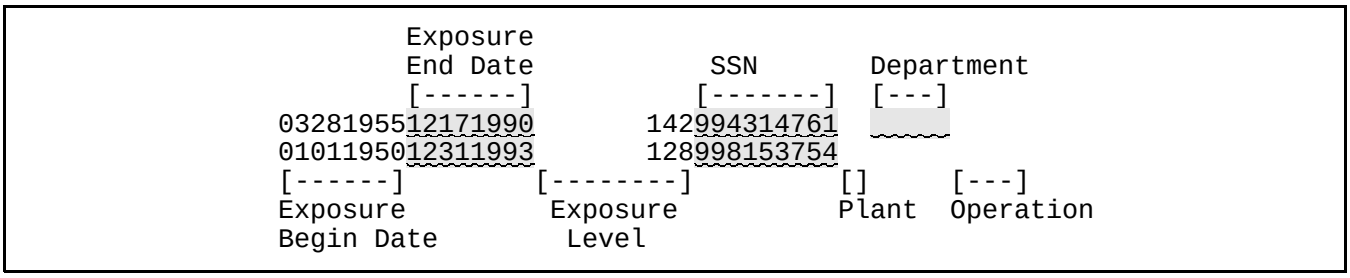

Figure 4.3. Two typical lines in a personal exposure file.

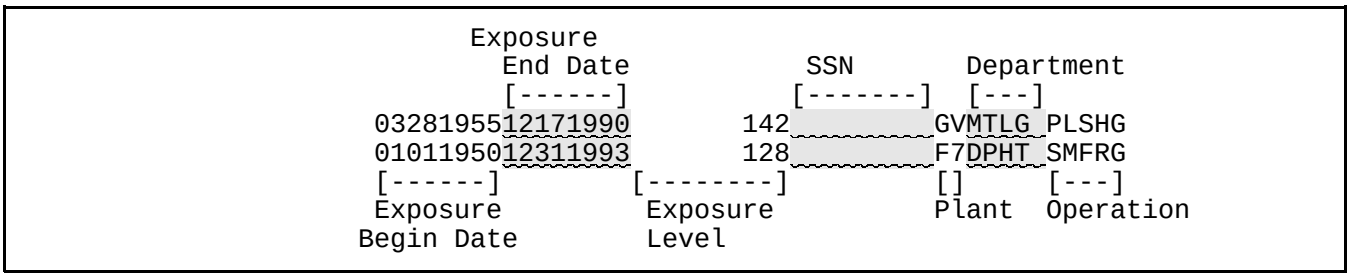

Figure 4.4. Two typical lines in an area exposure file.

The study files are summarized in Table 1, Table 2, and Table 3. In these tables, required and optional field names are identified and described, and the required input formats are noted. Any workers who are missing required information are excluded from the analysis. Typical input lines for each file are shown with labeled fields in Figures 2, 3, 4, and 5. Additional information concerning the fields in the study files, including their definitions and input rules, is available in Appendices D, E, and F.

4.1.2 The Mortality Files

The **mortality** (or incidence) files are required. These files contain the rates or proportions for the U.S. nonexposed referent population, and are used in determining expected values for cause-specific deaths in the cohort under study. PC LTAS provides mortality rate files that represent US national underlying cause death rates beginning in 1940 and ending with the latest rates available for the NIOSH 92 death categories. Also included are expanded underlying cause rates (99 categories) for 1960-1995, US multiple cause rates for 1960-1995 (92 categories), and SEER Cancer Incidence Rates for 1970-1995 (37 categories). Proportion files for use with PMR runs are given for NIOSH 92, NIOSH 99 and multiple cause.

There are four types of mortality files: the rate file (or rate description file), the rate data file which consists of a data file and its index file, and the ICD structure file. These files are described in the following paragraphs. The user can alter the rate and structure files. The rate data files cannot be changed directly. See Appendix I for information on how to use the “BLDRATE.EXE” utility to create a new rate data file.

The **rate file** (or rate description file) is an ASCII text file that describes the rate data file and ICD file. It has a “.RDF” file extension. It has two principal sections. The"header" records describe the rate data file associated with the rate file, the labels for races and genders, and the cut points for the calendar periods and age categories. The title records list the titles of the major and minor categories. (Each major category is a unique grouping of one or more minors; i.e., no minor is in more than one major.) The default rate file is listed in Appendix H. At the top of the file are comment lines which specify the rules and options for building a rate file along with information on how the user can modify this file for his or her specific needs.

The **rate data file** actually consists of two binary files. The data file has a “.dat” file extension. The index file has an “.IDX” file extension. These files must correspond to the ICD structure file. The data file contains the death rates corresponding to the various cause-of-death categories. The index file specifies the location in the data file of mortality rates corresponding to the various race/sex/age/year categories. It enables fast retrieval of the information in the data file.

The default rate file contains US national underlying cause death rates for the 92 minor cause-of-death categories (minors) used by NIOSH. Each of the supplied rates files contains rates for each of the death or incidence categories for two racial groups (white and non-white), two genders, fifteen five-year age categories (beginning with 15-19 and ending with 85+) and several five-year calendar periods from the first to the last year covered by the file.

Users can also supply their own rate data file with the “BLDRATE.EXE” program, which is run from the DOS command line instead from PC LTAS. Use of a different rate data file may require different rate (description) file (with the “*.RDF” extension) and ICD file. One source of rates is the WONDER system, which includes NIOSH-created US, state, and county rates for 92 death categories. The WONDER system is available through the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia. See Appendix I, “How to Create a Rate Data File” to create a non-standard rate file.

The expanded NIOSH rate file with 99 minors and corresponding rate data and structure files is included with PC LTAS. In this file, “melanoma” is has been split out from "skin cancer", “testicular cancer” has been split out from "cancer of male organs", “other pneumoconioses” have been split out from the category "other respiratory diseases", a category has been added for “HIV-related” disease beginning in 1987, a category has been added for “cardiomyopathy” beginning in 1968 (8th revision), and a category has been added for “conductive disorder” of the heart. There have also been two rearrangements. “Arteriosclerotic heart disease” has been taken from the category "other diseases of the heart" and added to “ischemic heart disease”, and the category "other neoplasms of lymphatic and hematopoietic tissue" has been reduced to "myeloma" with the remaining causes added to the old category of “lymphosarcoma” and “reticulosarcoma” to form a new combined category called "non-Hodgkin's lymphoma". Differences in ICD code groupings between the default rate file and the NIOSH 99 rate file are listed in detail in Appendix L.

The SEER Cancer Rate file with rate data and structure files is described in Appendix M. These are cancer incidence rates for 1970-1995.

A multiple-cause-of-death rate file also is supplied with PC LTAS. In this file all listings on the death certificate are counted in the numerator of the rates, while the population denominators remain the same as the usual underlying-cause-of-death rates. The same 92 categories of death are used as in the underlying-cause rate file, but the time period starts in 1960. Because on the average about 2.5 causes are listed on a

death certificate (including other significant conditions), the multiple cause rates are on the average 2.5 times higher than the usual rates underlying-cause rates, although the increase varies by cause. Multiple cause rates are useful for analyzing causes of death which are not usually underlying causes, such as diabetes, arthritis, and renal disease. When a multiple cause rate file is used, the demographic file must include all mentions of a cause on the death certificate. The ICD structure file is shared by single cause and multiple cause rate files. Additional information can be found in Steenland et al. [10] and Israel et al. [11]

The following rate files are included with LTAS. The years 1995 to 1999 are filled in with dummy data which are copies of 1990 to 1994 data. The race mapping used in these files is: white, Hispanic, and unknown map to white; and black, Oriental, Native American and other map to nonwhite.
Standard US 92 cause 1940-99 rates
Standard US 92 cause 1940-99 proportions
Multi-cause 92 cause 1960-99 rates
Multi-cause 92 cause 1960-99 proportions
99 cause 1960-99 rates
99 cause 1960-99 proportions
37 cause 1970-95 SEER Incidence Rates (cancer rates)

The **ICD structure file** has an ".ICD" file extension. ICD stands for International Classification of Disease. This file contains ICD codes and relates them to the information in the rate data file by specifying how the ICD codes are grouped into the various death categories. This information is used in conversion of ICD codes to NIOSH (or other) death categories. Appendix G shows how to the build an ICD structure file.

4.2 Using the Programs

This section contains instructions concerning keystrokes which apply to all of PC LTAS.

4.2.1 How do I choose one of the menu choices?

Commands are always executed by highlighting them and pressing "Enter." Highlight the command by moving the cursor with the arrow keys. In some cases where the arrow keys do not work use the tab and shift-tab keys. In many places you can type the highlighted letter of the desired choice.

4.2.2 Hints are visible on the status line on the bottom line.

Throughout the LTAS program look at the status line on the bottom line of the screen for a short message of what to do at the current field.

4.2.3 How do I move the cursor?

The cursor is shown by highlighting the field that it is on. Highlighting is shown by changing the colors of the field. The fields generally have a dark background with light letters. When the field is highlighted the background becomes light and the letters become dark.

The easiest way to move the LTAS cursor is to move the mouse cursor to a field and click the left mouse button. A mouse click always means pressing the left mouse button unless the directions specifically say to use the right mouse button. Clicking the mouse The mouse cursor is a rectangle which is the size of one character. It changes colors to be visible over any color. For example it is black when over light gray, orange when over blue, and cyan when over a red background.

The cursor may behave a little differently depending on which window and field the cursor is in. Generally use the arrow keys to move from one field to another. "Tab" and "Shift Tab" are sometimes necessary to move the cursor to where you want to go. "Home" and "End" keys sometimes move to the first and last fields in a window. At other times these keys move to the beginning and end of an input field.

"Down Arrow" or "Enter" key will move the cursor to the next field. "Escape" key will

toggle the cursor between the main menu and the parameters window. Sometimes you can type “Enter” key until the cursor passes through all the fields.

4.2.4. How do I stop the program if it is busy?

The Alt key and “x” will exit the separate program steps to return to the main menu. Alt x at the main menu will exit LTAS and return to the DOS prompt. You should wait until LTAS is done with a process before quitting.

If you really need to quit LTAS during processing, the following techniques will help. In some places Control key and Break key will end LTAS and exit to the DOS prompt. During processing of the **Verify** step, “Ctrl” (Control) key and “Break” key will stop both **Verify** and LTAS, and return control to the DOS prompt. The LTAS screen will not be cleared so this will look very confusing. Type “CLS” and the “enter” key to clear the DOS screen. The mouse cursor will still be active and the DOS cursor will be invisible. Correct this by briefly restarting LTAS and exiting so that LTAS can perform its normal shutdown activities.

The **Stratify** and **Analyze** steps are simpler to stop. “Ctrl Break” will bring up a confirmation message which asks “Abort?”. The three choices are “yes”, “no”, “cancel”. Choose “yes” to end **Stratify** and return to the main menu. Both “no” and “cancel” will resume processing where it left off. The screen will look messy, but will be normal when you return to the main menu after processing is complete.

4.2.5. How do I get online help?

You can enter the help system by choosing one of the choices on the main menu for Help, or by pressing the F1 key. F1 is function key 1. In most screens and fields, the F1 key will show context sensitive help for that screen or field. Help will be shown that is related to the screen or field where the cursor is. See section 4.6 for more information on help.

4.3 Program Steps for Creating a Life Table

4.3.1 Before you begin.

Before running a Life Table, the user must create the ASCII study files in accordance with Table 1, Table 2, and Table 3 in section 4.1, and Appendix D, Appendix E, and Appendix F.

To get to the LTAS main menu start at the DOS prompt. If you are using Microsoft Windows you will need to choose the icon for MS DOS. Change directory to the drive and directory where LTAS is installed. For this description it is assumed to be on drive "c:" in the directory "c:\LTAS\". Type "LTAS" and press enter to start the program. *(Note: If the name of a parameter file is added to this command line, LTAS will attempt to open this file immediately, eliminating the need to specifically request to open a project from within LTAS. For example:* **LTAS SAMPLES.LTP** *will instruct LTAS to open study file SAMPLES.LTP. Read on for a discussion of study parameters and parameter files.)*

As LTAS runs, the user is prompted for life table parameters. This information determines the bounds within which the study is conducted (for example, study begin date, study end date, etc.). Some of the Parameters apply to only one step in the Life Table run, and others apply to all steps. When a command on the PC LTAS menu screen is executed, the user is prompted for the Parameters which are relevant to that command but have not yet been specified. As Parameters are specified by the user, those to be used in subsequent steps are stored in the Parameter file, which has a *.ltp* extension. Descriptions of the Life Table parameters can be found in chapter 10.

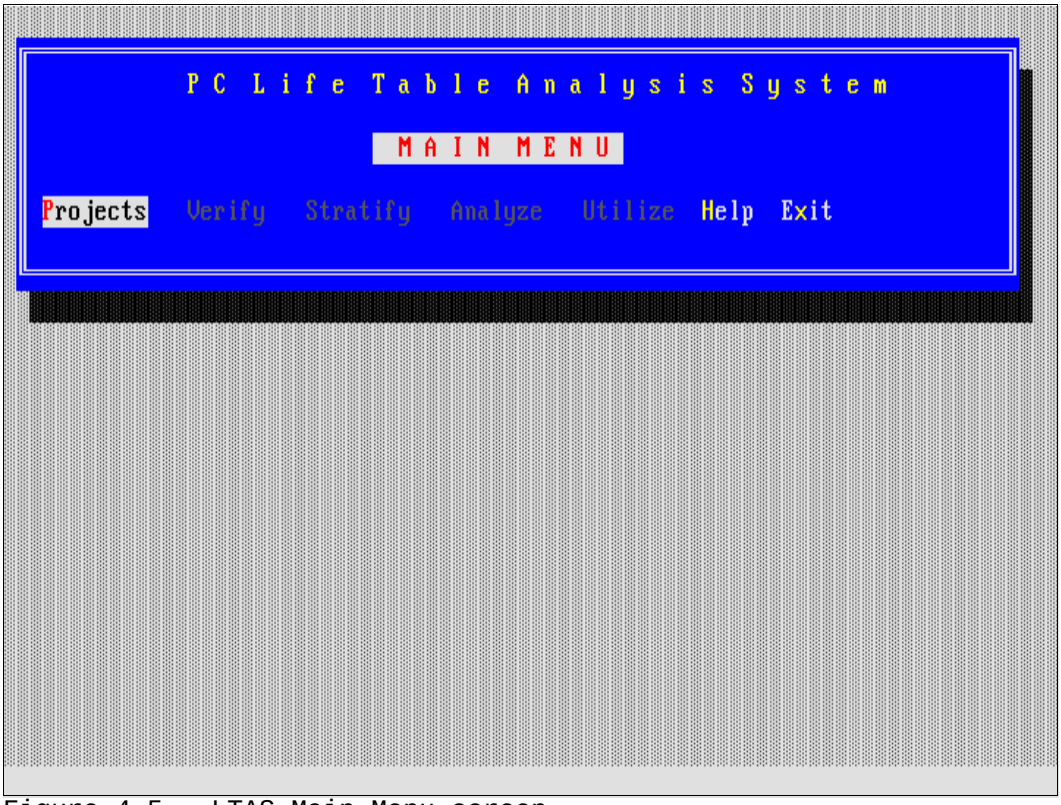

Figure 4.5. LTAS Main Menu screen.

4.3.2 Appearance of the Main Menu.

When the system is started, the user is presented with a Main Menu screen containing seven steps (see Figure 4.5). **Projects** is the highlighted choice when the program begins. Each choice has a one letter hot key. A deactivated step or command is dimmed

on the menu screen. When some steps, such as **Projects**, are selected, a pop-up menu appears with two or more commands (see Figure 4.6). The user runs the Life Table system by selecting these steps and executing the appropriate commands in the proper order. Proper order is ensured by deactivation of steps and commands that cannot be properly executed at a given time because required information (Parameters, for example) is missing.

Help can be chosen at any time when in the main menu. You may also press the F1 key to get context sensitive help. **Exit** ends the program, returning you to the DOS program. As you progress through LTAS more choices will become visible. These choices are generally chosen from left to right in sequence: **Projects**, **Verify**, **Stratify**, **Analyze**. As each step is finished the next step will become visible on the Main Menu. **Utilize** has some additional utilities which are not always needed for an LTAS run.

Verify, **Stratify**, **Analyze**, and **Utilize** are initially deactivated and are therefore dimmed on the screen. **Projects**, **Help**, and **Exit** are activated and are therefore highlighted on the screen. The cursor shows where it is at by changing the colors of the selection as in **Projects** in figure 4.5.

4.4 **Projects.**

Projects is where the user specifies initial parameters for an LTAS run. A pop-up menu (Figure 4.6) appears containing the following commands: Open, New, Save, Save As, Revert, and Print.

For a quick first run use “New”. After you have created one or more projects (study files) you can use “Open”. Both choices will show a second window on the screen for data input.

4.4.0 File selection window. See Figure 4.7 for a picture of the “Select Study Parameters File” window with an existing project highlighted. This window is used in several places in LTAS for selecting a file. It is first seen in Projects for “Open” and “Save As”. Two boxes are inside this window.

4.4.1 **Open. Open** is used to open an existing project file. A pop-up window (Figure 4.7) appears, showing a list of filenames on the left and a list of directories on the right. Use the mouse to double-click on the project file. To see further down on the list, move the mouse cursor to the left box with the file names, then use the down arrow or page down key to see the other files.

When the cursor is in the file selection window, typing the first letter of the file name will toggle through all of the files which begin with that same letter. When the cursor is on your choice of file name, press the “Enter” key to select it.

If you need to choose another directory, type the full path to the directory in the dir field, and then type “*.ltp” in the file field. Another way to choose the directory is to double click on the directory name on the right side of the file selection window.
The “..” directory is the parent directory, one level up from the current directory.

If you do not have a mouse, you can type the name of the directory in the “Dir” field, and the file in the “File” field. Select the “OK” button with the “end” key, and press “enter.”

You can also use the “tab”, “shift” + “tab”, and arrow keys to move the cursor.

After a file is selected, a new Project Parameters window pops up (Figure 4.8). See section 4.5.

4.4.2 **New. New** This command is used to create a new Parameter file. When **New** is executed, a pop-up window appears containing blank fields for the following Parameters: **Study Description** (free text up to 60 characters), **Rate File**, **Study Begin Date**, and

Study End Date. (This window is identical to that shown in Figure 4.8 except that the Parameter fields here are blank.) The user enters the required information and presses the "Enter" key. At this point, the user must save the Parameters in a new Parameter file by means of the **Save As** command (see below).

4.4.3 **Save.** **Save** will save the current project to the Parameter file most recently opened.

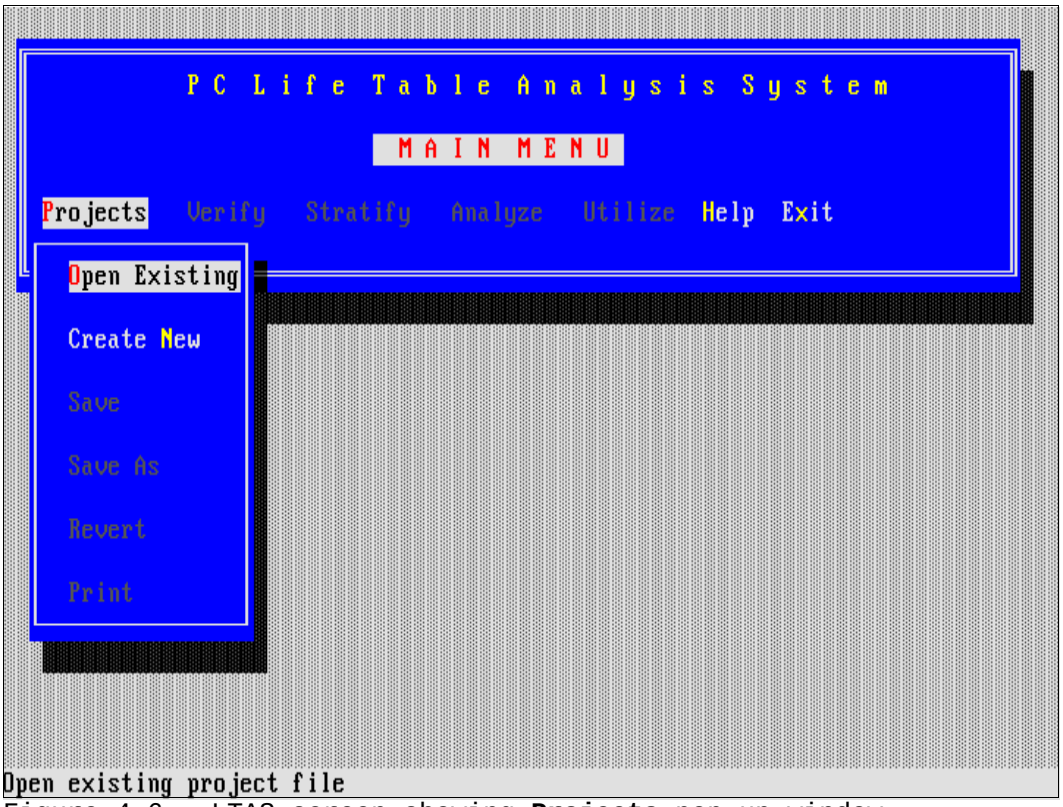

Figure 4.6. LTAS screen showing **Projects** pop-up window.

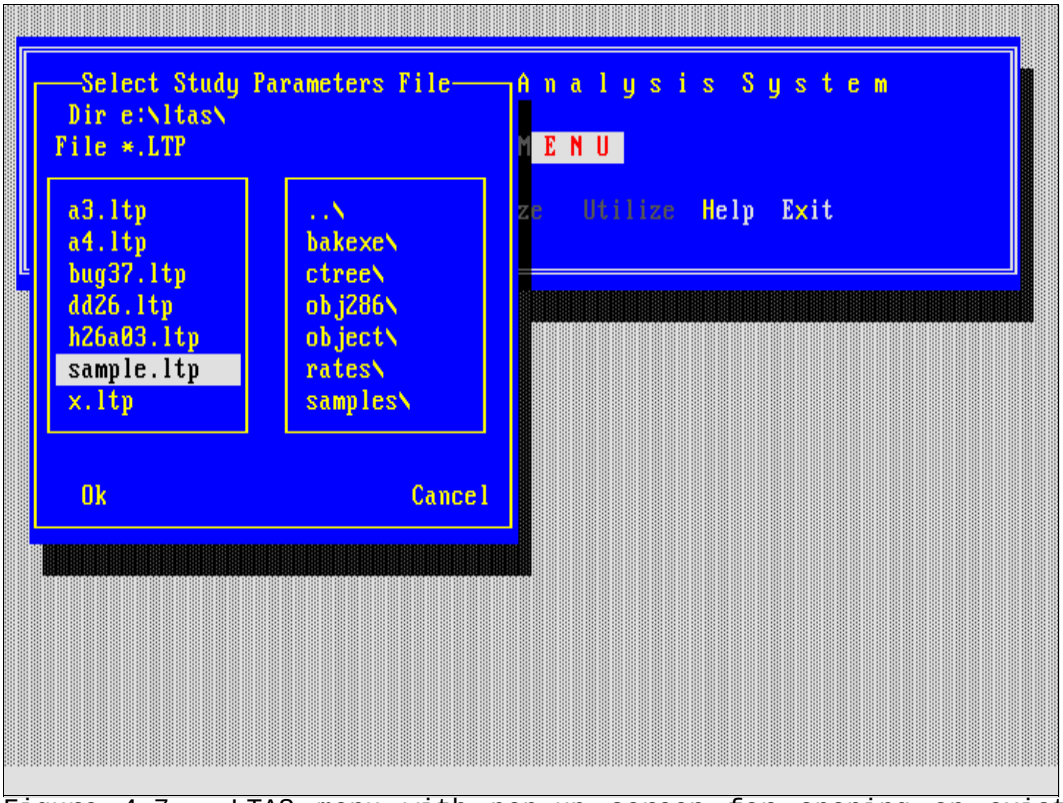

Figure 4.7. LTAS menu with pop-up screen for opening an existing project (Parameter) file.

4.4.4 **Save As.** **Save As** saves the current project to a new Parameter file. NOTE: You can make a copy of an existing LTAS parameters file by giving it a different name with "Save As".

4.4.5 **Revert.** **Revert** rereads the project file. All changes made to a project since it was last saved are ignored. It is too late to use "Revert" to undo changes which are already saved.

4.4.6 **Print.** **Print** will send the contents of the parameters file to the printer.

4.5 Project Parameters input screen.

This window contains four Parameter input fields: **Study Description**, **Rate File**, **Study Begin Date**, and **Study End Date**. You can accept or change the initial values displayed for these Parameters. Return to the Main Menu by pressing the "Esc" key, and save these parameters to a file with "Project: Save" (section 4.4.3).

If you try to start **Verify** without saving the file you will see a red dialog box with white text saying "Study parameters have changed. Save to <filename>? ". When you choose "ok" you see another red dialog box with the title "File Exists", "Overwrite existing file?".

4.5.1 **Study Description.** The description line is your area to describe what this study is. The status line says "Enter/edit study description (free text up to 60 characters)". 54 characters are visible on the screen. Typing the "End" key will make all 60 characters visible.

4.5.2 **Rate File.** Rate Files for nonexposed or referent population are chosen from a list. Press the space bar to see a list of available files. Use the "Down Arrow" and "Up Arrow" keys to move the cursor to the desired rate file. The most common is "Standard U.S. Deaths 92 Minors". "Enter" key will cause the highlighted title to be input into this field. See section 4.1.2 for a description of the rate files which come with PC LTAS. The choice of rate files depends on the type of study. Proportion

files must be chosen for PMR when only deaths are available. For cohorts with both living and dead, rate files must be chosen. For cohorts with deaths as endpoints, mortality rate files must be chosen . For cohorts with cancer incidence endpoints, SEER cancer incidence rates may be selected.

4.5.3 **Begin date.** Workers ending employment before this date will be excluded from the analysis. For many studies this may be set at a very early date prior to any of the work histories (such as 01/01/1900). This cannot be left blank. Enter the study begin date in “mm/dd/yyyy” format. Do not type the “/”. The slashes (virgules) are already in place. Single digit months are a little tricky. Use a zero or a space to fill in the first digit. Type “01011940" to get “01/01/1940" or type “ 1 11940" to get “ 1/ 1/1940".

4.5.4 **End date.** End date is the last date of the study, or end of follow-up. See **Begin Date**.

4.6 **Help**.

There are several choices under **Help**. Move the cursor with the arrow keys to your choice. Press “Enter” key to activate your selection. Another way to see help is to press the F1 key (function key 1). In most cases it will show context sensitive help. The other help topics are available by choosing the “Help Contents” button on the bottom of the screen.

Each help screen has buttons which are seen as red text instead of black. The cursor is always at the highlighted button, which is white text on a red background. Move the cursor to one of the buttons with the mouse cursor and click on it. Or if you are using the keyboard, use arrow keys to move the cursor. Press <Enter> to activate the button. This will show a different help screen or exit help. You can also move the cursor by typing the first letter of the text on the button. This will cycle through each of the buttons beginning with that same letter.

Help shows help on help.

Contents allows you find help by choosing a category. Each category shows a list of topics to choose from.

Navigation explains which keystrokes to use to move around in LTAS.

About shows the version number and the name and address of DSHEFS (Division of Surveillance, Hazard Evaluations, and Field Studies), 4676 Columbia Parkway, Cincinnati, OH 45226. Press “Enter” key to activate the “OK” button and remove the message box.

4.7 **Exit. Exit** will end the PC LTAS program.

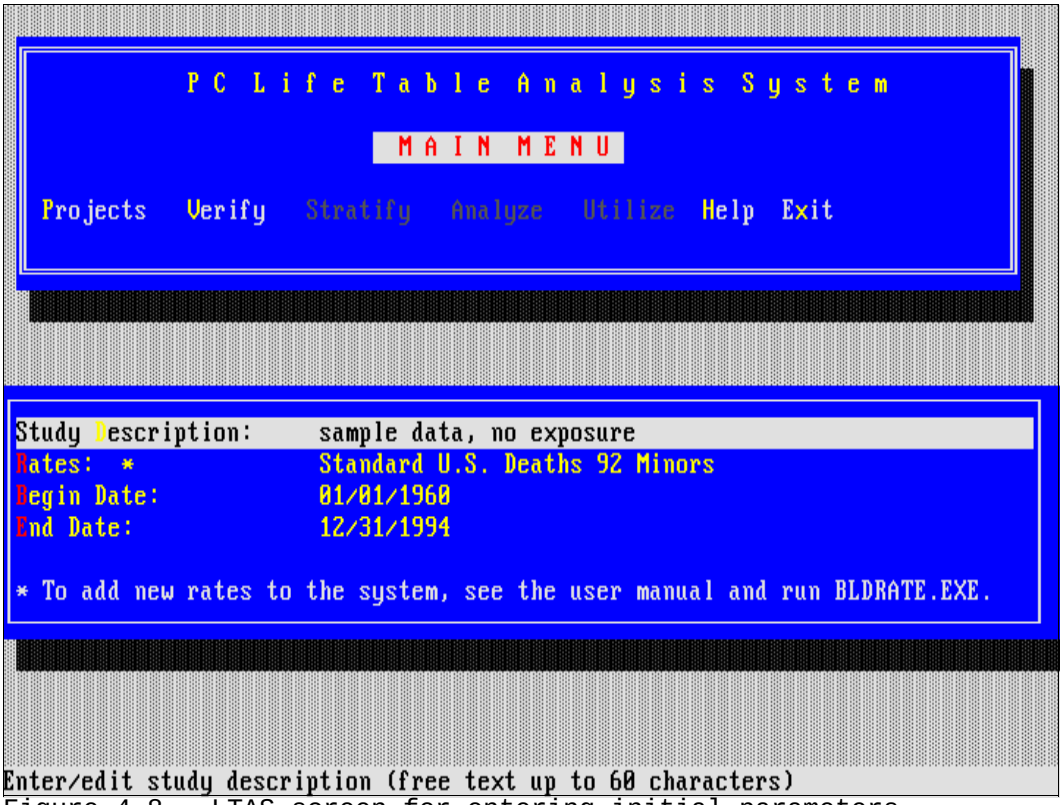

Figure 4.8. LTAS screen for entering initial parameters.

5.0 **Verify**.

In the **Verify** step the demographics and work history files are specified by the user and then inspected to verify that they contain valid information. These files are edited by PC LTAS as necessary, and the information is output to indexed files that the **Analyze** step can use. Any valid file name is acceptable for the input and output files.

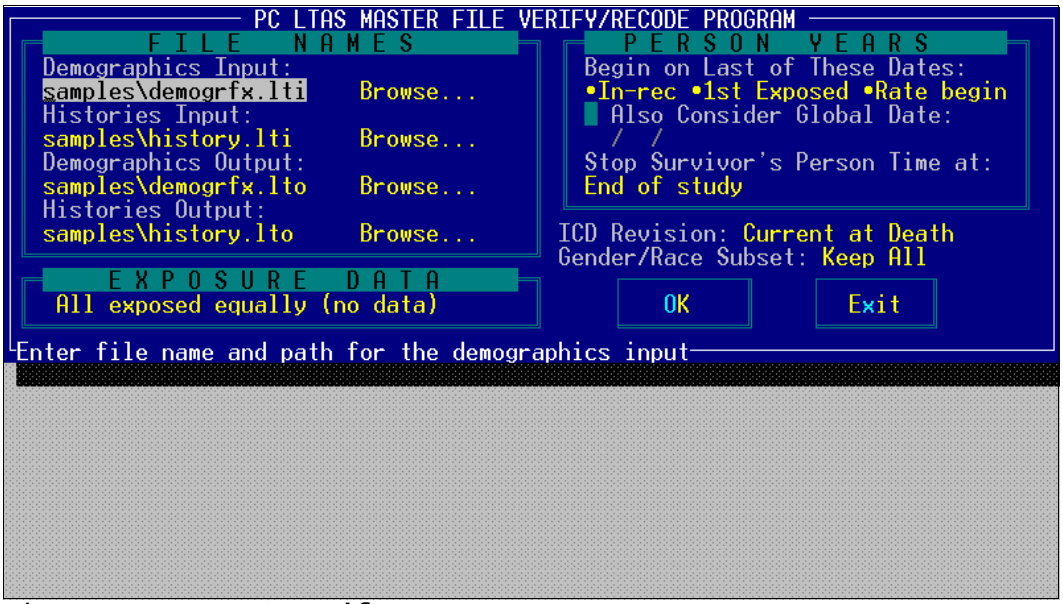

Figure 5.1. LTAS **Verify** screen.

Verify performs the following functions:

- **Verify** corrects certain errors in the demographics and work history files. It supplies default values for some missing information.

- **Verify** selects values for certain variables, such as **PY Begin** (section 5.0.6) and **Withdrawal Date** (section 5.0.5). When all errors can be corrected and all missing values can be supplied, the worker or work history is retained in the analysis. When the errors and omissions cannot all be corrected, the worker or work history is rejected and listed in the error report

- **Verify** reformats the input information in the demographics and work history files as needed by other LTAS programs. For example, **Verify** adds exposure information to the work histories in a new work history file.

- **Verify** converts ICD codes to NIOSH death categories.

- **Verify** generates reports containing a list of errors and corrective actions taken. (See section 5.2 below)

- **Verify** generates a summary report file called “Summary.rpt.” (Section 5.2.1). It lists summaries of the number of workers included and rejected, and categories of errors and corrections.

All the study files (the demographics file, the work history file, and the exposure file) and the Parameter file are read by **Verify**. These files are not changed by **Verify**. Up to six output files are generated: a new demographics file containing recoded demographics information; a new work history file containing recoded information from the input work history and exposure files; the summary report file “Summary.rpt" (section 5.2.1), and one or two error report files: “Except.rpt" (section 5.2.2) and“Experr.rpt" (section 5.2.3). These output files are all in ASCII format and

can be read or printed with a DOS text editor or a word processing package.

Technical details of **Verify** are listed in Appendix J.

5.1 Entering the parameters

When **Verify** is selected, a screen appears as shown in Figure 5.1. At the top of the screen is a screen title. To execute **Verify**, the user highlights each input line and supplies the required information. When all the information is entered, the user presses the "Enter" key. At this point, "Ok" is highlighted, and **Verify** begins running when the user selects presses "Enter" again. A progress report window shows the number of demographic records processed as **Verify** runs. When "Done!" is illuminated in the pop-up window, the user returns to the Main Menu screen by pressing "Enter."

This is the list of fields that you are asked to fill:

5.1.1 **Demographics Input** file name.
To use the file selection window, press the tab key to move to the “Browse...” button, then press “enter” key. See section 4.4.0 for help on using file selection windows. When the file selection window is closed you will see the file name on the screen.

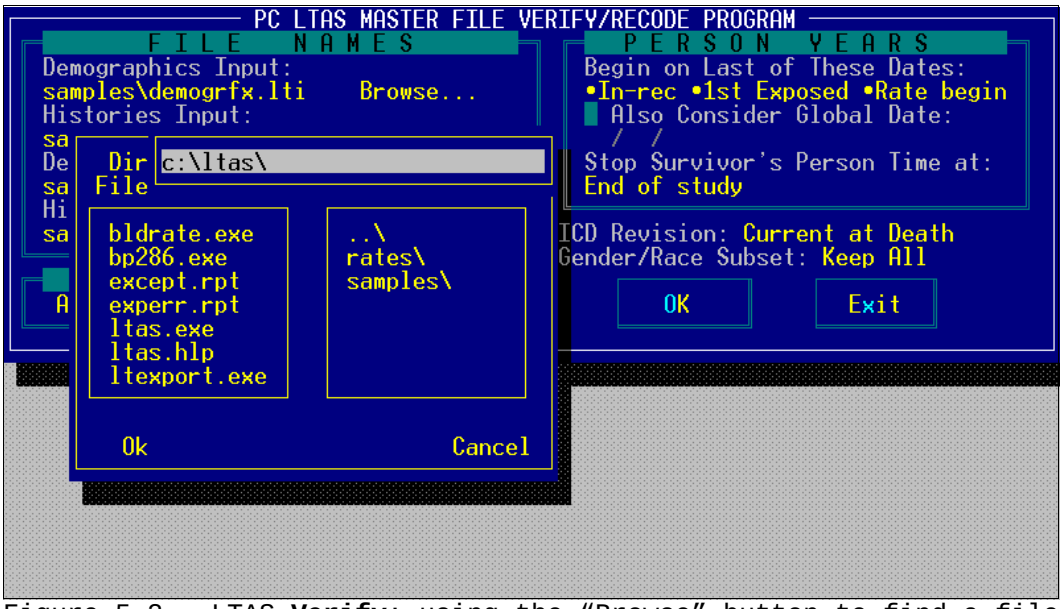

Figure 5.2. LTAS **Verify**: using the “Browse” button to find a file.

5.1.2. **Histories Input** file name. To use the file selection window, press the tab key to move to the “Browse...” button, then press “enter” key. See section 4.4.0 for help on using file selection windows.

5.1.3. **Demographics Output** file name. If this file already exists it will be overwritten with new data. To use the file selection window, press the tab key to move to the “Browse...” button, then press “enter” key. See section 4.4.0 for help on using file selection windows.

5.1.4. **Histories Output** file name. If this file already exists it will be overwritten with new data. To use the file selection window, press the tab key to move to the “Browse...” button, then press “enter” key. See section 4.4.0 for help on using file selection windows.

5.1.5. **Stop Survivors' person time at** - Space bar toggles through “End of Study,” and “Earlier of DLO (Date Last Observed) & Study End.”

5.1.6. **Person Years Begin Dates -** Person years will begin on the latest date in the chosen list. Space bar cycles through “First Exposed, Rate Begin,” “Study Begin, First

Exposed, Rate Begin," "In-rec, 1ST Exposed, Rate Begin." "In-rec" means the person years begin date listed in the demographics file.

5.1.7. **Also Consider Global Date -** If this option is selected the date entered will be considered in addition to the other person years begin dates from the above selection. The latest of all these dates will be used to initiate person-time at risk. Workers whose date of death (or date last observed if using the DLO option) is earlier than this global date will be rejected from the study.

5.1.8. **ICD Revision -** LTAS translates the cause of death on the input demographics file from ICD code to NIOSH (or user-defined) minor. This can be accomplished by using the ICD revision in effect at the time of death, or by selecting a single revision to use for all deaths regardless of date. The default is "Current at time of death"; pressing the space bar cycles through all available revisions. See the PC LTAS manual, appendix K, "Relation between NIOSH death categories and International Classification of Disease groupings."

5.1.9. **Gender/Race Subset -** You can limit the data to one gender/race subset. Space bar cycles through a list from the rate file, and the default choice to "Keep All" of the data. This list is usually "male white," "male non-white," "female white," "female non-white."

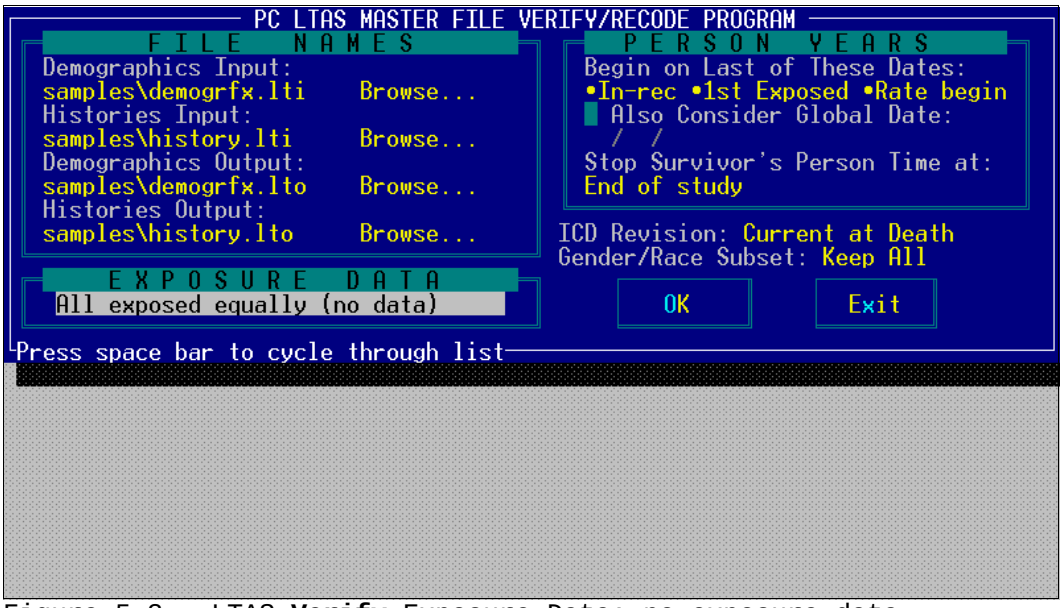

Figure 5.3. LTAS **Verify** Exposure Data: no exposure data.

5.1.10. **Exposure Data**. There are three options for exposure data. The input fields will change for these options.

5.1.10.1. **All Exposed Equally** (no exposure data). See Figure 5.3. Use this choice if this is a duration run, not an exposure run.

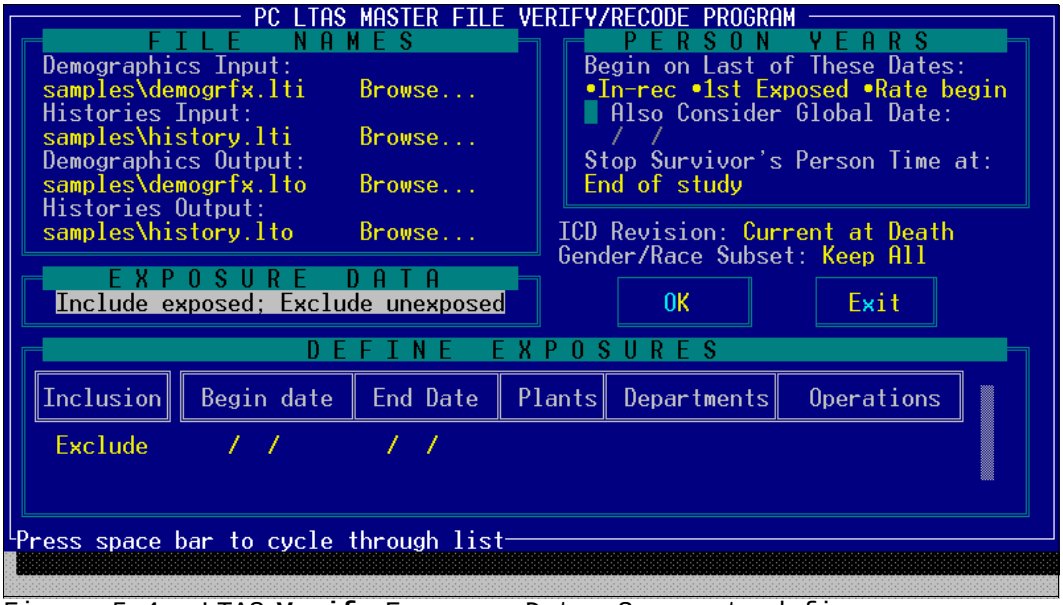

Figure 5.4. LTAS **Verify** Exposure Data: Screen to define exposures and to include or exclude plants, departments, operations. The include/exclude parameters are not input yet.

5.1.10.2. **Include exposed; Exclude unexposed**. See Figure 5.4. This choice allows you to list ranges of dates or ranges for exposed plant/ department/ operation combinations. No exposure file is used. This assumes that all exposed jobs are equally exposed but not all jobs are exposed. This results in a “duration” run. The entire list can be included or excluded but you cannot combine both include and exclude. For the "include" option you must specify which jobs (plant/ department/ operation) are exposed and when (begin and end dates). For the "exclude" option you may specify ranges of dates, ranges of plant/ department/ operation, or both dates and plant/ department/ operation. A blank field is treated as a wild card matching everything; e.g., if you list a plant, dept, and operation but no dates the plant/ dept/ operation is considered exposed throughout the study period.

Use <Alt> + <Insert> key combination to insert extra fields. Use <Alt> + <Delete> key combination to delete fields.

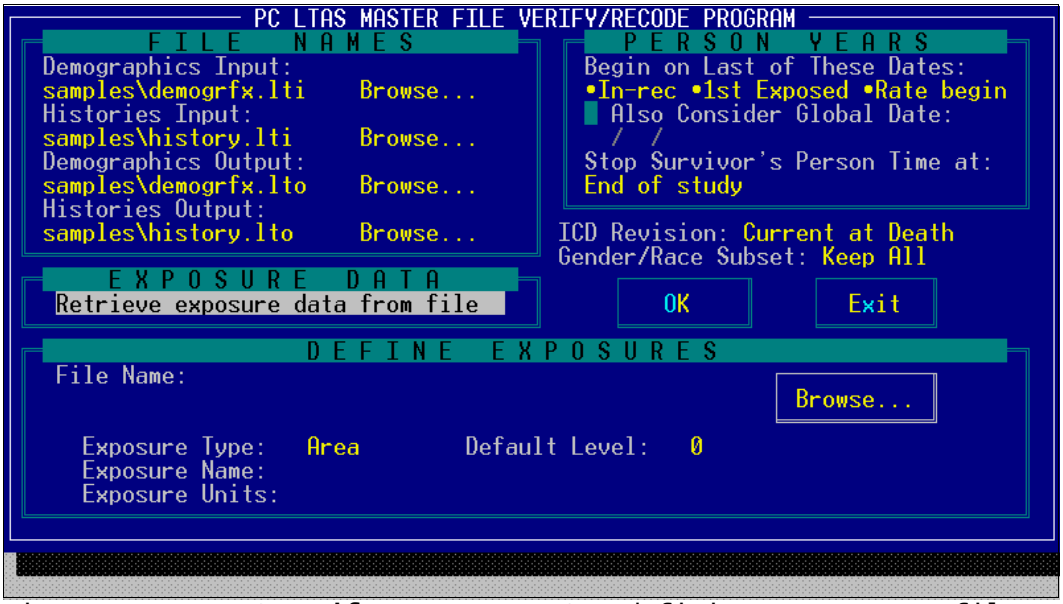

Figure 5.5. LTAS **Verify** Exposure Data: defining an exposure file. The exposure file name and default level are not input yet.

5.1.10.3. **Retrieve exposure data from file**. See Figure 5.5. With this choice an exposure file specifies level of exposure for specific workers or specifications.

Use the tab key to move the cursor onto the “Browse” button to select an exposure file. Use the arrow keys to move into the following input fields.

File Name - Enter the name of the exposure file. You may enter the name directly or use the “Browse” window to choose a file. Use the “tab” key to move the cursor to the “Browse...” button and press the “enter” key to open a file selection pop-up window. See section 5.1.1 for directions on how to use this window.

Exposure Type - Space bar toggles between “Personal” and “Area.”

Default Level - The default level is used when the worker or work area is not found in the exposure file. The default is zero if nothing else is entered. The level can be written in normal decimal form such as “3.781" or in e-notation such as “2.59e-5" or “4.2E2".

Exposure Name - Name of what kind of exposure. For example, smoking, or lead.

Exposure Units - Measurement units used for the exposure. For example, packs of cigarettes per day, grams per day.

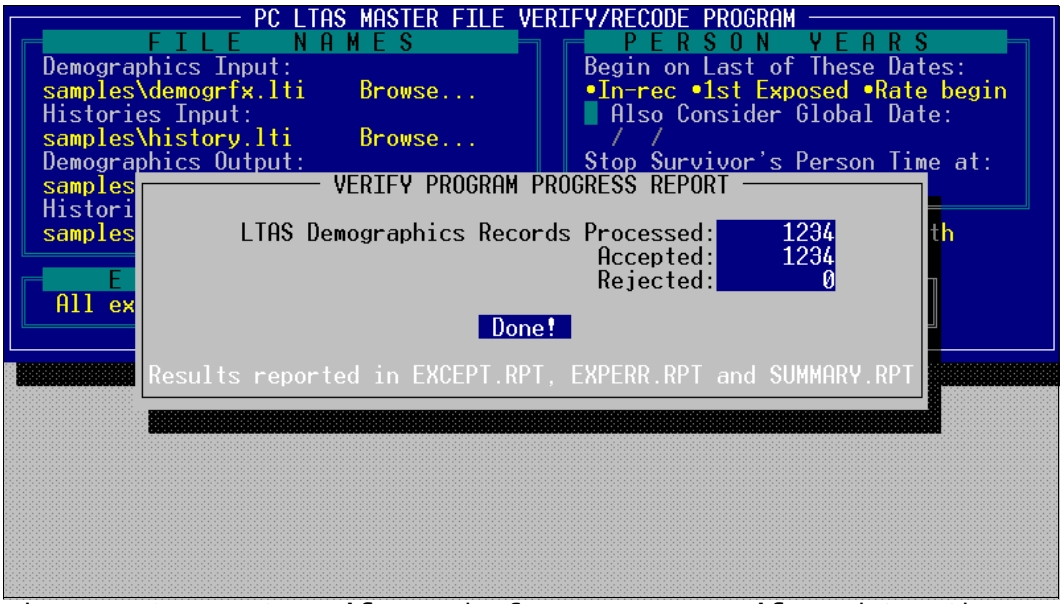

Figure 5.6. LTAS **Verify**: end of program. **Verify** updates the progress report window to show the number of demographics records processed, accepted and rejected. If the number of records accepted is suspiciously low, colors will change to alert you. Upon completion press the “enter” key to return to the main menu and run Stratify.

5.2 Reports created by **Verify**

Up to three reports are produced by **Verify** to show what was done:

5.2.1 “Summary.rpt is both a summary of the numbers of errors and a cohort status report.
It is always printed by a successful **Verify** run. It shows the number of worker and work history warnings and rejections for several categories (see Figure 5.7). The cohort status report is on the second page (see Figure 5.8). It shows the number of workers accepted and rejected for each gender/race combination, and for alive, dead, and unknown vital status.

5.2.2 “Except.rpt.” lists demographic and history file errors by worker number. The 'event' field can be “warning”, “worker rejection”, “worker correction”, “work history

rejection", or "work history correction". Worker rejections and corrections are done to the demographic file. Work history rejections and corrections are done to the history file. See Table 13 in Appendix J for a list of possible worker demographic and history error messages.

```
Date:  03/21/1996        PC LIFE TABLE ANALYSIS SYSTEM              Page:   1
Time:  16:49
                              Study File Processing
                           Study File:  e:\lt\sample.ltp


                                  File Edit Summary

# Workers:                                    # of Work Histories:

   4346  Input Demo File                      22925  Input WH File
      0  Rejected - Error                        67  Rejected - Worker Rejected
     67  Rejected - Non Error                     0  Rejected due to WH Error
   4279  Available for Analysis                   0  Rejected due to Study End
                                                  0  Not Used - Other
      9  Demo Data Warnings *                     0  With Warnings *
      0  WH Rejections *
      0  WH Warnings *                        22639  Available for Analysis



                            File Edit Detail Tabulation


# of Workers Rejected - Error:            # of Workers with Warnings *:

      0  Invalid Data for Req Field              0  Missing Day/Mon- DOB,DLO,DOD
      0  SSN not Unique                          7  Dead - Missing UCOD
      0  Field Values Inconsistent               0  DOD > Study End
      0  ICD Look-up Problem                     0  DLO > Study End **
      0  No WH Available                         0  No Rates for Age at PY Begin
      0  > 1 WH Have Errors                      0  Unknown VS
      0  Other WH problem                        2  Wkr > 100 Yrs Old
                                                 0  Default Exposure Used **
      0  # Wkrs Rejected - Error                 0  WH Rejects (excludes
                                                    non-exp)WH Warnings
                                                 0  WH Warnings

# of Workers Rejected - Non Error:        # of WHs Rejected:

     67  Did Not Meet Study Dates               67  Worker Rejection
      0  Gender/Race not Selected                0  Invalid data for Req Field
      0  PMR/PCMR run: Wkr Ineligible            0  Problem with Date Order
      0  Rates not Available                     0  WH Begin > Study End
      0  No Exposed WHs                          0  Other (excludes non-exp)

                                           # of WHs with Warnings:

     67  # Wkrs Rejected - Non Error             0  WH End > Study End


=========== NOTE: See Exceptions Report (except.rpt) for details. ===========

* of non-rejected workers.
** These warnings not detailed in Exceptions Report (except.rpt).
```

Figure 5.7. Summary.rpt file, first of two pages, summary of errors for workers and work histories.

5.2.3 "Experr.rpt" is a report of errors in the exposure file. See Table 14 in Appendix J for a list of possible exposure error messages.

Date: 03/21/1996 PC LIFE TABLE ANALYSIS SYSTEM Page: 2
Time: 16:49

Study File Processing
Study File: e:\lt\sample.ltp

Cohort Status

Gender	Race	Input Records		Rejected	Accepted
		n	% of ttl	n	n
MALE	WHITE	1336	31	22	1314
MALE	NON-WHITE	893	21	13	880
MALE	ALL	2229	51	35	2194
FEMALE	WHITE	1226	28	16	1210
FEMALE	NON-WHITE	891	21	16	875
FEMALE	ALL	2117	49	32	2085
ALL	WHITE	2562	59	38	2524
ALL	NON-WHITE	1784	41	29	1755
ALL	ALL	4346		67	4279

Vital Status					
ALIVE		3392	78	25	3367
DEAD		954	22	42	912
UNKNOWN		0	0	0	0
ALL		4346		67	4279

Figure 5.8. Summary.rpt file, second of two pages, summary of accepted and rejected by cohort.

Date: 03/21/1996 PC LIFE TABLE ANALYSIS SYSTEM Page: 1
Time: 16:49

Study File Processing
Study File: e:\lt\sample.ltp

Errors Listed by Worker

SSN	WH Begin	Event	Reason
900120000		Wkr Rejection	Study Begin exclusion
900390000		Warning	Dead - Missing UCOD
900850000		Warning	Dead - Missing UCOD
901920000		Warning	Dead - Missing UCOD
905230000		Warning	Dead - Missing UCOD
906240000		Warning	Dead - Missing UCOD
907650000		Warning	Worker > 100 yrs old
908140000		Warning	Dead - Missing UCOD
911560000		Wkr Rejection	Study Begin exclusion
913190000		Wkr Rejection	Study Begin exclusion
913390000		Wkr Rejection	Study Begin exclusion
913460000		Wkr Rejection	Study Begin exclusion
914250000		Wkr Rejection	Study Begin exclusion
915190000		Wkr Rejection	Study Begin exclusion
915680000		Wkr Rejection	Study Begin exclusion
915710000		Wkr Rejection	Study Begin exclusion
916340000		Wkr Rejection	Study Begin exclusion
916360000		Wkr Rejection	Study Begin exclusion
916390000		Wkr Rejection	Study Begin exclusion
916400000		Wkr Rejection	Study Begin exclusion
917060000		Wkr Rejection	Study Begin exclusion
917090000		Wkr Rejection	Study Begin exclusion

Figure 5.9. **Verify** exceptions report -- errors listed by worker number.

```
Date:  04/17/1996        PC LIFE TABLE ANALYSIS SYSTEM              Page:   1
Time:  16:02
                              Study File Processing
                            Study File:  e:\lt\sample.ltp

                               Exposure File Errors

Plant     Dept     Oper     Exp Begin     Error


   01        02       4001011900     Invalid Exp Level

   01        02       43             Invalid Exp Begin

   01        02       8801011900     Invalid Exp End

   01        07       8801011995     Exp Begin > Exp End

   01        40       4001011900     Exp End > Today

                        01011900     Missing plant
```

Figure 5.10. **Verify** report on errors in an exposure file.

6.0 **Stratify**

The **Stratify** step is used for assigning events (deaths and person years) to appropriate strata (age by calendar period, for example). **Stratify** calculates the number of person years and observed deaths according to the levels of stratification. The input files are the new versions of the demographics file and the work history file that the **Verify** step created. Two pairs of output files are created. One pair contains the observed deaths calculated for each stratum, and the other pair contains the corresponding values of calculated person years. One file of each pair has an “IDX” extension, and the other a “dat” extension: for example, “pyrs.idx” and “pyrs.dat.”

If **Stratify** rejects any workers it creates a list in a file called “REJECTS.xxx”. The “.xxx” represents a number such as “.001,” so that previous versions of the file are not overwritten. The only two possible causes for rejection are (1) failing to meet a required minimum duration or exposure level, (2) being unexposed entirely after a user has defined exposure. So this report is produced only when a minimum is specified and at least one worker does not meet that minimum. **Verify** already removes unexposed work histories workers before **Stratify**.

To stratify the data, enter the required information and chooses the "OK" button. A progress report window (Figure 6.2) shows the number of worker demographic and history records processed and the number of person years accumulated while the program is running. The "Done" button becomes more visible when stratification is complete. Return to the Main Menu by pressing "Enter."

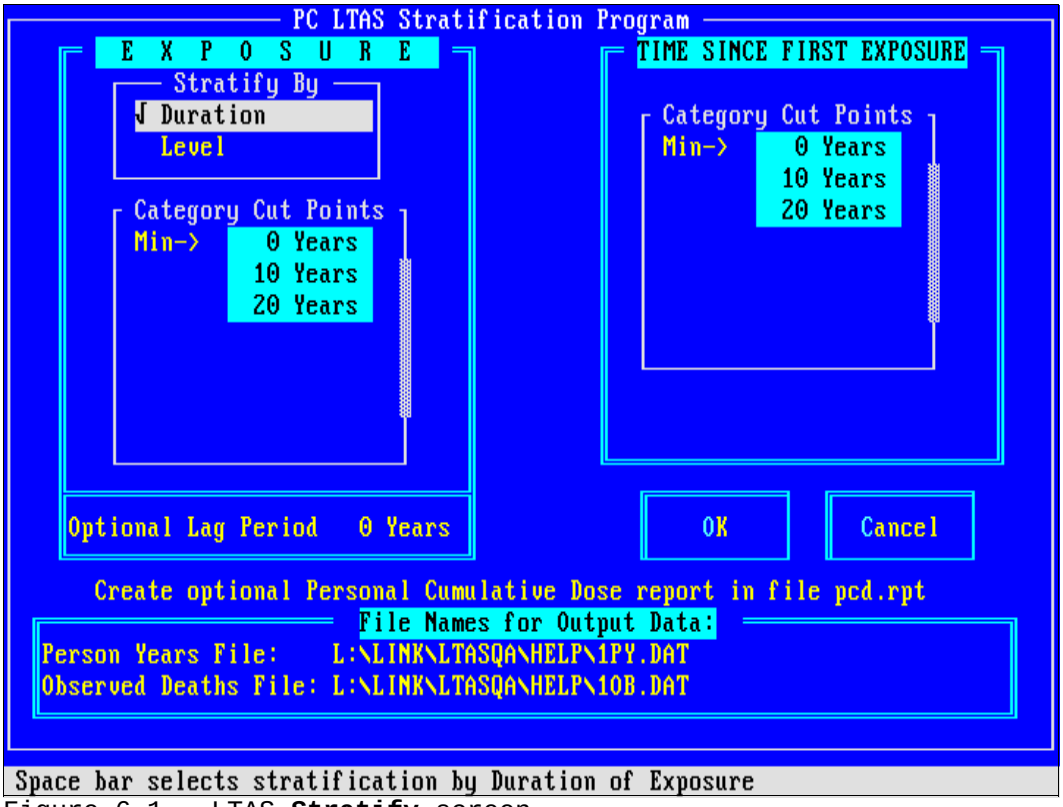

Figure 6.1. LTAS **Stratify** screen.

6.1 **Stratify** parameters

! **Stratify by** - “**Duration**” of exposure, or “**Level**” of exposure. Press the space bar to choose the selection at the cursor. A check mark will appear to the left of your choice.

! **Category Cut Points** - These are the borders of the duration or exposure strata. If “duration” run is chosen, the space bar cycles through the units (years, months,

days) for the field where the cursor is (Figure 6.1). If “level” run is chosen, the cut points are simply numbers (Figure 6.3). “Alt Insert” inserts a new field before the cursor. “Alt Delete” removes the field at the cursor, and the cursor moves to the next field. “Home” key moves the cursor to the first field. “End” key moves the cursor to the last field. The up and down arrows move through the fields. Put the values in increasing value. Otherwise you will get a red error box when you attempt to start **Stratify**. The error box says “**Exposure level specification error**,” or “**Duration specification error**,” or “**TSFE specification error**”. Press “Enter” key to remove the error box. Put the strata in valid ascending order and try again. Make sure that you did not accidentally change to smaller units.

The first cut point can be zero units or a nonzero minimum exposure can be entered.

! Default cut points for **Duration** - zero to thirty years by five year increments. These can be changed. For “**Level**” of exposure option there are no default cut points. If you are reusing a parameter file (with a “.ltp” extension) there might already be a list of levels of exposure from a previous run of PC LTAS.

! **Optional Lag Period** - The lag option ignores exposure for a specific time starting at the beginning of exposure. See section 2.1 “Lagging exposures”.

! **Create optional Personal Cumulative Dose report** - This option is often not needed. It creates a report suitable for importing into SAS or another program. It lists SSN, last name, total person days at risk, and total exposure. For duration runs the total exposure will be days of exposure. For exposure level runs the exposure will be the same as defined in the **Verify** step (See Figure 6.2).

Table 6-1: Summary of Personal Cumulative Dose report

Field name	start	stop	length
SSN	1	9	9
last name	11	30	20
person days	32	41	10
exposure	43	62	20

! Time Since First Exposure - These are the cut points of the TSFE strata (see Figure 6.3). See also “Category Cut Points” above for details on how to enter the cutpoints.

! Person Years File and **Observed Deaths File -** You can change the default names of the person years and observed deaths output files. The default names of the person years and observed deaths files are based on the output names used in the **Verify** program. The last two letters of the name will be “PY” for person years and “OB” for observed deaths. The file extensions must be “dat.” This option is not often needed.

SSN	last name	Personal Cumulative Dose person days at risk	cumulative exposure
655545555	KOGOLRMOBKOM	1099	123
655525555	RMABBASN	7256	195
655505555	SMENNOM	7634	90
655585555	RIRRBOJM	15782	7556
655565555	DUNRUBOMZ	7843	2912
655455555	RMERHOMGABB	8948	3389
655445555	KHEEGO	10156	642
655425555	SOMPALN	10885	6
655415555	WABDUMRHJM	10406	353
655495555	QIALRUB	14514	8080
655485555	TMOLLUL	6585	6018
655475555	RELGO	13429	3215
655355555	TOMGOMEL	15763	9353
655345555	RUTEM	14746	7289
655335555	UDTMENO	10688	2568
655315555	TIMREL	16904	3807
655305555	ENTEML	8370	306
655395555	POUMLOY	11521	6553
655385555	DCCUIBOY	4631	4037
655365555	TEYK	12214	6280

Figure 6.2. Personal Cumulative Dose report “pcd.rpt.”

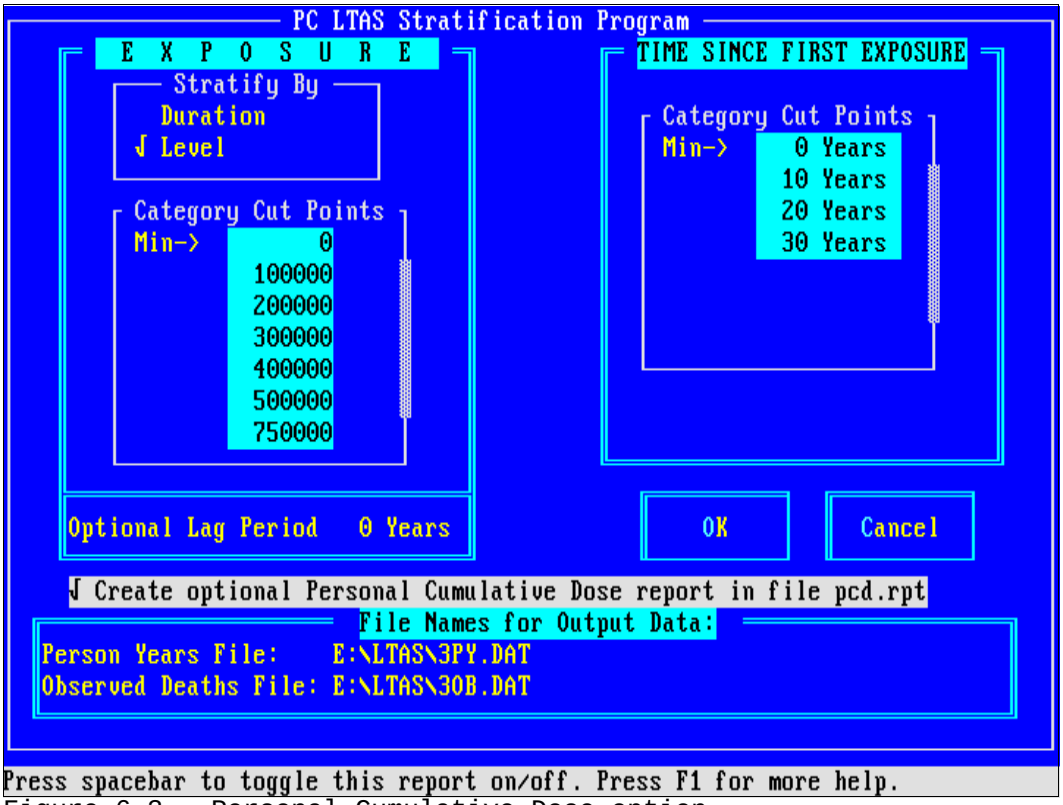

Figure 6.3. Personal Cumulative Dose option.

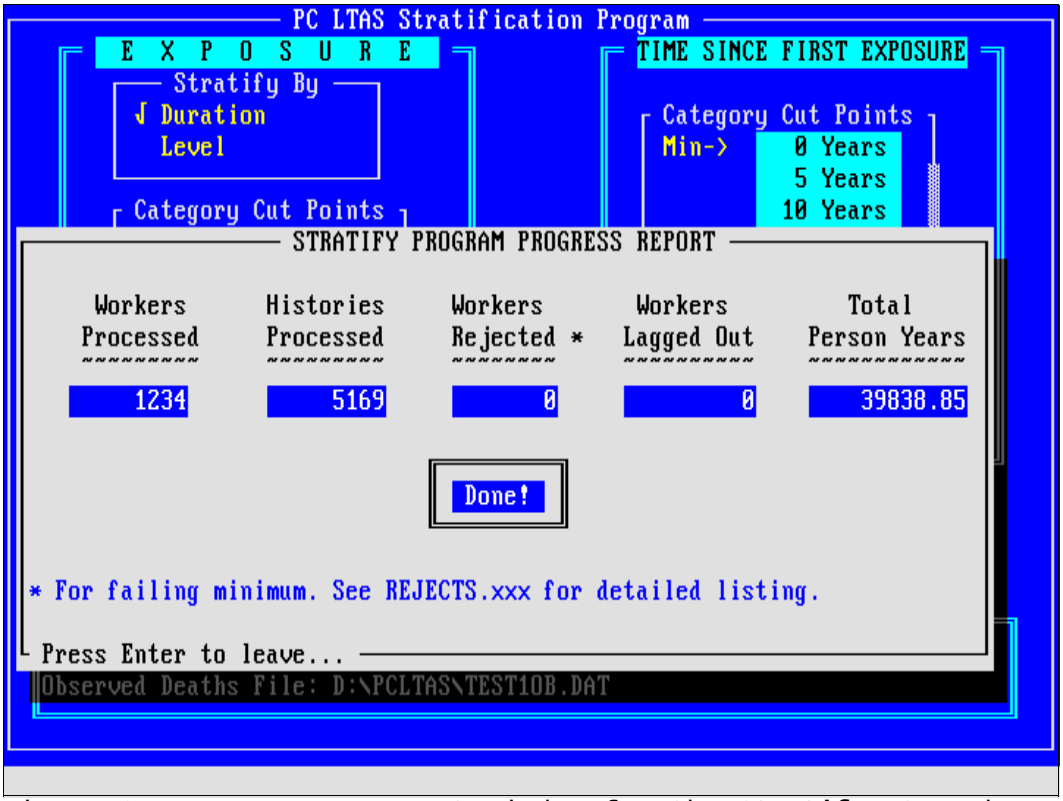

Figure 6.4. Progress report window for the **Stratify** step shows how far the processing has reached. When it is done, press “enter” key to return to the main menu and run **Analyze**.

7.0 **Analyze**

The **Analyze** step can be run after the **Stratify** step. It analyzes the data and prints a report. The **Analyze** screen (see Figure 7.1) contains report options, printing options, and the major and minor cause-of-death categories. Each major category is a unique grouping of one or more minors. No minor is in more than one major. The user can select options to customize a report.

Use the mouse or arrow keys to move the cursor through the choices. Use "Tab" key to move into and out of the list for "Select Major/Minors." See section 7.4 for directions on moving through the list of majors and minors. "Alt o" will move the cursor to the "Ok" button. "Escape" key or "Alt x" will move the cursor to the "Exit" button.

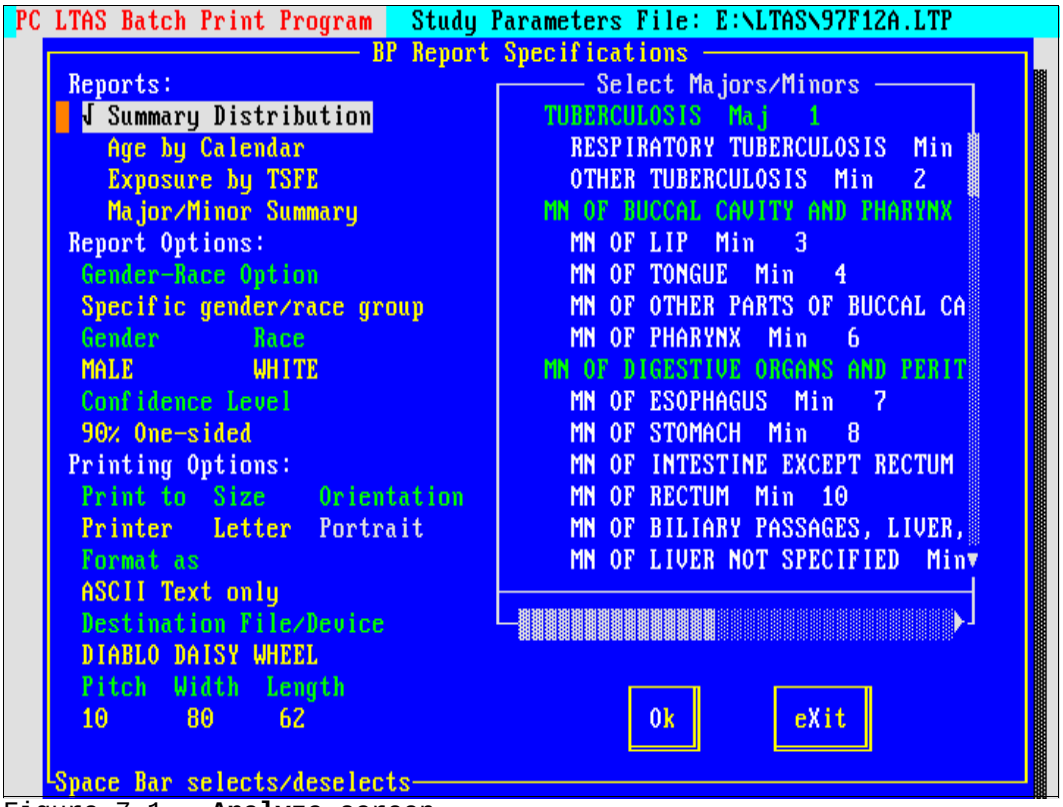

Figure 7.1. **Analyze** screen.

Analyze creates a report which can be sent directly to the printer or to a file. The user can produce variations of the report as wanted. For example, the user can select one or more minors for the "Age by Calendar" and "Exposure by TSFE" reports. Direct standardization is available for one or more minors chosen for the "Exposure by TSFE" report. When the report is complete, the user has the option of choosing another report. "Exit" ends **Analyze** and returns to the main menu.

Also, **Analyze** can be run again later as desired if the files from the **Stratify** step are not erased. However, if the parameters are changed in the parameters file for any of the earlier steps, then the data must be run through the **Stratify** step again before any additional printed reports can be obtained. This is a good reason to use a different project name when you change the study parameters.

NOTE: When the report is finished and control returns to this **Analyze** screen the cursor will still be on the "Ok" button. Accidentally pressing "Enter" will start the same report again. Move the cursor to the "Exit" button to return to the main menu, or choose another report.

7.1 Reports.

After the **Analyze** screen appears, the user can select any combination of four different types of reports. See the upper left of Figure 7.1.

! **Summary Person Years** -- prints two tables of distribution of person years by exposure or duration. The first table breaks down the person years by duration of exposure and TSFE (Figure 7.5). The second table breaks down the person years by age and calendar time (Figure 7.6).

! **Age by Calendar** -- prints a table of observed and expected by ages and calendar periods as seen in Figure 7.7. The left axis is five year age categories. The top axis is five year groupings such as 1940-1944, 1945-49, etc., plus a summary of the entire study.

! **Duration / Exposure by TSFE** (time since first exposed) -- prints a report that lists observed deaths, expected deaths, and standardized mortality ratios (SMRs) for each category by TSFE and duration of exposure or cumulative level of exposure -- see Figure 7.8. One table is printed for each major or minor chosen in “select majors/minors”, “unselected minors,” “all deaths,” and “all cancers.” The left axis is TSFE (time since first exposed). The top axis is duration of exposure for duration runs, or level of exposure for level runs.

If direct standardization option is chosen, an extra row will be added to the bottom of the table as in Figure 7.9.

If a lag is chosen in **Stratify**, there will be an extra box at the bottom of the chart for nonexposed (zero exposed) as in Figure 7.10.

! Major/Minor Summary -- prints a report summary of observed and expected deaths by each major and minor category as in Figure 7.11. This report lists total observed deaths, expected deaths, and SMRs (standardized mortality ratios) for all of the major and minor causes of death in the rates file.

7.2 Report Options.

The Report Options (see the top left of Figure 7.1, which the user can specify are the Gender/Race Option, Gender, Race, and the confidence level (and corresponding p-value for hypothesis test). The user can specify the following Printing Options: Print to file or printer, paper size, orientation, text/character format, file name, pitch, width, length.

! **Gender/Race Option** -- Three choices are available. “Specific gender/race group” will enable the gender and race fields. “All genders/races combined” and “Each + All” options will disable the gender and race fields.

! Confidence Level -- 90% and 95% confidence intervals are available.

7.3 Printing Options.

! **Print to** -- You may print to a file or you may print directly to the printer.
NOTE: When sending output to a printer, the Analyze step sends output directly to the printer port using the printer information stored in the LTAS file named PRINTERS.LT. This file contains codes to control the printer and identifies the port to which the printer is connected. As distributed, PRINTERS.LT contains information for Hewlett Packard LaserJet printers and a few dot-matrix printers connected to the LPT1 port. If you wish to use a different printer or print through a different port, see Appendix N to learn how to identify your printer to LTAS.

! **Size** -- When outputting to a printer, the user can select *letter* (8.5 x 11 inches), *legal* (8.5 x 14 inches), or *Big* (11 x 14 inches).

! **Orientation** -- The user can select *portrait* or *landscape* orientation. *Portrait* means the long side of the paper is vertical. *Landscape* means the long side of the paper is horizontal.

! **Format as** -- If "Text + char graphics" is selected, then the box drawing characters of the extended ASCII character set are used in printouts of *Exposure by TSFE* reports to produce boxes with smooth lines and corners. Otherwise, "ASCII Text Only" will make a less attractive output produced by using plus and minus signs to form the boxes. If the box drawing characters are not supported by the target device or font, the user must select the *text only* option.

! **Destination File/Device** -- If output is to a file, the file name must be specified. If destination is "Printer" you must specify what kind of printer you are using. Press the space bar to see a list of available printers as in figure 7.2. Use the up arrow and down arrow keys to move the cursor to the closest choice for a printer. If your printer is not on the list, choose a similar printer -- laser, dot matrix, daisy wheel. The choice of printer enables or disables some printer options. After choosing a printer you should review the choices you made for "Size," "Orientation," "Pitch," "Width," and "Length." They may have been changed while the cursor was in the printer choice field.

Note that HP Laser printer has two separate options for duplex (two-sided printing), one for binding on the short side (good for portrait) and one for binding on the long side (good for landscape).

! **Pitch** -- is the number of characters per inch. If output is to a printer, then the user may select 10 pitch, 12 pitch, or 17 pitch. More characters per inch will cause smaller letters, for example 10 pitch is often 12 point Courier font, 12 pitch is often 10 point Courier font.

! **Width** -- Choose the number of characters for the width of the page. The range will vary depending on the printer or print to file choice. Look at the status line (bottom of the screen) while the cursor is in this field for the minimum and maximum width values for your printer choice.

! **Length** -- Choose the number of lines for the page. When the cursor in this field, look at the status line for the minimum and maximum length values for your printer choice.

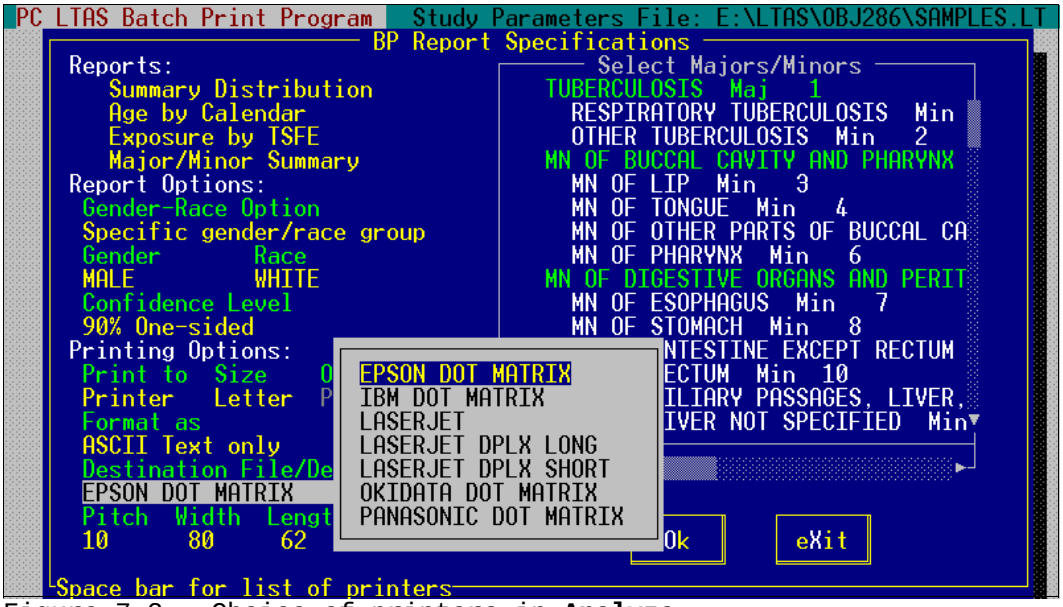

Figure 7.2. Choice of printers in **Analyze**.

7.4 Select Majors/Minors.

You can choose major and minor categories from those listed in the rates file. Each major or minor can be chosen as indirect standardization or direct standardization. Direct standardization gives all the same information as indirect standardization in the “Exposure by TSFE” report plus an extra row of SRR information at the bottom of the table and a Rothman Trend Test.

Use the “Tab” key to get into and get out of this list of majors and minors. Click on the triangles at the bottom and top of the scroll bar to scroll through the list. These triangles can be seen to the right of the majors/ minors list in Figure 7.3. You can drag the button (the light colored area on the scroll bar) by placing the mouse cursor on the button and holding down the left mouse button while moving the button down or up the scroll bar. This will move through the list.

If you do not have a mouse, use the arrow keys, “Page Down”, and “Page Up” keys to scroll through the list.

Indirect Standardization: Click on your selection with the mouse. If you do not have a mouse, Press space bar or “Enter” key to toggle a choice on or off. A check mark appears to mark your choice. The cursor moves to the next available choice. To select all of the majors and minors press the “Insert” key. To deselect all of the majors and minors press the “Delete” key.

Direct Standardization: Click on your selection with the right mouse button instead of the left. Or select with <Ctrl+X> . An “X” will appear to the left of your choice instead of the usual check mark. Figure 7.3 shows minor 16 chosen for direct standardization.

Some keystrokes are different in the major/minor list. Up and down arrows move through the choices. “Home” key moves to the top of the list. “End” key moves to the bottom of the list. “Page Down” and “Page Up” keys move one page (one full window). Another way to move down the list is to type the first letter of the name of the major or minor. You may need to type this letter often to go through all of the majors and minors which begin with the same letter. To move to the right in the current line you can use the right arrow key. The left arrow key will move left in the current line. The left and right arrow keys are sometimes needed to see the entire title of many majors and minors.

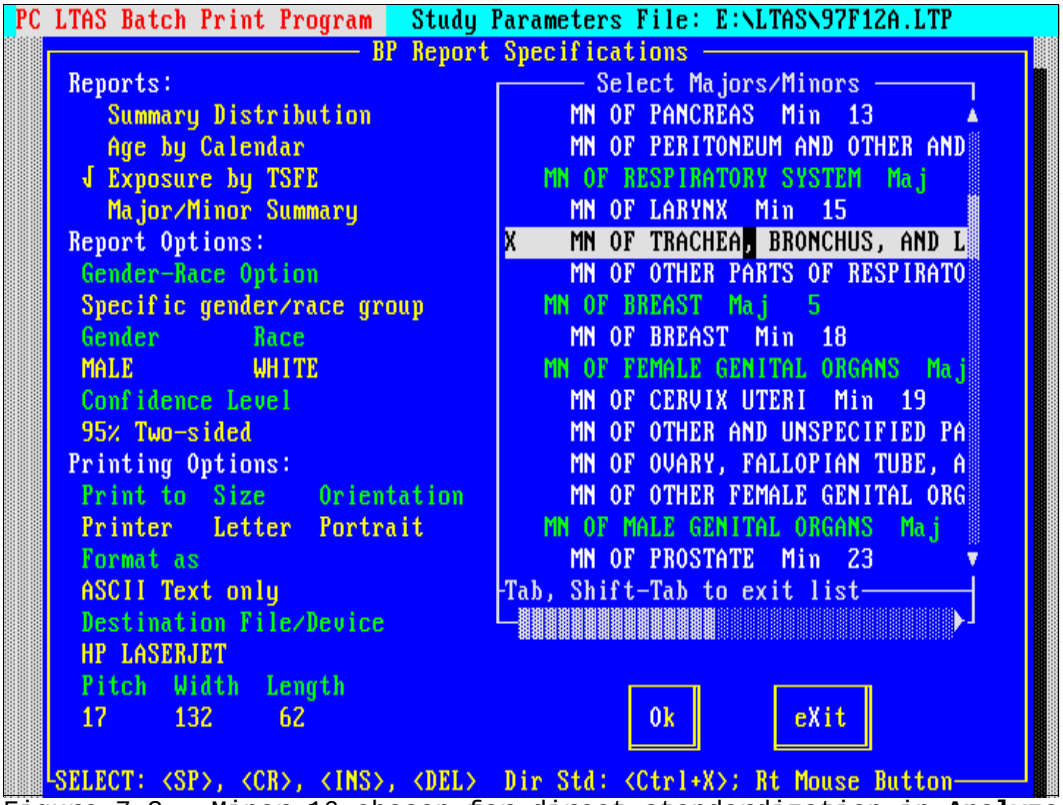

Figure 7.3. Minor 16 chosen for direct standardization in **Analyze**.

```
 Date:  6/16/1997            PC LIFE TABLE ANALYSIS SYSTEM           Page: 1
 Time: 16:06
================================================================================
                        G L O B A L   P A R A M E T E R S
LAST COMPLETE STEP: Stratify
STUDY DESCRIPTION: 97f03a =97e09b: hs1 smr dose updated data and program
STUDY BEGIN DATE: 01/01/1901
STUDY END DATE: 12/31/1990
RATES IN USE: Standard U.S. Deaths 92 Minors
AGE CATEGORIES: 15\20\25\30\35\40\45\50\55\60\65\70\75\80\85\
CALENDAR CATEGORIES: 1940\1945\1950\1955\1960\1965\1970\1975\1980\1985\1990\
SINGLE CAUSE OF DEATH
================================================================================
                        V E R I F Y   P A R A M E T E R S
INPUT DEMOGRAPHICS FILE: e:\ltas\hs1d4.lti
INPUT WORK HISTORY FILE: e:\ltas\hs1h2.lti
OUTPUT DEMOGRAPHICS FILE: hsd.dem
OUTPUT WORK HISTORY FILE: hsd.hst
BEGIN PERSON TIME AT LATER OF In-rec / Rate begin
STOP SURVIVORS PERSON TIME AT: END OF STUDY
GENDER/RACE SUBSETTING: FEMALE  NON-WHITE

EXPOSURE LEVEL FILE NAME: e:\ltas\hs1new.elf
EXPOSURE TYPE: Area
EXPOSURE NAME:
EXPOSURE UNITS:
DEFAULT LEVEL: 0
================================================================================
                      S T R A T I F Y   P A R A M E T E R S
ANALYSIS TYPE: SMR

      LEVEL       TIME SINCE FIRST EXPOSURE
_________________ _________________________

MINIMUM->0                001Y

         8000             005Y

         32000            010Y

         48000            015Y

                          020Y

                          025Y

                          030Y


PERSON YEARS FILE: E:\LTAS\97F03APY
OBSERVED DEATHS FILE: E:\LTAS\97E03AOB
```

Figure 7.4. A parameters list is printed with each report

Date: 6/16/1997 PC LIFE TABLE ANALYSIS SYSTEM Page: 2
Time: 16:06

Distribution of Person Years
Study File: 97F03A.LTP

Race = WHITE Gender = MALE
Entire Exposed Study Group

Level of Exposure

TSFE	0 8000	8000 32000	32000 48000	48000 & Over	Total
001Y - 005Y	7926.54	736.14	0.00	0.00	8662.68
005Y - 010Y	9011.10	3294.22	348.12	36.46	12689.90
010Y - 015Y	7819.66	4422.48	707.61	910.63	13860.38
015Y - 020Y	7371.95	4593.10	741.38	1792.39	14498.82
020Y - 025Y	7036.63	4454.53	778.74	2152.41	14422.31
025Y - 030Y	6215.46	4164.18	763.65	2187.48	13330.77
030Y & Over	8783.87	8766.63	2375.90	7648.62	27575.02
Total	54165.21	30431.27	5715.40	14728.00	105039.87

----- Value too large * Two-Sided P < 0.05 ** Two-Sided P < 0.01

Figure 7.5. Summary of Person Years, page one of two.

Date: 6/16/1997 PC LIFE TABLE ANALYSIS SYSTEM Page: 3
Time: 16:06

Distribution of Person Years
Study File: 97F03A.LTP

Race = WHITE Gender = MALE
Entire Exposed Study Group

AGES	1940-1944	1945-1949	1950-1954	1955-1959	1960-1964	1965-1969
15-19	0.33	1.87	0.87	0.00	0.01	0.00
20-24	247.11	194.46	590.96	488.08	489.18	277.54
25-29	555.68	696.90	1364.88	1598.77	1124.86	951.92
30-34	797.76	973.74	1483.49	2183.20	2006.13	1365.52
35-39	959.56	1143.83	1522.80	1949.96	2413.17	2122.47
40-44	730.64	1187.44	1312.44	1740.93	2061.08	2478.57
45-49	431.90	885.11	1161.33	1294.39	1700.96	2030.23
50-54	283.84	479.59	840.17	1092.94	1232.36	1597.85
55-59	180.79	321.88	449.75	779.01	1007.53	1136.55
60-64	63.10	166.77	274.79	376.62	669.32	882.71
65-69	21.49	60.07	128.98	210.48	292.05	562.84
70-74	0.00	14.62	41.28	96.71	149.17	213.34
75-79	2.16	0.00	9.99	20.94	67.24	100.31
80-84	1.01	0.00	0.00	3.85	7.58	33.92
85+	0.00	0.00	0.00	0.00	1.98	5.49
TOTAL	4275.36	6126.27	9181.73	11835.88	13222.63	13759.27

AGES	1970-1974	1975-1979	1980-1984	1985-1989	1990+	TOTAL
15-19	0.00	0.00	0.00	0.00	0.00	3.09
20-24	0.00	0.00	0.00	0.00	0.00	2287.32
25-29	273.18	0.00	0.00	0.00	0.00	6566.20
30-34	938.63	269.05	0.00	0.00	0.00	10017.51
35-39	1346.01	928.30	267.67	0.00	0.00	12653.79
40-44	2077.30	1321.17	925.78	267.30	0.00	14102.65
45-49	2416.05	2014.69	1286.57	903.40	118.26	14242.88
50-54	1935.05	2320.97	1942.25	1221.41	188.31	13134.75
55-59	1495.29	1800.77	2176.41	1826.27	272.73	11446.97
60-64	1018.16	1346.11	1606.36	1998.65	416.40	8818.99
65-69	745.32	869.73	1158.72	1366.34	311.04	5727.05
70-74	409.34	605.80	703.36	898.85	212.55	3345.03
75-79	134.60	301.20	448.14	538.77	118.96	1742.31
80-84	56.75	75.55	182.52	280.26	64.40	705.84
85+	22.12	31.26	40.01	113.03	31.60	245.50
TOTAL	12867.78	11884.61	10737.80	9414.29	1734.25	105039.87

----- Value too large * Two-Sided P < 0.05 ** Two-Sided P < 0.01

Figure 7.6. Summary of Person Years, page two of two.

Date: 6/16/1997 PC LIFE TABLE ANALYSIS SYSTEM Page: 24
Time: 16:06

Distribution of Observed and Expected by Age/Calendar Period
Study File: 97F03A.LTP
Comparison Rates in use: Standard U.S. Deaths 92 Minors
Race = WHITE Gender = MALE
Jan 1901 - Dec 1990 Inclusive

Entire Exposed Study Group

	MN OF TRACHEA, BRONCHUS, AND LUNG Minor 016			ISCHEMIC HEART DISEASE Minor 051		
AGES	OBS	EXP	SMR	OBS	EXP	SMR
15-19	0	0.0000	0.00	0	0.0000	0.00
20-24	0	0.0069	0.00	0	0.0348	0.00
25-29	0	0.0380	0.00	0	0.2921	0.00
30-34	0	0.1867	0.00	0	1.4908	0.00
35-39	0	0.7082	0.00	7	5.7757	1.21
40-44	2	2.1908	0.91	14	15.6362	0.90
45-49	6	5.3765	1.12	31	30.6251	1.01
50-54	9	10.4032	0.87	58	48.0454	1.21
55-59	19	16.4171	1.16	52	63.9646	0.81
60-64	25	20.6496	1.21	84	73.6502	1.14
65-69	22	18.5704	1.18	64	69.8280	0.92
70-74	15	13.8450	1.08	58	58.9882	0.98
75-79	12	8.2452	1.46	33	43.8416	0.75
80-84	4	3.4468	1.16	18	25.6834	0.70
85+	1	1.0114	0.99	13	15.1282	0.86
TOTAL	115	101.0958	1.14	432	452.9844	0.95

	PNEUMOCONIOSES AND OTHER RESPIRATORY DISEASES Minor 065			Unselected Minors		
AGES	OBS	EXP	SMR	OBS	EXP	SMR
15-19	0	0.0000	0.00	0	0.0043	0.00
20-24	0	0.0180	0.00	8	4.0176	1.99
25-29	0	0.0561	0.00	24	10.5717	2.27**
30-34	2	0.1168	17.13*	32	17.5228	1.83**
35-39	0	0.2199	0.00	35	27.5731	1.27
40-44	0	0.3897	0.00	44	40.9570	1.07
45-49	3	0.7559	3.97	66	56.5493	1.17
50-54	4	1.5363	2.60	83	74.1670	1.12
55-59	4	3.0101	1.33	123	93.3259	1.32**
60-64	19	5.0351	3.77**	122	106.6518	1.14
65-69	21	6.1675	3.40**	122	101.4889	1.20*
70-74	14	6.6128	2.12*	81	88.9713	0.91
75-79	11	5.7689	1.91	78	70.6428	1.10
80-84	11	3.5461	3.10**	67	44.3059	1.51**
85+	3	1.8277	1.64	23	27.3733	0.84
TOTAL	92	35.0608	2.62**	908	764.1226	1.19**

----- Value too large * Two-Sided P < 0.05 ** Two-Sided P < 0.01

Figure 7.7. Portion of output for observed/expected comparison by age group and calendar period (all races and sexes combined).

Date: 6/16/1997 PC LIFE TABLE ANALYSIS SYSTEM Page: 4
Time: 16:25

Distribution of Observed and Expected by TSFE/Exposure
Study File: 97E29A.LTP
Comparison Rates in use: Standard U.S. Deaths 92 Minors
Race = WHITE Gender = MALE
Jan 1901 - Dec 1990 Inclusive

ISCHEMIC HEART DISEASE
Minor 051

Duration of Exposure

TSFE	001Y 005Y	005Y 010Y	010Y 015Y	015Y 020Y	020Y 025Y
	2	0	0	0	0
001Y	2.2198	0.0008	0.0000	0.0000	0.0000
005Y	0.90	0.00	0.00	0.00	0.00
	3	3	0	0	0
005Y	3.5705	3.0454	0.0011	0.0000	0.0000
010Y	0.84	0.99	0.00	0.00	0.00
	8	0	1	0	0
010Y	7.0583	3.6517	4.2652	0.0015	0.0000
015Y	1.13	0.00	0.23	0.00	0.00
	13	5	3	5	0
015Y	12.6638	5.5313	5.1269	4.5190	0.0018
020Y	1.03	0.90	0.59	1.11	0.00
	19	13	5	7	1
020Y	19.8892	8.6043	6.0621	5.7871	4.1726
025Y	0.96	1.51	0.82	1.21	0.24
	20	11	10	4	8
025Y	25.9935	11.9827	8.2211	5.6441	6.1366
030Y	0.77	0.92	1.22	0.71	1.30
	83	66	46	24	35
030Y	85.8172	68.7239	51.5849	32.4364	24.4464
& Over	0.97	0.96	0.89	0.74	1.43*
	148	98	65	40	44
	157.2122	101.5401	75.2612	48.3880	34.7573
Total	0.94	0.97	0.86	0.83	1.27

----- Value too large * Two-Sided P < 0.05 ** Two-Sided P < 0.01

Figure 7.8. Portion of output for observed/expected comparison by duration of exposure and time since first exposure.

Date: 6/17/1997 PC LIFE TABLE ANALYSIS SYSTEM Page: 4
Time: 10:49

Distribution of Observed and Expected by TSFE/Dose
Study File: 97F03A.LTP
Comparison Rates in use: Standard U.S. Deaths 92 Minors
Race = WHITE Gender = MALE
Jan 1901 - Dec 1990 Inclusive

PNEUMOCONIOSES AND OTHER RESPIRATORY DISEASES
Minor 065

Level of Exposure

TSFE	0 8000	8000 32000	32000 48000	48000 & Over	Total
	0	0	0	0	0
001Y	0.0979	0.0152	0.0000	0.0000	0.1130
005Y	0.00	0.00	0.00	0.00	0.00
	0	1	0	0	1
005Y	0.1399	0.0716	0.0116	0.0014	0.2244
010Y	0.00	13.98	0.00	0.00	4.46
	1	0	0	0	1
010Y	0.1890	0.1393	0.0266	0.0413	0.3961
015Y	5.29	0.00	0.00	0.00	2.52
	0	0	0	0	0
015Y	0.3364	0.2644	0.0395	0.0984	0.7386
020Y	0.00	0.00	0.00	0.00	0.00
	2	2	0	0	4
020Y	0.7369	0.5262	0.0644	0.1702	1.4977
025Y	2.71	3.80	0.00	0.00	2.67
	2	1	1	4	8
025Y	1.4724	1.0342	0.1063	0.2658	2.8787
030Y	1.36	0.97	9.41	15.05**	2.78*
	14	14	9	41	78
030Y	7.6847	10.1386	3.1198	8.2690	29.2121
& Over	1.82*	1.38	2.88**	4.96**	2.67**
	19	18	10	45	92
	10.6572	12.1894	3.3681	8.8461	35.0608
Total	1.78*	1.48	2.97**	5.09**	2.62**
SRR	1.0000	1.3346	1.9881	2.6658	2.1878
95% C. I.	0.49 2.03	0.65 2.73	0.86 4.62	1.35 5.28	1.26 3.80
CHISQ	0	0.35	4.5	3.9	0.18

Rothman Trend Test: Slope = 9.62e-09 Std Err = 5.6e-10

----- Value too large * Two-Sided P < 0.05 ** Two-Sided P < 0.01

Figure 7.9. Portion of output from a direct standardization run.

Date: 6/17/1997 PC LIFE TABLE ANALYSIS SYSTEM Page: 3
Time: 12:03

Distribution of Observed and Expected by TSFE/Exposure
Study File: 97F18A.LTP
Comparison Rates in use: Standard U.S. Deaths 92 Minors
Race = WHITE Gender = MALE
Jan 1901 - Dec 1990 Inclusive

ISCHEMIC HEART DISEASE
Minor 051

Duration of Exposure

TSFE	000Y 010Y	010Y 020Y	020Y 030Y	030Y & Over	Total
000Y	7 6.9775 1.00	0 0.0000 0.00	0 0.0000 0.00	0 0.0000 0.00	7 6.9775 1.00
005Y	9 15.5249 0.58	0 0.0121 0.00	0 0.0000 0.00	0 0.0000 0.00	9 15.5370 0.58
010Y	53 50.1481 1.06	20 23.6855 0.84	0 0.0168 0.00	0 0.0000 0.00	73 73.8504 0.99
020Y	73 82.2750 0.89	30 33.1290 0.91	21 17.8622 1.18	0 0.0002 0.00	124 133.2664 0.93
030Y & Over	105 109.3398 0.96	60 67.0256 0.90	41 33.4432 1.23	11 13.7648 0.80	217 223.5733 0.97
Total	247 264.2653 0.93	110 123.8521 0.89	62 51.3222 1.21	11 13.7650 0.80	430 453.2045 0.95

Zero Exposed: 2 / 4.3770 / 0.46

----- Value too large * Two-Sided P < 0.05 ** Two-Sided P < 0.01

Figure 7.10. Portion of output for observed/expected comparison by duration of exposure and time since first exposure with a five-year lag period.

Date: 6/16/1997 PC LIFE TABLE ANALYSIS SYSTEM Page: 2
Time: 16:07

Summary of Observed and Expected Deaths
Study File: 97F03A.LTP
Comparison Rates in use: Standard U.S. Deaths 92 Minors
Race = WHITE Gender = MALE
Entire Exposed Study Group

Category Number	Cause	Observed Deaths	Expected Deaths	Ratio	95% Confidence Limits Lower	Upper
1	TUBERCULOSIS	39	10.8372	3.60**	2.5587	4.9197
1	RESPIRATORY TUB	36	10.1689	3.54**	2.4792	4.9013
2	OTHER TUBERCULO	3	0.6684	4.49	0.9255	13.1245
2	MN OF BUCCAL CAV	9	8.5053	1.06	0.4829	2.0089
3	MN OF LIP	1	0.2266	4.41	0.1117	24.5222
4	MN OF TONGUE	2	1.9967	1.00	0.1213	3.6160
5	MN OF OTHER PAR	2	2.2723	0.88	0.1066	3.1775
6	MN OF PHARYNX	4	4.0097	1.00	0.2718	2.5513
3	MN OF DIGESTIVE	69	80.4183	0.86	0.6676	1.0859
7	MN OF ESOPHAGUS	2	7.1930	0.28	0.0337	1.0038
8	MN OF STOMACH	12	13.7744	0.87	0.4496	1.5219
9	MN OF INTESTINE	24	27.5855	0.87	0.5573	1.2946
10	MN OF RECTUM	7	7.8584	0.89	0.3569	1.8354
11	MN OF BILIARY P	3	4.9734	0.60	0.1244	1.7638
12	MN OF LIVER NOT	0	2.1835	0.00	0.0000	0.0000
13	MN OF PANCREAS	17	15.4534	1.10	0.6405	1.7614
14	MN OF PERITONEU	4	1.3966	2.86	0.7804	7.3250
4	MN OF RESPIRATOR	121	106.4820	1.14	0.9429	1.3578
15	MN OF LARYNX	3	4.2101	0.71	0.1469	2.0836
16	MN OF TRACHEA,	115	101.0958	1.14	0.9391	1.3655
17	MN OF OTHER PAR	3	1.1761	2.55	0.5259	7.4584
5	MN OF BREAST	0	0.4024	0.00	0.0000	0.0000
18	MN OF BREAST	0	0.4024	0.00	0.0000	0.0000
6	MN OF FEMALE GEN	0	0.0000	0.00	0.0000	0.0000
19	MN OF CERVIX UT	0	0.0000	0.00	0.0000	0.0000
20	MN OF OTHER AND	0	0.0000	0.00	0.0000	0.0000
21	MN OF OVARY, FA	0	0.0000	0.00	0.0000	0.0000
22	MN OF OTHER FEM	0	0.0000	0.00	0.0000	0.0000
7	MN OF MALE GENIT	26	22.9689	1.13	0.7392	1.6587
23	MN OF PROSTATE	24	21.6043	1.11	0.7116	1.6530
24	MN OF OTHER MAL	2	1.3646	1.47	0.1774	5.2909
8	MN OF URINARY OR	9	15.7475	0.57	0.2608	1.0850
25	MN OF KIDNEY	5	7.4122	0.67	0.2183	1.5761
26	MN OF BLADDER A	4	8.3353	0.48	0.1308	1.2273
9	MN OF OTHER AND	34	36.4959	0.93	0.6451	1.3019
27	MN OF SKIN	3	5.6330	0.53	0.1098	1.5572
28	MN OF EYE	0	0.2223	0.00	0.0000	0.0000
29	MN OF BRAIN AND	9	8.5291	1.06	0.4815	2.0033
30	MN OF THYROID G	1	0.5464	1.83	0.0463	10.1679

----- Value too large * Two-Sided P < 0.05 ** Two-Sided P < 0.01

Figure 7.11. Portion of output from Major/Minor Summary.

8.0 **Utilize**

When **Utilize** is selected, a window (Figure 8.1) shows the utility commands: **Export**, **Display Rates**, and **Deceased Listing**.

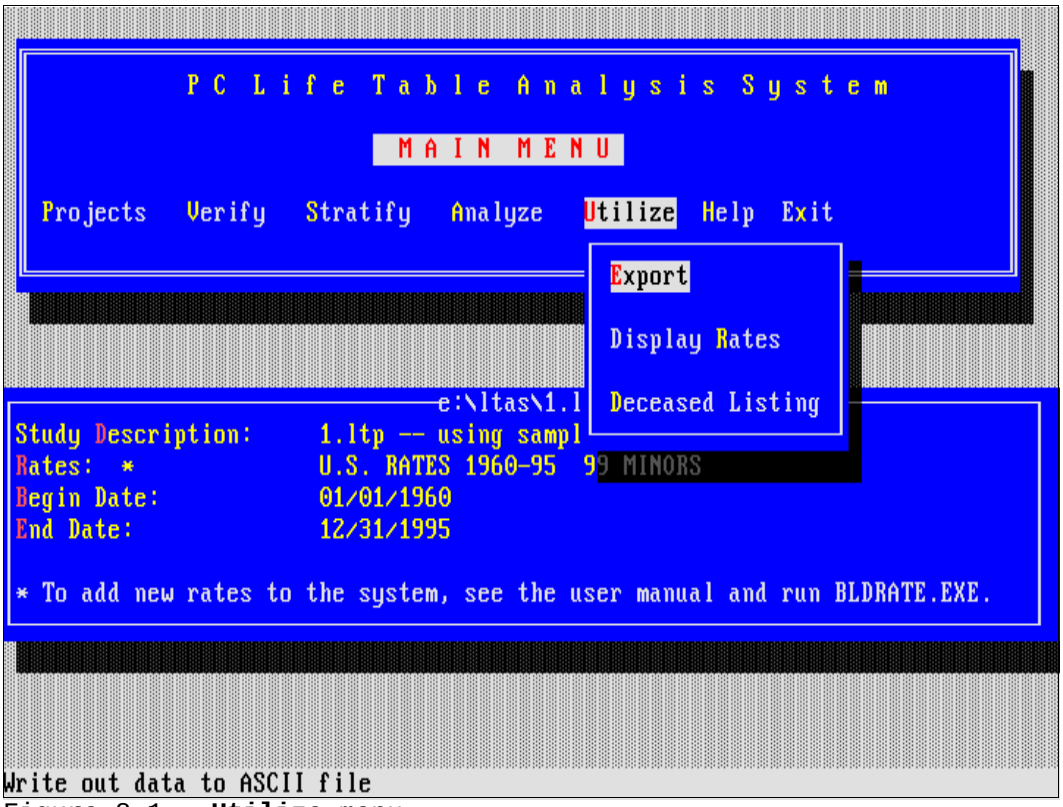

Figure 8.1. **Utilize** menu

8.1 **Export**

Export (Figure 8.2) exports stratified data to an ASCII output file which can be analyzed with other programs, such as SAS, a spreadsheet, or data base program. This can be done without running **Analyze**. The stratification used will correspond to the stratification used in the rate file selected initially for this study, and the user-supplied stratification for TSFE and cumulative level of exposure. (We recommend that only one minor be selected for each report file. See below.)

To export data the user must specify an output file name and at least one minor. A list is provided to select minors. This is similar to the list in **Analyze** (See section 7.4). Move the cursor to your selection. To scroll through the list using the mouse click on the triangles at the top and bottom of the scroll bar which is on the right of the list. The triangle at the bottom of the scroll bar can be seen in Figure 8.2. When you scroll down another triangle will appear at the top of the scroll bar so that you can scroll up. You can drag the scroll button (the light colored area on the scroll bar) by holding the left mouse button down while moving the button down or up the scroll bar; this will cause the list to scroll.

If you do not have a mouse, move the cursor with the up and down arrows. “Home” moves the cursor to the top of the list. “End” moves the cursor to the bottom of the list. “Page Down” and “Page Up” move one page (one full window). Make a selection by pressing space bar or “Enter” key. A check mark character is shown and the cursor moves to the next available choice. “Insert” key will cause all of the minors to be selected. “Delete” key will deselect all of the minors so that the user can start again.

When **Export** begins, a progress report window appears. Press “Enter” when the "Done" button is highlighted. The user can export additional data to other output files

without leaving **Export**. Specify a new output file name and minors. Select “exit” when all data have been exported to return to the main menu.

The output format is described in Appendix C, “Export File Format”. There are columns for gender, race, age stratum, calendar stratum, cumulative level of exposure or duration stratum, minor (as defined in the rate file), expected deaths (person years times the nonexposed or referent rate), observed deaths, person days at risk (instead of person years), rate of death from the nonexposed or referent rate data file (decimal point assumed before first digit). All these fields are padded with zeros. A typical export file might have 2 sexes, 2 races, 15 five-year age categories, 10 five year calendar periods, 7 cumulative level of exposure categories, and 7 TSFE categories, for 2 * 2 * 15 * 10 * 7 * 7 = 29,400 observations for each minor. This is why it is better to limit the export report to one minor.

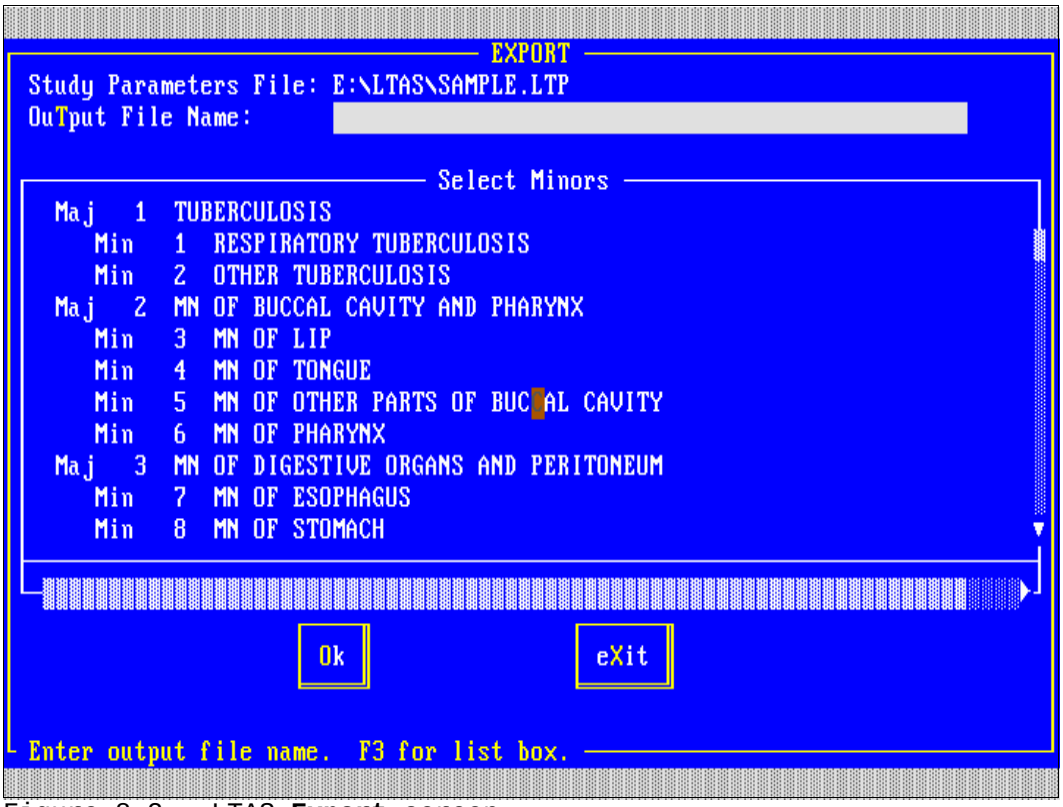

Figure 8.2. LTAS **Export** screen.

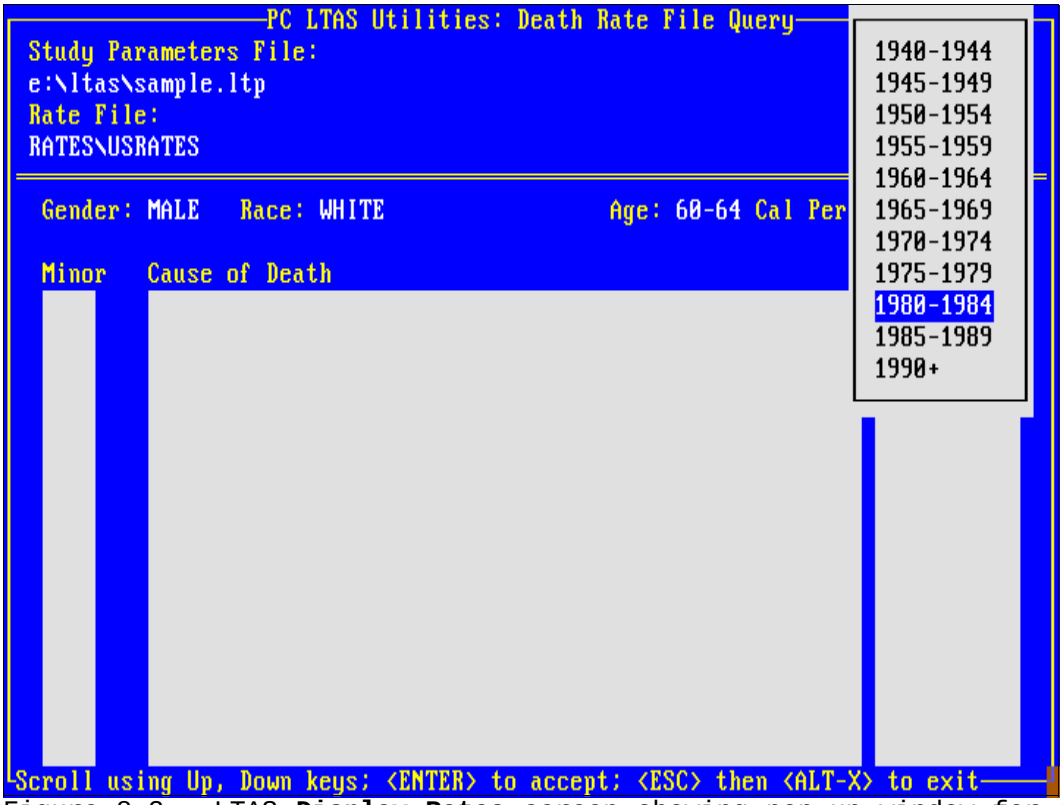

Figure 8.3. LTAS **Display Rates** screen showing pop-up window for selection of calendar period.

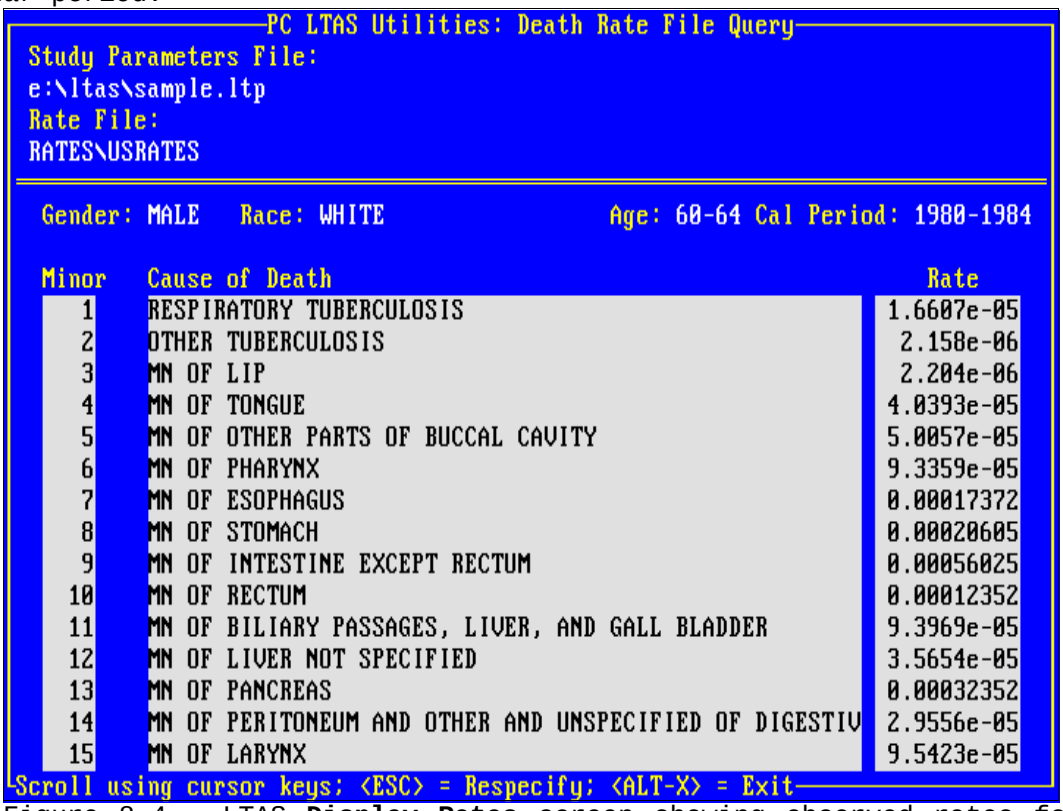

Figure 8.4. LTAS **Display Rates** screen showing observed rates for the NIOSH minors. The user can scroll down to view the rates for the remaining minors.

8.2 **Display Rates**

This utility shows the contents of the rate file for all of the minors for a given

gender/ race/ age/ calendar combination after the data are stratified. When **Display Rates** is selected, you see a window with the title "PC LTAS Utilities: Death Rate File Query" (Figure 8.3) At the top of the window, the Parameter file name and the rate file name are shown. Below the rate file name is an input line containing prompts for gender, race, age, and calendar period.

To display the observed rates, supply the following information: gender, race, age group, and calendar period. When you press the "Enter" key the minors and rates appear(Figure 8.4). “Alt X” will end the **Display Rates** program.

8.3 **Deceased Listing**

This utility exports the observed deaths file of the currently open project to an ASCII text file. There is one record per line. The fields are fixed width. This file can be used in other programs such as SAS or a spreadsheet. The output file has the same name as the observed deaths file shown in **Stratify** (Figure 6.1) except that it has a “.txt” extension. Choose **Utilize**, then **Deceased Listing**. A message will appear on the screen telling the name of the output file (Figure 8.7). The report is shown in Figure 8.5.

Table 5 shows the widths and column locations of the fields. Four fields indicate strata which were defined in the **Stratify** step. Only the first value of the range is written. For example, if the age range is 45 to 49 years, 45 will appear in the age stratum field. If the dose level in the stratum for 0 to 100000, 0 will appear even though the actual dose is likely to be above 0.

If a multiple cause rate file is used, each worker will have a record for each cause of death listed in the demographic file. Each of these records will differ only by the cause of death field. See Figure 8.6.

Table 8-1: Summary of Deceased Listing

Field	start	stop	length
SSN	1	9	9
last name	11	30	20
cause of death (“cod”)	32	34	3
gender	36	42	7
race	44	52	9
age stratum	54	56	3
calendar year stratum	58	64	7
exposure/dose stratum	66	75	10
TSFE (time since first exposed) stratum.	77	80	4

Observed death listing report 3OB.txt

SSN	name	cod	gender	race	age	calend. period	cumulative exposure	TSFE
655385555	DCCUIBOY	37	FEMALE	WHITE	35	1970	200000	010Y
655245555	DUMRALA	37	FEMALE	WHITE	55	1975	500000	020Y
655115555	CAONAOBNPA	37	MALE	WHITE	60	1985	500000	030Y
655195555	CHDAOBUMNPA	14	FEMALE	NON-WHITE	55	1975	200000	030Y
655945555	VAPGEMNR	37	FEMALE	NON-WHITE	65	1970	100000	020Y
655925555	RMINOWACZ	37	FEMALE	NON-WHITE	45	1985	100000	010Y
655995555	SOBYOU	37	FEMALE	WHITE	60	1975	300000	020Y
655755555	CASSUMELO	37	FEMALE	WHITE	55	1985	300000	030Y
655705555	JUCPNEL	37	MALE	WHITE	75	1985	300000	030Y
655785555	TMYLNPA	10	FEMALE	WHITE	70	1985	100000	030Y
655645555	DEMMAN	14	MALE	NON-WHITE	70	1980	400000	030Y
655635555	HOLKMACP	37	MALE	WHITE	65	1975	400000	030Y
654595555	DOMMARMAOBK	14	MALE	NON-WHITE	65	1975	400000	030Y
654565555	RAKK	37	FEMALE	WHITE	60	1975	300000	020Y
654445555	HUHL	14	MALE	WHITE	60	1980	500000	030Y
654415555	RMBEOMPO	5	MALE	NON-WHITE	50	1970	0	010Y
654495555	NRAVOM	14	FEMALE	NON-WHITE	50	1975	500000	030Y
654325555	KOBBDEMO	6	FEMALE	WHITE	50	1970	500000	020Y
654315555	JEMKUL	37	FEMALE	WHITE	45	1970	300000	010Y
654305555	LOBNEL	14	MALE	NON-WHITE	50	1970	300000	020Y
654275555	PMUNNY	11	FEMALE	WHITE	80	1985	200000	030Y
654105555	KUBO	14	MALE	WHITE	65	1980	500000	030Y
654025555	DUMRALNOL	37	FEMALE	NON-WHITE	45	1970	0	010Y
654925555	MACHUMKN	37	MALE	WHITE	60	1985	300000	030Y
654905555	CUMMEBB	37	FEMALE	NON-WHITE	50	1970	100000	010Y

Figure 8.5. **Deceased Listing** shows the contents of the observed deaths file in a readable format. Only the first value of a range is shown for each stratum: age, calendar period, exposure/duration, TSFE (time-since-firsts-exposure).

Observed death listing report 2OB.txt

SSN	name	cod	gender	race	age	calend. period	duration	TSFE
655545555	KOGOLRMOBKOM	57	FEMALE	WHITE	70	1960	000Y	000Y
655545555	KOGOLRMOBKOM	58	FEMALE	WHITE	70	1960	000Y	000Y
655545555	KOGOLRMOBKOM	51	FEMALE	WHITE	70	1960	000Y	000Y
655485555	TMOLLUL	51	FEMALE	WHITE	65	1960	010Y	010Y
655485555	TMOLLUL	58	FEMALE	WHITE	65	1960	010Y	010Y
655385555	DCCUIBOY	61	FEMALE	WHITE	35	1970	010Y	010Y
655245555	DUMRALA	51	FEMALE	WHITE	55	1975	020Y	020Y
655245555	DUMRALA	55	FEMALE	WHITE	55	1975	020Y	020Y
655245555	DUMRALA	63	FEMALE	WHITE	55	1975	020Y	020Y
655115555	CAONAOBNPA	58	MALE	WHITE	60	1985	020Y	020Y
655115555	CAONAOBNPA	55	MALE	WHITE	60	1985	020Y	020Y
655195555	CHDAOBUMNPA	16	FEMALE	NON-WHITE	55	1975	020Y	020Y
655945555	VAPGEMNR	41	FEMALE	NON-WHITE	65	1970	010Y	020Y
655945555	VAPGEMNR	92	FEMALE	NON-WHITE	65	1970	010Y	020Y
655945555	VAPGEMNR	61	FEMALE	NON-WHITE	65	1970	010Y	020Y
655925555	RMINOWACZ	85	FEMALE	NON-WHITE	45	1985	000Y	010Y
655995555	SOBYOU	51	FEMALE	WHITE	60	1975	010Y	020Y
655995555	SOBYOU	51	FEMALE	WHITE	60	1975	010Y	020Y
655755555	CASSUMELO	51	FEMALE	WHITE	55	1985	010Y	020Y
655755555	CASSUMELO	51	FEMALE	WHITE	55	1985	010Y	020Y
655755555	CASSUMELO	41	FEMALE	WHITE	55	1985	010Y	020Y
655705555	JUCPNEL	92	MALE	WHITE	75	1985	020Y	020Y
655795555	OTOMHUMR	51	FEMALE	NON-WHITE	55	1965	020Y	020Y
655785555	TMYLNPA	12	FEMALE	WHITE	70	1985	010Y	020Y
655785555	TMYLNPA	54	FEMALE	WHITE	70	1985	010Y	020Y

Figure 8.6. **Deceased Listing** for a multiple cause run. Each person has a record for each cause of death -- the “cod” column.

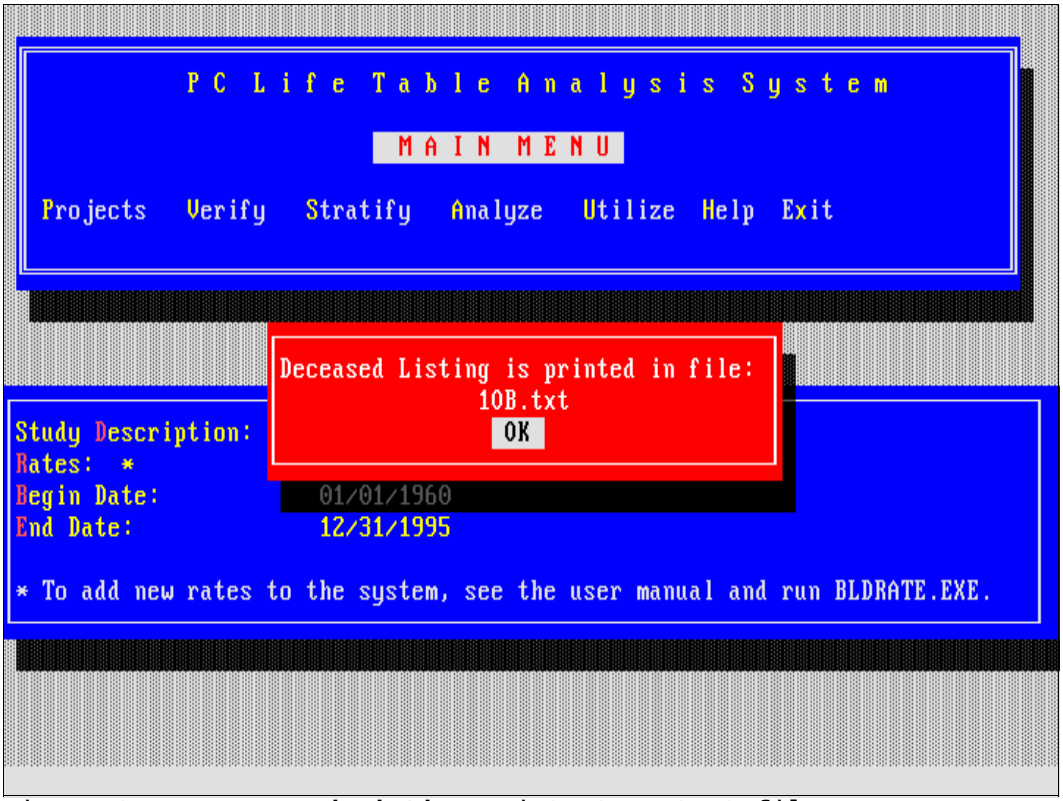

Figure 8.7. **Deceased Listing** prints to a text file.

9.0 Parameters and System Features Defined

This chapter lists parameters and system features are used in PC LTAS. For a more general list of definitions see the glossary in Appendix A.

Age by Calendar -- This option causes a printout of the distribution of observed and expected events (deaths or diagnoses) stratified by age and calendar period. This is specified at the **Analyze** step.

Age Categories -- Person years and observed deaths are stratified by the age categories specified at the **Stratify** step.

Calendar Periods -- Person years and observed deaths are stratified by the calendar periods specified in the **rate file** and used in the **rate data file**.

Confidence Level -- At the **Analyze** step, the user specifies the confidence level and the type of hypothesis test at a significance level of 0.05. A 95% confidence interval gives a two-sided hypothesis test. A 90% confidence interval gives a one-sided hypothesis test. Both the confidence level and the hypothesis test are based on the assumption that the number of deaths has a Poisson distribution.

Default Exposure Level -- The exposure level in exposure level runs that will be applied to periods not having valid exposure level data. The **default exposure level** is used only when an exposure file is used; otherwise, it is ignored by the system. The default can be any nonnegative number. If the default is zero, then any SSN or Plant/Department/Operation area that is **not** in the exposure file is considered unexposed.

The user can use **default exposure level** to save data entry time. Setting the default to zero will exclude the workers who are not included in the exposure file. To exclude a few workers or work areas, set their exposure level to zero in an exposure file and make the default level one. If no default is specified by the user, the system assigns it a value of zero. This is specified at the **Verify** step.

Direct Standardization -- Direct standardization of mortality rates is available if the ratio type is SMR, standardized mortality ratio. The user must specify the major and/or minor categories for which mortality rates are to be directly standardized. Any number of categories can be selected for direct standardization. This is specified during the **Analyze** step by using “Ctrl X” to choose a major or minor.

Duration of Exposure -- Selection of this option at the **Stratify** step results in stratification by Duration of Exposure. Data must be stratified by either Duration of Exposure or Exposure Level but cannot be stratified by both.

Duration of Exposure Cut Point -- These cut points are the values of **Duration of Exposure** that bound the strata. Cut points can be specified in days, months, or years. Their numerical values can range from zero to 999. The number of cut points is limited only by machine memory. These are specified at the **Stratify** step.

End Pyrs on DLO -- If this option is selected, then the calculation of person years for each worker will end on the date the worker was last observed. This is specified at the **Verify** step. (Also see Date Last Observed in Appendix A)

Exposure by TSFE -- Selection of this option causes a printout of the distribution of observed and expected events deaths broken down by TSFE (Time since First Exposure/employment) and by Duration or Level of Exposure. A different table is produced for each calendar period. This is specified at the **Analyze** step.

Exposure Level -- Selection of this option at the **Stratify** step results in stratification by Exposure Level. Data must be stratified by either duration of exposure or cumulative level of exposure (duration times level, e.g. ppm-years) but cannot be stratified by both.

Exposure Level Cut Points -- These are the values of Exposure Level which bound the strata for person years and observed deaths. They are only required when the data are stratified by cumulative level of exposure. These cut points are specified at the **Stratify** step.

Exposure Name -- Descriptive name of the substance whose quantity is specified in the exposure file. For example, “dioxin” or “ionizing radiation”. Specified at the **Verify** step.

Exposure Type -- The user selects either "Area" or "Personal" in accordance with the type of exposures contained in the exposure file. (This parameter is not required unless data are to be stratified by Exposure Level.) Specified at the **Verify** step.

Exposure Units -- Units applicable to the substance specified in the exposure file. For example, “parts per million (ppm)” or “radiation absorbed dose (rads).” Specified at the **Verify** step.

Gender -- When analyzing data representing a specific gender/race group, (see Gender/race Subset below), the user must select the gender from those available in the rate file. Specified at the **Analyze** step.

Gender/race Subset -- At the **Verify** step, the user can select "Keep All," in which case subjects of all gender/race combinations are retained in the analysis, or the user can select one gender/race combination, for example, non-white females. At the **Analyze** step, the user's options depend on what was selected at the **Verify** step. If the user selected one gender/race combination, then that combination is the only one available at the **Analyze** step. On the other hand, if the user selected *"Keep All,"* then at the **Analyze** step, the user can select either a specific gender/race group; all genders/races combined; or each gender/race combination separately and all genders/races combined.

ICD -- International Classification of Diseases. This is a list of numbers representing diseases published by the World Health Organization. There are several revisions of this list. See ICD Revision.

ICD File -- This is used by LTAS to convert ICD numbers into majors and minor groupings which are listed in the RDF file. This conversion is necessary because the rate data files are listed by minors. See Appendix G.

ICD Revision -- This parameter indicates which revision of the ICD codes should be used in assigning a NIOSH minor cause-of-death category to each deceased worker. The user can choose *time of death* or the fifth through ninth revisions. These revisions are detailed in Appendix K. If a specific ICD revision is selected, that revision is used to assign a NIOSH code regardless of the worker's date of death. The default ICD revision is that in effect at time of death. Specified at the **Verify** step.

Lag -- Recent exposures may have little or no bearing on the risk of certain diseases. The lag period is the time that must elapse before exposure is counted. Person-time and deaths occurring during the lag period are assigned to a zero exposure group. Lag differs from latency in that no exposure is counted until the lag period is completed, whereas latency merely stratifies observed deaths and person-time by time-since-first-exposure and does not affect accumulation of exposure.

Lag is entered at the **Stratify** step as an integer ranging from 0 to 999. The

units can be days, months, or years, but the number of years entered cannot exceed 89.

Major/minor Summary -- Selection of this option causes a printout of the major and minor causes of death along with their corresponding observed deaths, expected deaths, the ratio of expected to observed, and confidence limits for the ratio. Specified at the **Analyze** step.

Person years Begin Date -- Date from which a subject's time at risk is initially calculated. Often the date of first exposure, but sometimes either the date of first exposure or a specific calendar date, whichever occurs first (such as for a cohort defined as employed at a certain date or later). For additional information, see Appendix D, “Details of Field names in Demographics File”. Specified in the **Verify** step.

Person years End Date -- Ending date of a survivor's time at risk. This is usually the same as the study end date. The DLO option sets the ending date at the earlier of the study end date or the Date Last Observed field in each worker's demographic record. Specified in the **Verify** step.

Print to -- The user can select a printout to the printer or to an ASCII text file. Specified at the **Analyze** step.

Race -- When analyzing data representing a specific gender/race group, (see Gender/race Subset), the user must select the race from those available in the rate file. Specified at the **Analyze** step.

Rate File -- This is also called a “rate description file.” It describes all of the following: the name of the rate data file and ICD file, the descriptive label shown in the menu choices for rate files, the genders, races, age categories, calendar categories, the names of the majors and minors, and markers showing the beginning and end of the cancer series in this list. The user can specify one of the supplied rate files or an alternate rate file created by the user (such as one containing state or county rates) in the project parameters input screen (section 4.5). Proportion files are supplied for PMR runs. See Appendix H for an example (“Standard US Deaths 92 Minors”). Also see Appendix I, “How to build a rate file.”

Rate Data File -- file with incidence rates or proportions indexed by gender, race, age group, calendar group, and minor. This file is specified in the rate file.

RDF -- file extension for a rate file (rate description file).

Study Begin Date -- Workers having final employment dates occurring before the study begin date will be excluded from the analysis. This is useful for cross-sectionally defined cohorts. This is specified at the **Project** step.

Note: Calculation of person years begins on the latest of the following dates:

1) Study Begin Date

2) January 1 of the first year in the *earliest* time period specified in the rate and structure files. (For runs using the default rate and structure files, that year will be 1940.)

3) Begin date of earliest work history during which subject is exposed.

Study End Date -- Dates in the study file which occur after the study end date are not used in the analysis. The details are as follows:

1) Work histories and exposure levels beginning after the study end date are ignored.

2) Work histories and exposure levels which end after the study end date are

considered to end on the study end date.

3) Deaths occurring after the study end date are ignored. The worker is considered to be alive.

4) A date last observed which occurs after the study end date is changed to the study end date.

5) Workers whose PY begin dates occur after the study end date are not used in the analysis.

6) All person-time calculation stops at or before the study end date.

Specified at the **Verify** step.

Summary Person years -- Selection of this option causes a printout of the distribution of person years by Time since First Exposure and Duration of Exposure; and by Age category and Calendar Time Period. Specified at the **Analyze** step.

10.0 Limits of LTAS Parameters

There are limits to the numbers of categories that can be assigned to certain LTAS parameters in a Life Table run. These limits are listed in Table 4 (below).

Table 10-1: Limits of LTAS Parameters

Parameter	Maximum Number
Age	30
Area exposure keys	1000
Area exposure records	16384
Calendar periods	30
Contributing causes of death per worker	4
Duration /exposure Categories	30
Exposure records per key	200
Gender	4
Histories per worker	200
ICD revisions	10
Majors/minors selected in **Analyze** step	50
Mappings per ICD revision	300
Minors per rate file	120
Minors per input raw file for BLDRATE.EXE	120
Minors per worker	9
Printers defined in printer definition file	25
Race	10
Rate files	30
TSFE categories	30

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A

APPENDIX A. Glossary

This appendix is a glossary of terms used in PC LTAS. See also chapter 9 for a list of parameters and system features.

Area -- some combination of plant/department/operation.

Area Exposure -- Exposure information based on areas, or plant/department/operation combination (as opposed to personal exposure).

CCOD -- Contributing cause of death

CDC -- Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention -- A Federal agency organized under the Public Health Service. Parent agency of NIOSH.

COD -- Cause of death.

Cohort -- A group of people under study for the effects of a common exposure.

Confidence level -- Probability that an interval calculated by a statistical procedure will contain the true value of a parameter.

Contributing cause of death -- A cause of death listed on the death certificate other than the underlying cause.

Cumulative level of exposure -- A time-dependent measure of accumulated exposure up to a specific point in time, typically in "exposure-time" units such as ppm-years. Used in analyses of exposure-response trends.

Cut Point -- The cut points are the values that mark the borders of the strata.

Date Last Observed -- Most recent date on which subject was known to be alive.

Death rate -- The total number of deaths from a certain cause during a certain time period, divided by the population's person-time at risk during that period. Usually stratified by age, race, sex, and calendar time. Used in Standardized Mortality Ratio (SMR) runs.

Demographics File -- A study file describing the workers in a cohort; includes demographic information.

Direct standardization -- Standardization of rates for age, race, sex, and calendar time in which the rates of different cumulative level of exposure groups are weighted by the person-time of the entire exposed cohort. Directly standardized rates are used for internal comparisons in which the low cumulative level of exposure (or low duration) group is the referent, and SRR (standardized rate ratios) are calculated.

DLO -- Date last observed.

DOB -- Date of birth.

DOD -- Date of death.

Duration -- Duration of exposure, used when no data are available on exposure level or intensity. In SMR runs using person-time and duration, an "exposure level" of 1 is assigned to each day of exposure for each subject. Duration accumulates over time; each person-day for each subject is assigned the cumulative duration, and then that person-day is allocated to the duration category.

Exp -- Exposure.

Export -- To create processed data from a software system in a form amenable for storage, display, or processing by other software. The PC LTAS **Export** step outputs person-time and observed deaths by age, race, sex, calendar time, cumulative duration of exposure, and time since first exposure.

Exposure -- see cumulative level of exposure, exposure level, or exposure file.

Exposure Begin Date -- Earliest date on which a worker was exposed.

Exposure File -- A study file listing times and levels of exposure. This can be personal exposure or area exposure.

Exposure level -- Also known as exposure intensity or exposure concentration. For example, parts per million (ppm) or milligrams per cubic meter (mg/m^3). This can change over time. It is specified in the exposure file for combinations of time period, plant, department, and operation (area exposure) or for combinations of time period and worker (personal exposure). A level of "0" means no exposure.

Hypothesis test -- A statistical test for the null hypothesis of no difference between an exposed group and a referent group. Often a test of whether a rate ratio (SMR or SRR) is statistically different from the null value of 1.0 by chance alone, assuming that the true (unknown) rate ratio were 1.0.

ICD -- International Classification of Diseases; a system of disease classification used by the World Health Organization (WHO). It is a list of numbers representing diseases. There are several revisions of this list.

ICD File -- Also called a structure file. This file is used by LTAS to convert ICD numbers into majors and minor groupings which are listed in the rate file (rate description file). This conversion is necessary because the rate data file is listed by minors. See Appendix G.

ICD time period — the time during which a given ICD revision is in effect.

Indirect standardization -- Standardization for age, sex, race, and calendar time in which the stratified rates of an external referent population are weighted by the stratified person-time of the exposed group. Used in SMRs.

In-Rec -- “in record” person year begin date which is in the demographic record. When used, person-time will begin at the in-rec date, the date of first exposure, or the date when rates begin, whichever is later. If this is not used, the begin date of the first work history is used.

Job -- Specific work assignment of subject, that is, a plant/department/operation combination. A subject may have multiple jobs or work assignments or work histories over a working lifetime.

Lag -- The time elapsed between exposure and the effect of that exposure. Used to discount recent exposures, especially in cancer mortality studies in which one assumes that a certain latency is required prior to observing an effect.

Major -- short name for Major cause-of-death category.

Major cause-of-death category (major) -- A related group of one or more minor cause-of-death categories.

Minor -- short name for Minor cause-of-death category.

Minor cause-of-death category (minor) -- A related group of one or more ICD codes.

Mn -- Minor. Same as Minor cause-of-death category.

Mortality Files -- The structure file, the rate file (rate description file), and the rate data file. These are ASCII text files.

Multiple cause mortality -- Considers all causes on the death certificate, not only underlying cause.

NIOSH -- National Institute for Occupational Safety and Health.

Operation -- Specific occupation or process for a work assignment or work history, for example, sterilizer operator in the Gauze department at Plant A.

Person-time at risk -- Amount of time at which each subject is at risk of dying from the exposure of interest. Often begins at time of first exposure; continues until end of follow-up. Summarized across subjects and stratified by potential confounders (age, race, sex, and calendar time). May also be stratified by cumulative level of exposure (or duration) and time since first exposure for analyses of trends. Used in SMR studies. (Also called person years, person years at risk, etc.)

Person years Begin Date -- Date from which a subject's time at risk is initially calculated. This is often the date of first exposure, or the person years begin date field in the demographic record for the subject. This depends on the person year begin date option (see ch. 5, **Verify**). Sometimes person years begin at the study begin date if the date of first exposure is before the study begin date. For additional information on the person years begin date field, see Appendix D, “Details of Field names in Demographics File”.

Person years End Date -- Ending date of the accumulation of person years. This is the date of death for dead people. For survivors, it is usually the study end date. The DLO (Date Last Observed) option ends the accumulation of person years at the date in the DLO field in the demographic record of the subject. For additional information on the date last observed field, see Appendix D, “Details of Field names in Demographics File”.

Personal Exposure -- Information describing the exposure of each subject (as opposed to area exposure).

PCMR -- Proportionate Cancer Mortality Ratio.

PMR -- Proportionate Mortality Ratio.

Proportionate Cancer Mortality Ratio (PCMR)-- ratio of exposed cancer deaths per unexposed cancer deaths. No person time is accumulated.

Proportionate Mortality Ratio (PMR)-- ratio of exposed deaths per unexposed deaths. No person time is accumulated.

PY -- person year.

PY Begin Date -- Person years Begin Date.

PY End -- Person years end date.

Rate File -- Also called a rate description file. This is a mortality file containing the titles corresponding to the numeric codes for race, sex, time periods, and cause-of-death categories. It specifies the rate data file and the ICD file.

Rate Data File -- A mortality file containing reference population incidence rates or proportions for the NIOSH minors. (The rate data file for a PMR run contains proportions instead of rates.) This file is used to calculate expected numbers of deaths. The rate data file has a “.dat” file extension and is accompanied by an index file with an “.IDX” file extension. The index increases the speed at which the computer can access the rate information.

SMR -- Standardized Mortality Ratio.

SRR -- Standardized Rate Ratio.

SSN -- Social Security number.

Standardization -- Adjustment or weighting of rates after stratification by age, race, sex, and calendar time to avoid confounding by these variables in a comparison of summary rates between an exposed cohort and a referent population. Standardization can be direct or indirect.

Standardized Mortality Ratio (SMR) -- Ratio comparing the summary mortality rate for an exposed cohort to the summary mortality rate for an external population (such as the U.S. population in the U.S. Rates file), after stratification of rates by age, race, sex, and calendar time, and weighting of stratified rates by indirect standardization.

Standardized Rate Ratio (SRR) -- Ratio comparing a summary mortality rate for a more highly exposed group (or longer duration group) to a summary mortality rate for a low-exposed (or low duration) internal referent group, after direct standardization of rates stratified by age, race, sex, and calendar time. SRR are an option in SMR runs; both SMRs and SRR are calculated when the SRR option is selected.

Stratification -- Categorization of rates or proportions by potential confounders (age, race, sex, calendar time). Rates (deaths per person-time) are stratified for SMR and SRR runs. Proportions (deaths from specific cause divided by all deaths) are stratified for PMR runs.

Stratum -- A single category of age, race, sex, and calendar time, for example, white males aged 50-54 in 1960-1964. Stratification by cumulative duration/ exposure and by time since first exposure (TSFE) is also provided by PC LTAS, for example 5-10 years duration in TSFE category 20-25 years, or 100-500 ppm in TSFE category 10-20 years.

Structure File -- A mortality file indicating which ICD codes correspond to each minor cause of death category.

Study Begin Date -- First date considered for all workers and the starting date for the reports. Any work exposure before this date is not considered in the study. Workers having final employment dates occurring before the study begin date are excluded from the analysis.

Study End Date -- Last date considered for all workers and the ending date for the reports. Any work exposure after this date is not considered in the study. Workers having beginning employment dates occurring after the study end date are excluded from the analysis.

Study Files -- The demographics, work history, and exposure files. Each subject has his or her own record in the demographics file and work history file. The exposure file can specify exposure levels for individual subjects (personal exposure file) or for different jobs (area exposure file). These are ASCII text files.

Time period -- in the structure file this is the time during which a mapping from ICD codes to minor cause of death is in effect. This usually corresponds to “ICD time period.”

Time Since First Exposure/Employment -- Calendar time elapsed between the date on which the subject began exposure and another specified date (such as date of death or end of study). A time-dependent measure that accumulates as the subject moves through time. Each person-day for each subject is assigned the time-since-first-exposure amount, and each person-day is allocated to the user-specified category of time-since-first-exposure. Used in analyses of trends with time-since-first-exposure. Sometimes called "latency" or "potential latency."

TSFE -- Time Since First Exposure or Time Since First Employment.

Underlying cause of death -- The cause listed on the death certificate as the underlying cause.

VS -- Vital status.

WH -- Work history.

Vital Status -- A variable indicating whether a subject is alive or dead. Vital status may also be listed as unknown.

Work History -- A record in a work history file. This record lists begin date, end date, and area (plant/department/operation) for one job. Each worker may have several work histories.

Work History Begin Date -- The date on which a subject began a period of work at a particular plant/department/operation.

Work History End Date -- The date on which a subject ceased a period of work at a given plant/department/operation.

B

APPENDIX B. Quick Start

This section provides a procedure for quick starting the system. It is primarily intended as a reference for those who have run PC LTAS before but do not necessarily remember every detail of the procedure. Others are advised to read this manual, especially chapters four through eight, before running the system.

Follow these directions to quick start and run the Life Table.

1. Create the ASCII study files. For more information see section 4.1.1, Appendix D, Appendix E, and Appendix F.

2. At the DOS prompt, type "LTAS." Press "Enter."

3. When the Main Menu screen is displayed, highlight **Projects**, and press "Enter." See section 4.2 for navigational instructions. See section 4.4 for the Project menu.

4. A pop-up menu screen will appear. To open an existing project file, highlight the "Open" command and press "Enter" to execute it. To create a new Parameter file, execute "New." The project parameters screen will appear.

5. Fill the needed information in the parameters menu. Select a rate file and the begin and end dates for the study. See section 4.5 for more information on the Project Parameters screen.

6. When all information has been supplied, press "Esc" to return to the Main Menu screen.

7. At this point, the user may execute the next available Main Menu command or return to a previously executed command. The latter would normally be done to revise input information.

Begin with the **Verify** step. See chapter 5 for details. Fill the names of the input demographic and work history files, the output demographic and work history files. The exposure file is optional, along with default exposure level, exposure type, exposure units. Choose which ICD (International Classification of Disease) conversions to use. The default is to use the NIOSH classification used at the time of death. Specify Sex, Race options. Specify when to begin and end person years. **Verify** will return to the Main Menu when you select the “OK” button after it is done.

8. Back at the Main Menu run the **Stratify** step. See chapter 6 for details. First choose whether this is stratified by duration of exposure or by level of exposure. Specify the cut points for stratification and for time since first exposure. Specify a lag amount. You may change the names of the person years file and the observed deaths file or accept the default names. **Stratify** will return to the Main Menu when you select the “OK” button after it is done.

9. At the Main menu run the **Analyze** step. See chapter 7 for details. This can print reports directly to the printer or to a file. Select any combination of reports. Choose gender, race, confidence level, and printing options. Tab over to the scrolling list to select majors and minors for the reports. You can choose direct standardization by using “Control X” key combination. Otherwise, use the space bar to select the major/minor. When **Analyze** is finished, you will have the opportunity to select more reports. Select the “Exit” button to get back to the main menu.

C

APPENDIX C. Export File Format

The following is a segment of a typical **Export** file.

```
[-- gender
|[-- race
||[-- age stratum
||| [-- calendar stratum
||| | [-- exposure stratum
||| | | [-- TSFE stratum
||| | | | [-- minor cause of death
||| | | | |  [-- expected deaths (person days * nonexposed rate / 365.25)
||| | | | |  |            [-- observed deaths
||| | | | |  |            |        [-- person days
||| | | | |  |            |        |          [-- rate per year
||| | | | |  |            |        |          |
||| | | | |  |            |        |          |
1101010101005000000000073000000000000002388000000112
1101020101005000000000054000000000000004976000000040
1101030101005000000000193000000000000017654000000040
1101040101005000000001630000000000000020532000000290
1101050101005000000000924000000000000013502000000250
1101060101005000000002687000000000000046733000000210
1101070101005000000001076000000000000033020000000119
1101080101005000000000807000000000000021042000000140
1102010101005000000000376000000000000011742000000117
1102020101005000000001309000000000000060520000000079
1102020102005000000000052000000000000002388000000079
1102030101005000000001526300000000000071529000000325
1102030102005000000000458000000000000005152000000325
1102040101005000000023314000000000000223506000000381
```

Each line represents a different stratum, a specific combination of gender, race, age group, calendar group, cumulative level of exposure group, TSFE group and minor. For example, a run with both sexes, two races, fifteen age groups, ten calendar groups, seven cumulative level of exposure groups , seven TSFE groups will have 2 * 2 * 15 * 10 * 7 * 7 or 29,400 records per minor. A file is created for a given user selected category of death (a minor). If more than one minor is selected this file will be repeated one minor at a time. If you select too many minors you could run out of disk space and the program will stop with an incomplete output file. It is best to keep one minor per file. This will cause the sum of the person days column to equal the number of person days in the study.

The contents of the **Export** file has the following format:

Export File Format

Columns	Description
1	Gender
2	Race
3-4	Age stratum (with leading zeros); 01 refers to first stratum specified in rate file.
5-6	Calendar year stratum (with leading zeros); 01 refers to first stratum specified in rate file.
7-8	Exposure stratum (with leading zeros); 01 refers to the first stratum specified in the Parameter file.
9-10	Time-since-first-exposure stratum (with leading zeros); 01 refers to first stratum specified in the Parameter file.
11-13	Minor cause-of-death category (with leading zeros); 01 refers to minor number one as defined in the rate file.

14-26 Expected number of deaths (with leading zeros) calculated by multiplying expected rate times person years. There may be some roundoff error. There is an implied decimal point after 5 digits, with 8 digits to the right of the decimal point.

27-35 Observed number of deaths (with leading zeros) as summed by the **Stratify** step and read from the observed file specified in the Parameter file.

36-46 Person days (not person years) at risk (with leading zeros) as calculated by the **Stratify** step and read from the person years file specified in the Parameter file. This is all person days for all minors within one GRACEL: gender, race, age group, calendar group, exposure group, latency group.

47-55 Stratum-specific rate from the nonexposed rate file (e.g. rate in the US population) read from the rate file chosen initially for this study. A decimal point is assumed before first digit.

D

APPENDIX D. Table D-1: Details of fields in the Demographics File

Field	Definition	Input Rules	Exception Processing
SSN	Social Security number or other unique worker identification.	Required. Must be unique. Should be padded on left with zeros. For example, 000456789 or 123456789.	Workers with missing SSN's will be deleted. Workers with matching SSN's will be deleted.
last name	Worker's last name	Optional	However, some reports are ordered by last name.
gender	Number which represents the gender of the worker. The default rate file uses "1" for male and "2" for female.	Required	Workers missing gender will be deleted.
race	Number which represents the race of the worker. The default rate file uses "1" for White and "2" for Non-White.	Required. Allowable values for race are those listed in the rate file.	Workers missing race will be deleted. Workers whose values are not specified in the rate file will be deleted.
vital status	A code indicating whether the subject is alive, dead, or unknown vital status.	Required. 1 = alive 2 = dead 3 = unknown vital status.	Workers missing vital status will be deleted.
date of birth	Worker's date of birth	Required. mmddyyyy example - “08081962" The month or the month and the day may be missing. Fill the missing parts with spaces. example - “08 1962"	Workers with missing date of birth will be deleted. Workers with DOB's not in this format will be deleted. July will be substituted for missing months. 15 will be substituted for missing day of month..
PY begin date	Date at which accumulation of worker's person-time begins.	Required when the study option “PY begin” specification method indicates that person-years begin dates will be specified for each worker. mmddyyyy example - “07151984"	Workers missing PY begin date will be deleted. PY begin dates not following this format may cause unpredictable results.
date last observed	Date on which worker was last observed and was not known to be dead. Determines when to end the person-years counter.	Required when DLO is used. mmddyyyy example - “08121976" The month or the month and the day may be missing. Fill the missing parts with spaces. example - ”08 1962" If the worker is dead, the DLO must equal the DOD.	Workers missing DLO will be deleted. Dates not in this format may cause unpredictable results. July will be substituted for missing months. 15 will be substituted for missing day of month. Decedent workers whose DLO does not equal DOD will be deleted.

Field	Definition	Input Rules	Exception Processing
date of death	Worker's date of death	Required for decedent workers. mmddyyyy example - “01011980" The month or the month and day may be missing. Fill missing parts with spaces. example - “01 1980"	Decedent workers missing date of death will be deleted. Dates not in this format may cause unpredictable results. July will be substituted for missing months. 15 will be used for missing day of month.
underlying cause of death	The ICD code for the underlying cause of death	Required for decedent workers. 3 or 4 characters may be entered. Accidental and poisoning deaths are coded with the E-series. The leading E for E-series ICD should not be entered. The decimal point should not be entered.	The residual rate file category will be used if underlying cause of death is missing. Workers having ICD codes of less than 3 characters will be deleted. ICD codes longer than 4 characters may cause unpredictable results. The system does not check this directly. However, analysis of data not conforming to this rule will not be reliable. The residual rate file category will be used. The rate file category used for this worker is not predictable.

E

APPENDIX E. Table E-1: Details of fields in the Work History File

Element	Definition	Input Rules	Exception Processing
SSN	Social Security number or other unique worker identification.	Required. Should be padded on left with zeros. For example, “000456789" or “123456789”	Records missing SSN will be deleted.
work history begin date	Date on which work history begins	Required mmddyyyy example - “05111985"	Records missing WH begin date will be deleted. Dates not in this format may cause unpredictable results.
work history end date	Date on which work history ends	Required mmddyyyy example - “12311987"	Records missing WH end date will be deleted. Dates not in this format may cause unpredictable results.
plant	An identifier of the plant or organization where a subject worked during a given work history record	Required if an area exposure file is being used.	Default exposure level will be used if work history is missing plant.
department	An identifier of the department where a subject worked during a given work history record	Optional	N/A
operation	An identifier of the operation where a subject worked	Optional	N/A

F

APPENDIX F. Table F-1: Details of fields in the Exposure File

Field	Definition	Input Rules	Exception Processing
exposure begin date	beginning date for an exposure period	Required mmddyyyy example - “01011989”	Default exposure is used. Exposure begin dates not in this format may cause unpredictable results.
exposure end date	Ending date for an exposure period	Required mmddyyyy example - “03241990”	Default exposure is used. Exposure end dates not in this format may cause unpredictable results.
exposure level	Level of daily exposure for an exposure period	Required Ten digit; scientific notation may also be used. Must be non-negative.	The default exposure (study option) will be used for records missing exposure. Fields longer than 10 may cause unpredictable results. The default exposure (study option) will be used for negative exposure levels.
SSN	Social security number or other unique worker identification	Required for personal exposure files. Should be padded on left with zeros. For example, “000456789" or “123456789"	The default exposure will be used for workers whose SSN's are not listed in the exposure file.
plant	An identifier of the plant or organization under consideration	Required for area exposure files.	The default exposure will be used for a worker associated with a plant in the work history file if the worker is not associated with that plant in the exposure file.
department	An identifier of the department under consideration	Optional	N/A
operation	An identifier of the operation under consideration	Optional.	N/A

G

APPENDIX G. How to build a structure file

In the input demographics file (see chapter 5, “**Verify**,”), causes of death are shown as World Health Organization's International Classification of Diseases (ICD) codes. The ICD codes were revised nine times. The time during which a given ICD revision is in effect is called an ICD time period.

PC Life Table groups related ICD codes into categories called "minors." LTAS groups minors into larger categories called "majors," each of which contains at least one minor. The **structure file** links ICD codes to NIOSH minors by showing which ICD codes correspond to each NIOSH minor for specified ICD time periods. For every specified period, each minor is listed on a separate line along with the corresponding range of ICD codes. If a minor corresponds to more than one range of ICD codes in a given revision, then the minor is listed on multiple lines, each containing a different ICD range. Entries in the structure file are listed in ascending order by ICD time period and by minor within each time period.

If the life table analysis is based on the NIOSH death categories, then the structure file supplied by NIOSH can be used. If another death classification is used, then a new structure file must be created. A structure file used during an LTAS run must agree with the rate file (rate description file) and rate data file used in the same run. This appendix details the building of a structure file relating ICD codes to NIOSH rates. It can be used as a model for building other structure files.

Types of Records

The structure file contains three types of records:

1. The **number-of-time-periods record** shows the number of ICD time periods to be referenced in the file.

2. The **time period intervals record** lists the ICD time periods to be referenced in the file. The number of time periods listed must equal the entry in the number-of-time-periods record.

3. The **ICD range record** contains the following: (a) The NIOSH Minor Death Category number; (b) The first ICD code in the range; © The last ICD code in the range; (d) The corresponding two digit **ICD Time Period code.**

Data Entry Instructions

In the structure file are several series of records, each corresponding to an ICD time period. Each series consists of one *number-of-time-periods record*, at least one *time period intervals record*, and at least one *ICD range record*. In most structure files, all series contain at least one *ICD range record* for each of the 92 NIOSH minors. The records comprising each series are entered as shown:

1. In the *number-of-time-periods record*, enter the number of ICD time periods as a 2-digit number in columns one and two. Use leading zeros if fewer than ten ICD time periods are used.

2. In the *time period intervals record*, enter the ICD time periods in chronological order. The format should be XXXX-YYYYbXXXX-YYYYb..., where "XXXX" represents the beginning year of the period, "YYYY" represents the final year, and "b" represents a blank. Each interval must be designated by two 4-digit dates in years, and the intervals must be separated from each other by a blank. A line can contain as many as eight time period intervals. By using multiple time period lines, the user may specify any number of time periods desired.

3. Enter the *ICD range records* as follows:

a. Enter the minor death category code in columns one through three; use leading zeros if the minor is less than 100.

b. Enter the first code of the corresponding ICD range in columns 4-7 as a 4-digit

number if the code contains a decimal point; otherwise, enter the code as a 3-digit number followed by a blank or a letter. Use leading zeros if necessary to keep the columns aligned.

! Decimal points are always omitted from the ICD codes listed in the structure file, as are *leading* E's which denote accidents or poisoning.

! A blank in the fourth position of an ICD code in an ICD range record indicates that all ICD codes having the same first three digits are considered equivalent to the NIOSH minor referenced in the record. If the fourth position of an ICD code is a blank, it is always entered as a blank in the structure file.

! If the last ICD time period is the one currently in effect, it should be specified without an end date.

c. Enter the second code of the corresponding ICD range in columns 7-10 as a 4-digit number. If the range contains only one ICD code, then repeat the code entered in columns 3-6.

d. Enter the ICD Time Period Code in columns 11 and 12 as a 2-digit number. Code the earliest time period as "01", the second as "02", etc. For example, Use a leading zero (as shown here) if the code is less than 10.

e. Enter the last line of each series concerning a single ICD time period as "XXXbbbb9999zz," where XXX is the minor for the "All Other Causes of Death" category, "bbbb" denotes a series of four blank spaces, and "zz" is the ICD Time Period Code. The "9999" must appear exactly as shown; for example, a "9998" in this location would result in the record **not** being treated as the last line in the series. Leading zeros are used in coding minors and ICD time period codes less than ten.

Part of a typical structure file is shown on the next page. The first line says that the file relates ICD codes to NIOSH minors for three ICD time periods. The second line lists the time periods. Next is a series of lines representing the first ICD time period. The following series represents the second period. This pattern is continued until all the ICD time periods listed on line two are represented.

```
03                            <-- three time periods follow
1960-1967 1968-1978 1979-1992  <-- range of years for each time period
001001 008901    <-- minor 1 is ICD codes 001 through 008.9 for 1960-1967
002010 019901        (time period 1)
003140 140901
004141 141901
.
.                <-- other records not shown
.
033197 197901
034156B156B01    <-- minor 34 in time period 1 is ICD codes: 156.B,
0341562156201        156.2,
034165 165901        165 through 165.9,
034179 179901        179 through 179.9,
034195 195901        195 through 195.9,
034198 199901        and 198 through 199.9.
035200 200901
035205 205901
036201 201901

096970 979901
.
.                <-- other records not shown
.
097964 964901
097980 985901
099    999901    <-- minor 99 in time period 1 is every other ICD code
001010 012902        that is not yet matched: “    ” through “999.9".
002013 019902        Minor 99 is called the “residual category”.
003140 140902
004141 141902
.
.                <-- other records not shown
.
085680 686903
086690 709903
087711 716903
087720 721903
088730 730903
089710 710903
089717 719903
089722 729903
089731 739903
090780 796903
090798 799903
091800 848903
0919290929103
092850 869903
0929292929203
093880 888903
0939293929303
094890 928903
095930 949903
096950 959903
097960 978903
0980420044903
099    999903
```

H

APPENDIX H. Rate File with example USRATES.RDF

On the following pages is a listing of the default rate file (rate description file) supplied with the system, called “USRATES.RDF.” The first section of this file describes the format of the rate data file and specifies requirements and options for the building of a rate data file. The NIOSH major and minor cause-of-death categories are also described in this section.

In this default file, the user can change the way minors are grouped into majors. The minors must be in ascending order. They are the same minors defined as numbers in the structure file with the “.ICD” extension. See Appendix G to see how the structure file groups the ICD numbers which are used in the demographics file into minors. The Rate File groups minors into majors and assigns labels to the majors and minors. A major includes all the minors after it until another major is defined.

Three is the absolute minimum number of majors that will work properly with LTAS and BLDRATE.EXE. Define a major at the beginning of the list of minors. Define a second major for the cancer series which begins with “=== BEGIN CANCER”. The cancer series begins with the line beginning with a “=”, but could be followed by anything. Last, define a major for the minors which follow the second line beginning with “=” or “=== END CANCER”.

If you are building a rate data file with the BLDRATE.EXE program see Appendix I. The “RATEFILE=” line will need to be changed to the new rate data file. The “ICDFILE=” line might also need to be changed if you make any changes to the way that the ICD numbers are converted to minors. To avoid confusion, the “DESCRIP=” line should be unique for each Rate File because this is what you will see in the list of rates files in LTAS. It is important that the labels section match the number of genders, races, age categories, and calendar categories in the raw rates file used in BLDRATE.EXE.

```
# This is a PC LTAS rate description file. The format is as follows:

# GENERAL RULES: The length of a line is 80 columns.  Short lines are allowed.
#                Long lines are bad practice.  They will be truncated, but this
#                may cause failure of PC LTAS steps when processing the titles
#                or rates.

# FILENAME:  PC LTAS recognizes a file as a rate description file by the
#            extension, which must be '.RDF'.  Also, PC LTAS programs look in
#            the .\RATES subdirectory (the RATES directory subordinate to the
#            directory in which the program is executing) to find rate
#            description files.  These are the only restrictions.

# COMMENTS:  Comment lines may appear anywhere in the file.  Comments begin
#            with the pound sign (#) in column one.
#            TOTALLY Blank lines are also permitted to improve readability.

# KEYWORDS:  Several items of information are specified by the use of a
#            "KEYWORD=" pattern.  That is, each of the following keywords
#            are entered, followed by an equal sign, followed by the
#            appropriate information.  The keywords, associated information
#            and format description follow:

#  RATEFILE:  This keyword is followed by the file name and path of a PC LTAS
#             rate file (with either a DAT or IDX extension).
RATEFILE=RATES\USRATES.DAT

# ICDFILE:  Identifies the PC LTAS ICD structure file.
ICDFILE=RATES\USRATES.ICD

# RATE DESCRIPTION: Free-format text describing the rates (this information is
#                   printed on several reports).
DESCRIP=Standard U.S. Deaths 92 Minors 1940 - 99

# RATIO TYPE: Identifies the associated data as RATES (for SMR runs) or
#             PROPORTIONS (for SMR runs)
RATIOTYPE=RATES

# MULTIPLE CAUSE: TRUE  (Rates may include more than one cause for each death)
#                 FALSE (Rates include only once cause for each death)
MULTICAUSE=FALSE

# LABELS: General rules for label lines:  Labels identify the gender, race
#         age and calendar period categories included in the rate file.  Each
#         label line may identify one or more categories.  If more than one
#         category is specified, each category should be separated by a
#         backslash.  Multiple lines may be used to specify all categories;
#         do not carry over a single label to a new line, do not end a line
#         with a backslash.  Labels must be introduced in the same order in
#         which they appear in the rate file, i.e. if males are coded as one
#         and females as two, MALE should appear first on the gender label line.

# GENDER LABELS: Each label no longer than 8 characters.
GENDERS=   MALE   \  FEMALE

# RACE LABELS: Each label no longer than 20 characters.
RACES=             WHITE
RACES=           NON-WHITE

# AGE LABELS:  Each two characters in size.
#              as
AGES=15 \ 20 \ 25 \ 30 \ 35 \ 40 \ 45 \ 50 \ 55 \ 60 \ 65 \ 70 \ 75 \ 80 \ 85

# CALENDAR PERIOD LABELS:
CALS= 1940 \ 1945 \ 1950 \ 1955 \ 1960 \ 1965
CALS= 1970 \ 1975 \ 1980 \ 1985 \ 1990 \ 1995

# MAJOR and MINOR CATEGORY TITLES:
# Identify each major by a three column number followed by the letter M, then
# the descriptive title of the major category (up to 68 characters).  Follow
# each major title line with title lines for each of the minors included in
# the major.  A minor title line is similar to a major title line, except
```

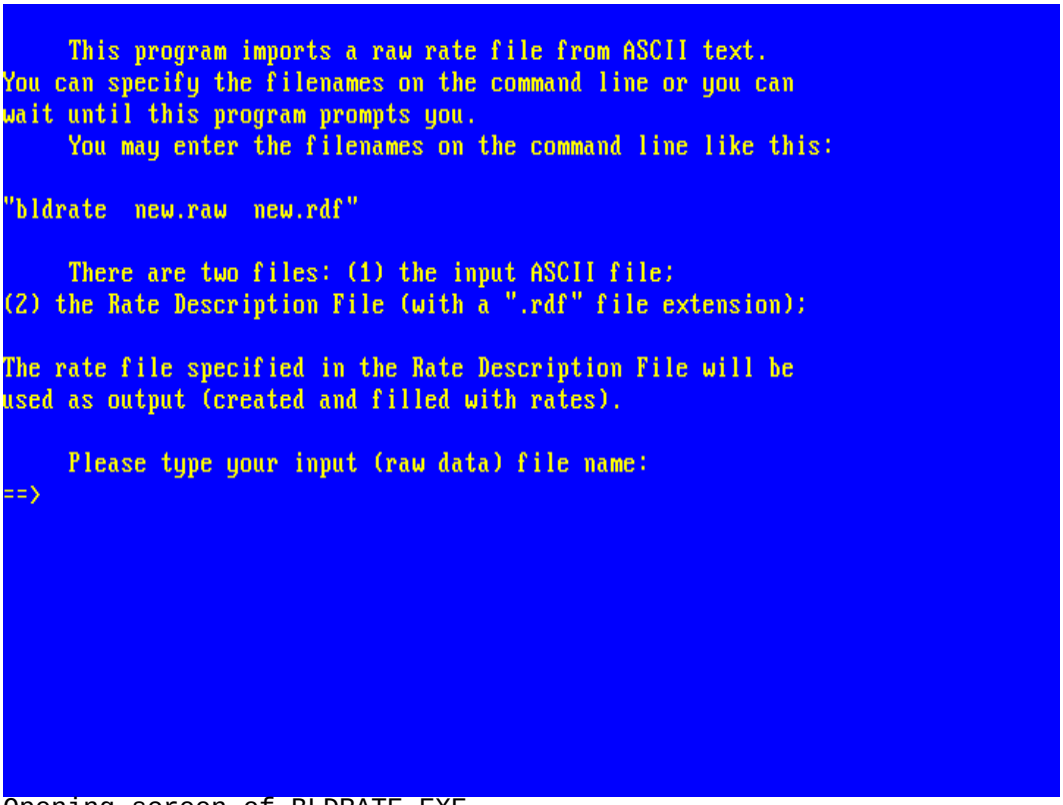
```
# that the letter N is used instead of M.  Majors and minors should be listed
# in ascending order by major/minor number; minor numbers must the minor numbers
# stored on the rate file.

001M TUBERCULOSIS
001N RESPIRATORY TUBERCULOSIS
002N OTHER TUBERCULOSIS

# CANCER BEGIN: Identify the beginning of the cancer series by including a
#               line that begins with an equal sign (=) before the first
#               cancer major.  (The rest of the line may include anything.)
#               The cancer series is reported in the ALL CANCERS line of
#               the analysis step reports.
======= BEGIN CANCER ========
002M MN OF BUCCAL CAVITY AND PHARYNX
003N MN OF LIP
004N MN OF TONGUE
005N MN OF OTHER PARTS OF BUCCAL CAVITY
006N MN OF PHARYNX
003M MN OF DIGESTIVE ORGANS AND PERITONEUM
007N MN OF ESOPHAGUS
008N MN OF STOMACH
009N MN OF INTESTINE EXCEPT RECTUM
010N MN OF RECTUM
011N MN OF BILIARY PASSAGES, LIVER, AND GALL BLADDER
012N MN OF LIVER NOT SPECIFIED
013N MN OF PANCREAS
014N MN OF PERITONEUM AND OTHER AND UNSPECIFIED OF DIGESTIVE ORGANS
004M MN OF RESPIRATORY SYSTEM
015N MN OF LARYNX
016N MN OF TRACHEA, BRONCHUS, AND LUNG
017N MN OF OTHER PARTS OF RESPIRATORY SYSTEM
005M MN OF BREAST
018N MN OF BREAST
006M MN OF FEMALE GENITAL ORGANS
019N MN OF CERVIX UTERI
020N MN OF OTHER AND UNSPECIFIED PARTS OF UTERUS
021N MN OF OVARY, FALLOPIAN TUBE, AND BROAD LIGAMENT
022N MN OF OTHER FEMALE GENITAL ORGANS
007M MN OF MALE GENITAL ORGANS
023N MN OF PROSTATE
024N MN OF OTHER MALE GENITAL ORGANS
008M MN OF URINARY ORGANS
025N MN OF KIDNEY
026N MN OF BLADDER AND OTHER URINARY ORGANS
009M MN OF OTHER AND UNSPECIFIED SITES
027N MN OF SKIN
028N MN OF EYE
029N MN OF BRAIN AND OTHER PARTS OF NERVOUS SYSTEM
030N MN OF THYROID GLAND
031N MN OF BONE
032N MN OF CONNECTIVE TISSUE AND SOFT TISSUE
033N MN OF OTHER AND UNSPECIFIED SITES (MINOR)
010M NEOPLASMS OF LYMPHATIC AND HEMATOPOIETIC TISSUE
034N LYMPHOSARCOMA AND RETICULOSARCOMA
035N HODGKIN'S DISEASE
036N LEUKEMIA AND ALEUKEMIA
037N OTHER NEOPLASMS OF LYMPHATIC HEMATOPOIETIC TISSUE

# END CANCER: Identify the end of the cancer series by placing a line that
#             begins with an equal sign (=) after the last minor in the series.
====== END CANCER ========

011M BENIGN AND UNSPECIFIED NEOPLASMS
038N BENIGN NEOPLASMS OF THE EYE, BRAIN, AND OTHER PARTS OF NERVOUS SYSTEM
039N NEOPLASMS OF EYE, BRAIN, & OTHER PARTS OF NERV SYSTEM UNSPECIF. NATURE
040N OTHER BENIGN AND UNSPECIFIED NATURE NEOPLASMS
012M DIABETES MELLITUS
041N DIABETES MELLITUS
013M DISEASES OF THE BLOOD AND BLOOD FORMING ORGANS
042N PERNICIOUS ANEMIAS
043N ANEMIAS OF OTHER AND UNSPECIFIED TYPE
```

044N COAGULATION DEFECTS, PURPURA, AND OTHER HEMORRHAGIC CONDITIONS
045N ALL OTHER DISEASES OF BLOOD FORMING ORGANS
014M MENTAL, PSYCHONEUROTIC, AND PERSONALITY DISORDERS
046N ALCOHOLISM
047N OTHER MENTAL DISORDERS
015M DISEASES OF THE NERVOUS SYSTEM AND SENSE ORGANS
048N MULTIPLE SCLEROSIS
049N OTHER DISEASES OF THE NERVOUS SYSTEM AND SENSE ORGANS
016M DISEASES OF THE HEART
050N RHEUMATIC HEART DISEASE, INCLUDING FEVER
051N ISCHEMIC HEART DISEASE
052N CHRONIC DISEASE OF ENDOCARDIUM
053N OTHER MYOCARDIAL DEGENERATION
054N HYPERTENSION WITH HEART DISEASE
055N OTHER DISEASES OF THE HEART
017M OTHER DISEASES OF CIRCULATORY SYSTEM
056N HYPERTENSION WITHOUT HEART DISEASE
057N CEREBROVASCULAR DISEASE
058N DISEASES OF THE ARTERIES, VEINS, AND PULMONARY CIRCULATION
018M DISEASES OF THE RESPIRATORY SYSTEM
059N ACUTE RESPIRATORY INFECTIONS EXCEPT INFLUENZA AND PNEUMONIA
060N INFLUENZA
061N PNEUMONIA (EXCEPT NEWBORN)
062N CHRONIC AND UNSPECIFIED BRONCHITIS
063N EMPHYSEMA
064N ASTHMA
065N PNEUMOCONIOSES AND OTHER RESPIRATORY DISEASES
019M DISEASES OF THE DIGESTIVE SYSTEM
066N DISEASES OF THE STOMACH AND DUODENUM
067N HERNIA AND INTESTINAL OBSTRUCTION
068N CIRRHOSIS OF THE LIVER
069N OTHER DISEASES OF DIGESTIVE SYSTEM
020M DISEASES OF THE GENITO-URINARY SYSTEM
070N ACUTE GLOMERULONEPHRITIS, NEPHROTIC SYNDROME, & ACUTE RENAL FAILURE
071N CHRONIC & UNSPEC. NEPHRITIS, RENAL FAILURE, & OTHER RENAL SCLEROSIS
072N INFECTION OF KIDNEY
073N CALCULI OF URINARY SYSTEM
074N HYPERPLASIA OF PROSTATE
075N OTHER DISEASES OF MALE GENITAL ORGANS
076N DISEASES OF THE BREAST
077N DISEASES OF THE FEMALE GENITAL ORGANS
078N OTHER GENITO-URINARY SYSTEM DISEASES
021M DISEASES OF THE SKIN AND SUBCUTANEOUS TISSUE
079N INFECTIONS OF THE SKIN AND SUBCUTANEOUS TISSUE
080N OTHER DISEASES OF THE SKIN AND SUBCUTANEOUS TISSUE
022M DISEASES OF THE MUSCULOSKELETAL SYSTEM AND CONNECTIVE TISSUE
081N ARTHRITIS AND SPONDYLITIS
082N OSTEOMYELITIS AND PERIOSTITIS
083N OTHER DISEASES OF MS SYSTEM
023M SYMPTOMS AND ILL-DEFINED CONDITIONS
084N SYMPTOMS AND ILL-DEFINED CONDITIONS
024M ACCIDENTS
085N TRANSPORTATION ACCIDENTS
086N ACCIDENTAL POISONING
087N ACCIDENTAL FALLS
088N OTHER ACCIDENTS
089N MEDICAL COMPLICATIONS AND MISADVENTURE
025M VIOLENCE
090N SUICIDE
091N HOMICIDE
026M OTHER CAUSES
092N OTHER CAUSES

I

APPENDIX I. How to build a rate data file.

BLDRATE.EXE is a simple program to create a rate data file and its index file. It must be started at the DOS prompt instead of from within LTAS. It takes two parameters in the following order: (1) name of the input raw ASCII file; (2) input rate file (also called “rate description file”). LTAS finds the name of the output rate data file name in the rate (description) file.



Opening screen of BLDRATE.EXE.

The input ASCII file is a list of rates for each minor in the title description file. Note that these are rates per year. Each line lists the rates for all of the minors for one combination of gender/ race/ age group/ calendar group. The rates for each minor begin with a decimal point (a period) and continue with nine digits. These must not contain any spaces, so they must be filled with trailing zeros.

The numbers for gender, race, age category, and calendar category refer to the label defined in the Rate File (see Appendix H). One is the first label, two is the second, etc. This is the same Rate File that is an input file to BLDRATE.EXE. To run LTAS with the new rate file you must also have a structure file with an “.ICD” file extension (see Appendix G). This file is listed in the Rate File on the “ICDFILE=” line.

The easiest way to make a rate file and rate data file is to begin with copies an existing rate file (rate description file) with the “.RDF” file extension and an ICD structure file with a “.ICD” file extension. This example will update the “Standard U.S. Rates NIOSH 92" rate file.

1. Copy the USRATES.RDF file to NEW92.RDF in the same directory.

2. Edit the new copy of the file, NEW92.RDF. If the structure file will be different, change the line “ICDFILE=” to the new structure file. In this example the same file will be used. Change the “RATEFILE=” line to the same name as the output of the BLDRATE.EXE program, for example: “RATEFILE=RATES\NEW92". Change the “DESCRIP=” line to indicate on the printed reports which rate file was used: “DESCRIP= Updated U.S. 92 Minors”. If this will be a multiple cause file change “MULTICAUSE=FALSE” to “MULTICAUSE=TRUE”, and the “DESCRIP=” line should also mention multiple cause. If adding or changing calendar period, update the “CALS=” lines to list the first year of

each group. This is all that needs to be changed in this file because the same majors and minors are being used.

If you want to reduce the majors to an absolute minimum you can make three majors: majors before the cancer series, majors in the cancer series, majors after the cancer series. The lines for majors begin with two digits followed by "M". The lines for minors begin with two digits followed by "N". Before the "01N" line make sure there is a "01M" line with any title that you want to appear in the LTAS program. Remove all the extra lines for majors, except the first major after the "=== BEGIN CANCER" line, and the first major after the "=== END CANCER" line. Change these to majors 02M and 03M with any title. Note that the structure file with the "*.ICD" extension does not use majors.

```
110101.000000000.000000595.000000595.000002381.000000000.000000595
110102.000000712.000000000.000000949.000001186.000000000.000000474
110103.000000000.000000266.000001597.000001597.000000000.000000266
110104.000000000.000000297.000001187.000000594.000000297.000000594
110105.000001576.000000000.000001576.000001576.000001576.000000000
110201.000001327.000000664.000001327.000001327.000000000.000000664
110202.000000492.000002213.000003935.000000984.000000246.000000738
110203.000001673.000000478.000003585.000000478.000000000.000001434
110204.000001320.000001320.000002639.000001056.000000264.000001056
110205.000000000.000000000.000000000.000000000.000000000.000002819
110301.000004306.000002153.000006460.000002871.000001435.000001435
110302.000002072.000001036.000004402.000002590.000000518.000002849
110303.000003061.000002590.000001884.000001413.000000235.000004003
110304.000001383.000001614.000005532.000000922.000000231.000000461
110305.000003586.000002391.000003586.000004781.000000000.000004781
...
121501.000000000.000000000.000000000.000000000.000106564.002557545
121502.000037336.000149343.000224014.000336022.000821386.002501493
121503.000030428.000091283.000212993.000182565.000212993.002221208
121504.000022694.000068083.000181554.000226943.000544662.002224038
121505.000000000.000099404.000000000.000198807.000099404.002286282
210101.000000000.000000000.000003668.000001834.000000000.000000611
210102.000000000.000000000.000001956.000000733.000000000.000000489
210103.000000000.000000275.000003027.000000275.000000000.000000275
210104.000000000.000000310.000002788.000001239.000000000.000000620
210105.000000000.000001656.000001656.000000000.000000000.000000000
210201.000000000.000000000.000003986.000001329.000000000.000000000
210202.000000250.000000999.000004247.000001249.000000000.000001249
210203.000000244.000000488.000001465.000000488.000000000.000000244
210204.000000000.000001367.000004648.000001640.000000000.000000820
210205.000000000.000000000.000004422.000000000.000000000.000000000
...
221401.000000000.000052648.000157945.000052648.000052648.000789723
221402.000000000.000016841.000084205.000084205.000050523.001128345
221403.000000000.000052704.000092231.000079056.000105407.001212185
221404.000000000.000081718.000071503.000061288.000143006.001001042
221405.000000000.000045188.000090375.000000000.000135563.000677813
221501.000000000.000000000.000145433.000072717.000000000.000799884
221502.000000000.000022224.000066671.000044447.000200013.001533436
221503.000000000.000062821.000078526.000047116.000125642.001350651
221504.000000000.000047972.000095944.000047972.000155909.001415174
221505.000000000.000052626.000105252.000052626.000105252.001315651
```

First columns of selected lines from raw rate file for SEER Cancer Rates.

3. Create the rates raw file, new92.raw. This can be typed in a word processor or created with SAS, a spreadsheet, or a database program. There must be one line for each gender/ race/ age category/ calendar category. See the following table for a list of what needs to go into each column. There is a limit of 1000 characters per line,

including the carriage return and line feed. Although this should be sorted to make it easier to edit, BldRate.exe does not require a sorted input file. The output file to BldRate.exe is a file plus an index.

The USRATES.RDF rate file which was copied in step one has two genders, two races, fifteen age labels, and eleven calendar period labels. This will be 660 lines (2 * 2 * 15 * 11 = 660). On each line will be columns for each minor.

Table I-1: Format for raw rates input file for BldRate.exe

Name	Length	Position
gender category	1	1
race category	1	2
age category	2	3-4
calendar category	2	5-6
rate for minor	10	7-16 17-26 27-36 37-46 ... repeat -- one per minor

4. Run BldRate.exe from the DOS prompt. In this example you can enter “bldrate new92.raw new92.RDF". If you do not specify the two input files on the command line, you will be asked for them by the program. The output file will have the name specified in the rate (description) file

5. Test the new rates file by running LTAS. If all the files are in the rates directory you should see a new choice: “Updated U.S. 92 Minors” or whatever else you put into the “DESCRIP=” line in the rate file.

J

APPENDIX J. Additional details of the Verify step

This appendix lists the details of the causes for rejections or corrections, and shows the three error reports, “Except.rpt,” “Experr.rpt,” and “Summary.rpt.” See chapter 5, “**Verify**”, for an overview.

Verify does the following:

! Eliminates input file errors: rejects worker; rejects work history; corrects some problems.

! Eliminates workers rejected for optional criteria: gender/race not selected for analysis.

! Determines values for variables needed in analysis. For example: person year begin; withdrawal date; rate file category for cause of death.

! Reformats files as needed by other LTAS programs. For example: associates exposure information with work history.

! Reports errors and summarizes numbers in a cohort status report and summary of errors.

Workers are rejected by **Verify** for any of the following errors:

! Missing or invalid data for required fields: SSN in Demographic File; Gender; Race; Vital Status; DOB.

! Missing or invalid data for conditionally required fields: PY Begin, if PY Begin specified individually; DLO, if DLO used; DOD, if vital status = 2 (dead); Any COD, if vital status = 2 (dead).

! SSN (in the demographic file) not unique

! Values for Vital Status, DOD, Cause of Death inconsistent: VS = 1 (alive) and any of the following are not blank: DOD, Underlying COD, Contributing COD (CCOD1 through CCOD9; VS = 3 (unknown) and any of the following are not blank: DOD, Underlying COD, any Contributing COD.

! *Date* > Today for any of the following: DOB; PY Begin, if PY Begin specified individually; DOD, if VS = 2 (dead).

! DOB > *Date* for any of the following: DOD, if VS = 2 (dead); WH Begin, for this worker's first WH record; Exp Begin, for this worker's first exp record (personal exp files only).

! DLO < *Date*, if DLO used for any of the following: Exposure End, for this worker's last exp rec (personal exposure files only).

! DOD < *Date*, if VS = 2 (dead) for any of the following: PY Begin, if PY Begin specified individually; WH End, for this worker's last WH record; Exposure End, for this worker's last exp rec (personal exposure files only).

! WH Problems: No WHs are available; More than one WH record has errors; WH not sorted chronologically; More WH than system limit (listed in ch. 10); Can not correct WH End greater than next WH Begin.

! Last WH end for this worker is before Study Begin Date

! WH End > WH Begin of next record

! PY Begin > Study End, if PY Begin specified individually

! Rates Are Not Available:

- **!** Gender is not on the Rate File
- **!** Race not on Rate File
- **!** DOD < Rate File Begin, if VS = 2 (dead)

- DLO < Rate File Begin

- Eliminated by Analysis Options:
  - Gender not Selected
  - Race not Selected

Warnings are issued in the except.rpt report for any of the following:

Table J-1: **Verify** step: conditions and corrections

Condition	Correction
Day or Month and Day missing: DOB DLO DOD	July 15 is used for missing Mon/Day 15 is used for missing Day
Missing Underlying COD, if VS = 2 (dead)	Residual death category used
DLO > Study End, if DLO used	DLO = Study End
DOD > Study End, if VS = 2 (dead)	VS = 1 (alive) DOD = missing DLO = Study End, if DLO used
Age at PY Begin Date < Lowest age category on rate file	PY Begin becomes Jan 1 of the year of DOB + Lowest Age category on rate file
SMR run & VS = 3 (unknown)	VS = 1 (alive)
Worker more than 100 years old at withdrawal	Warning only
No exposure information for this worker	Use default exposure level
DLO not equal to DOD if VS = 2 (dead) and DLO is used	Warning only

Work histories are rejected for any of the following:

- Missing or invalid data for required fields: SSN; WH Begin; WH End.
- WH End > Today
- WH Begin > WH End
- WH Begin > Study End (not considered an error)

The following corrections are made for the work history information:

Condition	Correction
WH End > Study End	WH End = Study End

The default exposure level is used for any of the following exposure file problems:

! Missing or invalid data for required fields: Exposure; Exp Begin; Exp End.

! Exp Begin > Exp End

! Exp End $ Exp Begin of next record

! Exp End > Today

Table J-2: List of fatal errors for **Verify** step

Text of Fatal Error for **Verify** step	Explanation
The input demo file didn't open	The input demographics file did not open. Check to see that the file exists and that it is not already opened by a different program.
The input WH file didn't open	The input work history file did not open. Check to see that the file exists and that it is not already opened by a different program.
The input exp file didn't open	The input exposure file did not open. Check to see that the file exists and that it is not already opened by a different program.
The output demo file didn't open	The output demographics file did not open. Check to see that this file does not already exist. If it does exist and you would like to overwrite it make sure that file attributes are not read only, and that the file is not already open by another program.
The output WH file didn't open	The output work history file did not open. Check to see that this file does not already exist. If it does exist and you would like to overwrite it make sure that file attributes are not “read only”, and that the file is not already open by another program.
The print file didn't open	The print file did not open. If the print files (except.rpt, experr.rpt, summary.rpt) already exist make sure that file attributes are not “read only”, and that the file is not already open by another program.
The input demo file is empty	The input demographics file is empty. Check to see if you are using the correct file name. Check your input data to find or create a nonempty demographic file.
The input WH file is empty	The input work history file is empty. Check to see if you are using the correct file name. Check your input data to find or create a nonempty history file.
The input exp file is empty	The input exposure file is empty. Check to see if you are using the correct file name.

Text of Fatal Error for **Verify** step	Explanation
Exceeded plant/dept limit in exp file	too many plant/department combinations in area exposure file, more than PC LTAS can handle. See chapter 10 for a list of the LTAS limits.
Prob reading param file	problem with reading study parameter file. Try starting over with a new study parameter file.
Prob reading rate description file	problem with reading rate file. Check the source of your rate files. If the file is damaged try reinstalling the rate file again. If you are using your own rate file with BLDRATE.EXE, check the data to see if it is in a valid format.
Demo file not sorted properly	Demographics file not sorted. Sort the file by ascending SSN before using it. One possible way to do this is to use SORT.EXE. At the DOS screen try “type dem.lti | sort > dem2.lti” to sort the dem.lti file line by line in sort and send the output to dem2.lti. Rerun **Verify** step with the new file.
WH file not sorted properly	Work history file not sorted. Sort the file by ascending SSN before using it. See above for an example of using SORT.EXE to sort a text file and send the output to another file. Then you can rerun **Verify** step with the new file.
Unable to display user screens and menus	problem with the screens file. Reinstall PC LTAS to get a fresh copy of the SCREENS.LT file.
ICD file did not open	ICD file did not open. Check to see that the file exists and that it is not already opened by a different program. Find or create the needed ICD file. You might need to reinstall LTAS to replace a damaged ICD file. If you are creating your own rates file you may need to also create new ICD and RDF files. See appendices H and I. ICD file is listed in the Rate File (RDF) after “ICDFILE=”. To find the correct RDF to look into, write down the name which you chose in the rate file list. Look in the files ending in “.RDF” to find a line which begins with “DESCRIP=”, and which is followed by the name that you chose. Avoid having more than one RDF with the same “DESCRIP=” line so that you will know which RDF is being used.
The ICD file is empty	ICD file is empty. Find or create the needed ICD file.
Problem reading no of ICD revs	Problem with the number of ICD revisions. For example, an invalid number.
Problem reading ICD map, line	Problem reading an ICD mapping for a specific line.
No ICD maps read	No ICD mappings were read.

Text of Fatal Error for **Verify** step	Explanation
No of ICD maps exceed limit, line	Too many ICD mappings for this revision. The line number is shown. The LTAS limits are listed in chapter 10.

Table J-3: **Verify** Exceptions Report error messages

Except.rpt Error Message	Explanation
Worker rejections	
Missing SSN - Demo	Demographic file is missing worker number
Invalid Gender	Gender number is missing or is not in the rate file.
Invalid Race	Race number is missing or is not in the rate file.
Invalid Vital Status	Vital status number is missing or is not in the rate file
Invalid DOB	Invalid or missing date of birth
Invalid PY Begin	Invalid or missing person year begin
Invalid DLO, Alive or Unk VS	Invalid or missing date last observed when vital status is alive or unknown
Invalid DOD	Invalid or missing date of death when dead
Invalid COD	Invalid or missing cause of death when dead
Dup SSN - Demo	Duplicate SSN in demographic file
Logic Vital Status	Vital status inconsistent with date of death or cause of death
DOB > Today	Date of birth after today
PY Begin > Today	Person year begin after today
DOD > Today	Date of death after today
DOD < DOB	Date of death before date of birth
WH Begin < DOB	Work history begin before date of birth
PY Begin > DOD	Person year begin after date of death
WH End > DOD	Work history end after date of death
ICD look-up prob	International Classification of Diseases (ICD) code lookup problem
No accepted WHS	No work histories for this worker are available, some may have been rejected.
2 WHS error rejects	Two or more work histories rejected for errors
No Demo matches WH	No demographic file record for the same SSN as the work history
Too many WHs	Too many work histories
WH dates not sorted	Work history dates not sorted. Sort by ascending begin date.
WH Overlap	Work histories overlap
No rates - Gender	No rates for this gender
No rates - Race	No rates for this race
No rates - DOD	No rates for this date of death
No rates - DLO	No rates for this date last observed
Study Begin exclusion	Last work history ends before the study begin date

Except.rpt Error Message	Explanation
PY Begin > Study End	Person year begin after study end
Gender not selected	Gender not selected for analysis
Race not selected	Race not selected for analysis
Alive or Unk VS	PMR run - Alive or unknown vital status
Alive or Unk VS; Non-canc	PCMR run - Alive or unknown vital status or a non-cancer cause of death
No Exposed WHs	No exposed work histories for this worker
Worker warnings and corrections	
DOB - mon/day missing	Date of birth has month and/or day missing
DLO - mon/day missing	Date last observed has month and/or day missing
DOD - mon/day missing	Date of death has month and/or day missing
Dead - Missing UCOD	Dead, missing underlying cause of death
DLO > Study End	Date last observed after study end
DOD > Study End	Date of death after study end
No rates - age	No rates for this age group
Unknown VS - Considered Alive	SMR run and unknown vital status
Worker > 100 yrs old	Warning for worker over 100 years old. No correction
Default Exp Used	Default exposure was used for all of the workers work history records because worker or work area not found in the exposure file.
Invalid DLO - VS=Dead	Date last observed is invalid for dead worker
DLO > Today	Date last observed after today NOTE: Changed from a rejection to warning.
PY Begin < DOB	Person year begin date before date of birth. NOTE: Changed from a rejection (v1.0b) to a warning (v1.0c)
Work History rejections -- error	
Missing SSN - WH	missing SSN in work history file
Invalid WH Begin	invalid or missing work history begin date
Invalid WH End	invalid or missing work history end date
WH End > Today	work history end date greater than today
WH Begin > WH End	work history begin date greater than work history end date
Work History rejections -- not considered as errors	
No demo record	no demographic record matching this work history
One day WH	one day work history
WH Begin > Study End	work history begin is greater than study end.
Work History corrections	
WH End > Study End	work history end is greater than study end.

Table J-4: **Verify** exposure file exceptions report errors listing

error message	explanation
Missing SSN	SSN is missing for a personal exposure file
Missing plant	Plant is missing for an area exposure file
Invalid Exp Begin	Invalid exposure begin date
Invalid Exp End	Invalid exposure end date
Exp Begin > Exp End	Exposure begin date is after exposure begin date
Exp End > Today	Exposure end date is after today
Invalid Exp Level	Invalid exposure level

K

APPENDIX K. Table K-1: Relation between NIOSH 92 death categories and International Classification of Disease (ICD) groupings

Major	Minor	NIOSH 92 Death Categories TITLE	5th Revision 1940-1948	6th Revision 1949	6th, 7th Rev. 1950-1967	8th Revision 1968-1978	9th Revision 1979-
01		Tuberculosis					
	01	Respiratory Tuberculosis	013	001- 008	001- 008	010- 012	010- 012
	02	Other Tuberculosis	014- 022	010- 019	010- 019	013- 019	013- 018
02		Malignant Neoplasms (Mn) of Buccal Cavity and Pharynx					
	03	Mn of Lip	045A	140	140	140	140
	04	Mn of Tongue	045B	141	141	141	141
	05	Mn of Other Parts of Buccal Cavity	045C,E	142- 144	142- 144	142- 145	142- 145
	06	Mn of Pharynx	045F	145- 148	145- 148	146- 149	146- 149
03		Mn of Digestive Organs and Peritoneum					
	07	Mn of Esophagus	046A	150	150	150	150
	08	Mn of Stomach	046B	151	151	151	151
	09	Mn of Intestine Except Rectum	046C,E	152, 153	152, 153	152, 153	152, 153
	10	Mn of Rectum	046D	154	154	154	154
	11	Mn of Biliary Passages and Liver	046F	155, 156, 156A, 156.1	155	155, 156	155.0, 155.1, 156
	12	Mn of Liver Not Specified	No rates	No rates	156, 156A, 156.1	197.8	155.2
	13	Mn of Pancreas	046G	157	157	157	157
	14	Mn of Peritoneum and Unspecified of Digestive Organs	046H,M	158, 159	158, 159	158, 159	158, 159
04		Mn of Respiratory System					
	15	Mn of Larynx	047A	161	161	161	161
	16	Mn of Trachea, Bronchus, and Lung	047B- F	162, 163	162, 163	162	162
	17	Mn of Other Parts of Respiratory System	No rates	No rates	160, 164	160, 163	160, 163-165
05		Mn of Breast					
	18	Mn of Breast	050	170	170	174	174- 175
06		Mn of Female Genital Organs					
	19	Mn of Cervix Uteri	No rates	No rates	171	180	180
	20	Mn of Other Parts of Uterus	048	172- 174	172- 174	181, 182	179, 181, 182
	21	Mn of Ovary, Fallopian Tube, and Broad Ligament	049A,B	175	175	183	183
06		Mn of Female Genital Organs					
	22	Mn of Other Female Genital Organs	049C- E	176	176	184	184
07		Mn of Male Genital Organs					
	23	Mn of Prostate	051B	177	177	185	185
	24	Mn of Other Male Genital Organs	051A, 051C- E	178- 179	178- 179	172.5, 173.5, 186, 187	186, 187
08		Mn of Urinary Organs					
	25	Mn of Kidney	052A	180	180	189.0- 189.2	189.0- 189.2
	26	Mn of Bladder and Other Urinary Organs	052B,C	181	181	188, 189.9	188, 189.3- 189.9

Major	Minor	NIOSH 92 Death Categories TITLE	5th Revision 1940-1948	6th Revision 1949	6th, 7th Rev. 1950-1967	8th Revision 1968-1978	9th Revision 1979-
09		Mn of Other and Unspecified Sites					
	27	Mn of Skin	053	190, 191	190, 191	172.0-172.4, 172.6-172.9, 173.0-173.4, 173.6-173.9,	172, 173
	28	Mn of Eye	No rates	No rates	192	190	190
	29	Mn of Brain and Other Parts of Nervous System	054	193	193	191, 192	191, 192
	30	Mn of Thyroid Gland	No rates	No rates	194	193	193
	31	Mn of Bone	No rates	No rates	196	170	170
	32	Mn of Connective Tissue	No rates	No rates	197	171	171
	33	Mn of Other and Unspecified Sites (Minor)	045D, 055	156B, 156.2, 160, 164, 165, 192, 194- 203, 205	156B, 156.2, 165, 195, 198, 199	194- 196, 197.0-197.7, 197.9, 198, 199	194- 199
10		Neoplasms of Lymphatic and Hematopoietic Tissue					
	34	Lymphosarcoma and Reticulosarcoma	No rates	No rates	200	200	200
	35	Hodgkin's Disease	No rates	No rates	201	201	201
	36	Leukemia and Aleukemia	074	204	204	204- 207	204- 208
	37	Other Neoplasms of Lymphatic and Hematopoietic Tissue	No Rates	No rates	202, 203, 205	202, 203	202, 203
11		Benign and Unspecified Neoplasms of the Brain					
	38	Benign Neoplasms of the Eye, Brain, and Other Parts of Nervous System	056D	223	223	224, 225	224, 225
11		Benign and Unspecified Neoplasms of the Brain					
	39	Neoplasms of Unspecified Nature of Eye, Brain, and Other Parts of Nervous System	057D	237	237	238, 743.4	237.5-237.9, 239.6-239.7
	40	Other Benign and Unspecified Nature Neoplasms	056A- C, 056, 057A- C, 057	210- 222, 224- 236, 238- 239	210- 222, 224- 236, 238- 239	208, 210-223, 226- 237, 239	210-223, 226-237.4, 238.0-239.5, 239.8-239.9
12		Diabetes Mellitus					
	41	Diabetes Mellitus	061	260	260	250	250
13		Diseases of the Blood and Blood Forming Organs					
	42	Pernicious Anemias	073A	290	290	281.0, 281.9	281.1, 281.9
	43	Anemias of Other and Unspecified Type	073B- D	291- 293	291- 293	280, 281.1-281.4, 282- 285	280, 281.1-281.8, 282- 285

Major	Minor	NIOSH 92 Death Categories TITLE	5th Revision 1940-1948	6th Revision 1949	6th, 7th Rev. 1950-1967	8th Revision 1968-1978	9th Revision 1979-
	44	Coagulation Defects, Purpura and Other Hemorrhagic Conditions	072	296	296	286, 287	286, 287
	45	All Other Diseases of Blood Forming Organs	075, 076	294, 295, 297- 299	294, 295, 297- 299	209, 288, 289	288, 289
14		Mental, Psychoneurotic, and Personality Disorders					
	46	Alcoholism	077	322	322	303	303
	47	Other Mental Disorders	079, 084	300- 321, 323- 326	300- 321, 323- 326	290- 302, 304- 315	290- 302, 304- 319
15		Disorders of the Nervous System and Sense Organs					
	48	Multiple Sclerosis	087	345	345	340	340
	49	Other Diseases of the Nervous System and Sense Organs	080- 082, 085- 086, 088, 089	340- 344, 350- 398	340- 344, 350- 398	320- 333, 341- 389	320- 337, 341- 389
16		Diseases of the Heart					
	50	Rheumatic Heart Disease, Including Fever	058, 090A, 092B- 092C, 093C, 095B	400- 402, 410- 416	400- 402, 410- 416	390- 398	390- 398
	51	Ischemic Heart Disease	093D, 094	420	420	410- 414	410- 414
	52	Chronic Disease of Endocardium	091C, 092A, 092D, 092E	421	421	424	424
	53	Other Myocardial Degeneration	093B, 093E	422	422	428	429.0, 429.1
	54	Hypertension with Heart Disease	131A	440- 443	440- 443	400.1, 400.9, 402, 404	402, 404
	55	Other Diseases of the Heart	090B, 091A, 091B, 093A, 095A,C	430- 434	430- 434	420- 423, 425- 427, 429	420- 423, 425- 428, 429.2- 424.9
17		Other Diseases of the Circulatory System					
	56	Hypertension without Heart Disease	102	444- 447	444- 447	400, 400.2,400 .3, 401, 403	401, 403, 405
	57	Cerebrovascular Disease	083	330- 334	330- 334	430- 438	430- 438
	58	Diseases of the Arteries, Veins, and Pulmonary Circulation	096- 101, 103	450- 468	450- 468	440- 444.1, 444.3- 458	415- 417, 440- 459
18		Diseases of the Respiratory System					
	59	Acute Respiratory Infections Except Influenza and Pneumonia	104, 105	470- 475, 500	470- 475, 500	460- 466	460- 466
	60	Influenza	033	480- 483	480- 483	470- 474	487
	61	Pneumonia (except newborn)	107- 109	490- 493	490- 493	480- 486	480- 486
	62	Chronic and Unspecified Bronchitis	106	501, 502	501, 502	490, 491	490, 491
	63	Emphysema	113	527.1	527.1	492	492
	64	Asthma	112	241	241	493	493

Major	Minor	NIOSH 92 Death Categories TITLE	5th Revision 1940-1948	6th Revision 1949	6th, 7th Rev. 1950-1967	8th Revision 1968-1978	9th Revision 1979-
	65	Pneumoconiosis and Other Respiratory Diseases	110, 111, 114A- E	510- 527.0, 527.2	510- 527.0, 527.2	500- 519	470- 478, 494- 519
19		Diseases of the Digestive System					
	66	Diseases of the Stomach and Duodenum	117, 118	540, 541, 543	540, 541, 543	531- 537	531- 537
	67	Hernia and Intestinal Obstruction	122	560, 561, 570	560, 561, 570	550- 553, 560	550- 553, 560
	68	Cirrhosis of the Liver	124	581	581	571	571
	69	Other Diseases of Digestive System	115, 116, 119- 121, 123, 125- 129	530- 539, 542, 544, 545, 550- 553, 571- 578, 580, 582- 587	530- 539, 542, 544, 545, 550- 553, 571- 578, 580, 582- 587	444.2, 520- 530, 540- 543, 561- 570, 572- 577	520- 530, 540- 543, 555- 558, 562- 570, 572- 579
20		Diseases of the Genito-urinary System					
	70	Acute Glomerulonephritis Nephrotic Syndrome and Acute Renal Failure	130	590	590, 591	580, 581	580, 581 584
	71	Chronic and Unspecified Nephritis and Renal Failure and Other Renal Sclerosis	131B, 132	592- 594	592- 594	582- 584	582, 583 585- 587
	72	Infection of Kidney	133	600	600	590	590
	73	Calculi of Urinary System	134	602, 604	602, 604	592, 594	592, 594
	74	Hyperplasia of Prostate	137	610	610	600	600
	75	Other Diseases of Male Genital Organs	138	611- 617	611- 617	601- 607	601- 608
	76	Diseases of the Breast	No rates	No rates	620, 621	610, 611	610, 611
	77	Diseases of the Female Genital Organs. (Contains breast disease prior to 1950)	139	620- 637	622- 637	612- 629	614- 629
	78	Other Genito- Urinary System Organs	135- 136	591, 601 603 605- 609	601, 603 605- 609	591, 593 595- 599	588, 589 591, 593 595- 599
21		Diseases of the Skin and Subcutaneous Tissue					
	79	Infections of the Skin and Subcutaneous Tissue	151- 152	690- 698	690- 698	680- 686	680- 686
	80	Other Diseases of the Skin and Subcutaneous Tissue	153	700- 716	700- 716	690- 708	690- 709
22		Disease of the Musculoskeletal System and Connective Tissue					
	81	Arthritis and Spondylitis	59	720- 727	720- 725	710- 715	711- 716 720, 721
	82	Osteomyelitis and Periostitis	154	730	730	720	730
	83	Other Diseases of MS System	155, 156	731- 749	731- 749 726- 727	716- 718 721- 738	710, 717- 719 722- 729 731- 739
23		Symptoms and Ill- defined Conditions					

Major	Minor	NIOSH 92 Death Categories TITLE	5th Revision 1940-1948	6th Revision 1949	6th, 7th Rev. 1950-1967	8th Revision 1968-1978	9th Revision 1979-
	84	Symptoms and Ill-Defined Conditions	162, 199 200	780- 793 795	780- 793 795	780- 793 795, 796	780- 796, 798 799
24		Accidents					
	85	Transportation Accidents	169- 173	E800- E866	E800- E866	E800- E845 E940- E941	E800- E848 E929.0- E929.1
	86	Accidental Poisoning	078, 178 179	E870- E895	E870- E895	E850- E877 E942	E850- E869 E929.2
	87	Accidental Falls	186A	E900- 904	E900- 904	E880- E887 E943	E880- E888 E929.3
	88	Other Accidents	174- 177 180- 185 186B- 194 195C- E	E910- E936 E960- E962	E910- E936 E960- E962	E890- E929 E944- E946	E890- E928 E929.4- E929.9
	89	Medical Complications and Misadventure	195A,B	E940- E959	E940- E959	E930- E936 E947- E949	E870- E879 E930- E949
25		Violence					
	90	Suicide	163, 164	E963 E970- E979	E963 E970- E979	E950- E959	E950- E959
	91	Homicide	165- 168 198	E964 E980- E985	E964 E980- E985	E960- E978	E960- E978
26		Other Causes					
	92	Other Causes	Residual and blank	Residual and blank	Residual and blank	Residual and blank	Residual and blank

L

APPENDIX L. Table L-1: Expanded NIOSH Death Categories: NIOSH 99

Major	Minor	Expanded NIOSH 99 Death Categories TITLE	6th, 7th Rev. 1950-1967	8th Revision 1968-1978	9th Revision 1979-
01		Tuberculosis			
	01	Respiratory Tuberculosis	001- 008	010- 012	010- 012
	02	Other Tuberculosis	010- 019	013- 019	013- 018
02		Malignant Neoplasms (Mn) of Buccal Cavity and Pharynx			
	03	Mn of Lip	140	140	140
	04	Mn of Tongue	141	141	141
	05	Mn of Other Parts of Buccal Cavity	142- 144	142- 145	142- 145
	06	Mn of Pharynx	145- 148	146- 149	146- 149
03		Mn of Digestive of Organs and Peritoneum			
	07	Mn of Esophagus	150	150	150
	08	Mn of Stomach	151	151	151
	09	Mn of Intestine Except Rectum	152, 153	152, 153	152, 153
	10	Mn of Rectum	154	154	154
	11	Mn of Biliary Passages, Liver, & Gall Bladder	155	155, 156	155.0, 155.1, 156
	12	Mn of Liver Not Specified	156A, 156.1	197.8	155.2
	13	Mn of Pancreas	157	157	157
	14	Mn of Peritoneum & Other & Unspecified of Digestive Organs	158, 159	158, 159	158, 159
04		Mn of Respiratory System			
	15	Mn of Larynx	161	161	161
	16	Mn of Trachea, Bronchus & Lung	162, 163	162	162
	17	Mn of Other Parts of Respiratory	160, 164	160, 163	160, 163-165
05		Mn of Breast			
	18	Mn of Breast	170	174	174- 175
06		Mn of Female Genital Organs			
	19	Mn of Cervix Uteri	171	180	180
	20	Mn of Other Unspecified Parts of Uterus	172, 174	181, 182	179, 181-182
	21	Mn of Ovary, Fallopian Tube, & Broad Ligament	175	183	183
	22	Mn of Other Female Genital Organs	176	184	184
07		Mn of Male Genital Organs			
	23	Mn of Prostate	177	185	185
	24	Mn of Testes	178	172.5, 173.5, 186	186
08		Mn of Urinary Organs			
	25	Mn of Kidney	180	189.0- 189.2	189.0- 189.2
	26	Mn of Bladder & Other Urinary Organs	181	188, 189.9	188, 189.3-189.9
09		Mn of Other and Unspecified Sites			
	27	Melanoma	190	172.0-172.4, 172.6- 172.9	172
	28	Other Mn of Skin	191	173.0-173.4, 173.6- 173.9	173
	29	Mn of Eye	192	190	190

Major	Minor	Expanded NIOSH 99 Death Categories TITLE	6th, 7th Rev. 1950-1967	8th Revision 1968-1978	9th Revision 1979-
	30	Mn of Brain & Other Parts of Nervous System	193	191, 192	191, 192
	31	Mn of Thyroid Gland	194	193	193
	32	Mn of Bone	196	170	170
	33	Mn of Connective Tissue	197	171	171
	34	Mn of Other & Unspecified Sites (Minor)	156B, 156.2, 165, 179, 195, 198, 199	187, 194-196, 197.0-197.7, 197.9, 198, 199	187, 194-199
10		Neoplasms of Lymphatic and Hematopoietic Tissue			
	35	Non-Hodgkin's Lymphoma	200, 205	200, 202	200, 202
	36	Hodgkin's Disease	201	201	201
	37	Leukemia & Aleukemia	204	204- 207	204- 208
	38	Myeloma	202, 203	203	203
11		Benign and Unspecified Neoplasms of the Brain			
	39	Benign Neoplasms of the Eye, Brain, & Other Parts of Nervous System	223	224, 225	224, 225
	40	Neoplasms of Unspecified Nature of Eye, Brain & Other Parts of Nervous System	237	238, 743.4	237.5-237.9, 239.6- 239.7
	41	Other Benign & Unspecified Nature Neoplasms	210- 222, 224- 236, 238- 239	208, 210-223, 226-237, 239	210- 223, 226- 237.4, 238.0- 239.5
12		Diabetes Mellitus			
	42	Diabetes Mellitus	260	250	250
13		Diseases of the Blood and Blood Forming Organs			
	43	Pernicious Anemias	290	281.0, 281.9	281.0, 281.9
	44	Anemias of Other & Unspecified Type	291- 293	280, 281.1-281.4	280, 281.1-281.8, 282-285
13		Diseases of the Blood and Blood Forming Organs			
	45	Coagulation Defects, Purpura & Other Hemorrhagic Conditions	296	286, 287	286, 287
	46	All Other Disease of Blood Forming Organs	294, 295, 297- 299	209, 288, 289	288, 289
14		Mental Psychoneurotic and Personality Disorders			
	47	Alcoholism	322	303	303
	48	Other Mental Disorder	300- 321, 323- 326	290- 302, 304- 315	290- 302, 304- 319
15		Diseases of the Nervous System and Sense Organs			
	49	Multiple Sclerosis	345	340	340
	50	Other Diseases of the Nervous System & Sense Organs	340- 344, 350- 398	320- 333, 341- 389	320- 337, 341- 389
16		Diseases of the Heart			
	51	Rheumatic Heart Disease, Including Fever	400- 402, 410- 416	390- 398	390- 398
	52	Ischemic Heart Disease	420	410- 414	410- 414, 429.2
	53	Chronic Disease of Endocardium	421	424	424
	54	Other Myocardial Degeneration	422	428	429.0, 429.1

Major	Minor	Expanded NIOSH 99 Death Categories TITLE	6th, 7th Rev. 1950-1967	8th Revision 1968-1978	9th Revision 1979-
	55	Hypertension with Heart Disease	440- 443	400.1, 400.9, 402, 404	402, 404
	56	Cardiomyopathy*	no code	425	425
	57	Conductive Disorder	433- 433.2	427.3- 427.9	426, 427
	58	Other Disease of the Heart	430- 432, 433.3- 434.9	420- 423, 426- 427.2	420- 423, 428, 429
17		Other Diseases of the Circulatory System			
	59	Hypertension without Heart Disease	444- 447	400.0, 400.2, 400.3, 401, 403	401, 403, 405
	60	Cerebrovascular Disease	330- 334	430- 438	430- 438
	61	Diseases of the Arteries, Veins & Pulmonary Circulation	450- 468	440- 444.1, 444.3- 458	415- 417, 440- 459
18		Diseases of the Respiratory System			
	62	Acute Respiratory Infections Except Influenza & Pneumonia	470- 475, 500	460- 466	460- 466
	63	Influenza	480- 483	470- 474	487
	64	Pneumonia (except newborn)	490- 493	480- 486	480- 486
	65	Chronic & Unspecified Bronchitis	501, 502	490, 491	490, 491
	66	Emphysema	527.1	492	492
	67	Asthma	241	493	493
	68	Asbestosis	523.3	515.2	501
	69	Silicosis	523.0	515.0	502
	70	Other Pneumoconioses	523.1- 523.2, 523.4- 523.9	515.1, 515.3- 516.0	500, 503, 505
	71	Other Respiratory Diseases	510- 522, 524- 527.0, 527.2	500- 514, 516.1- 519	470- 478, 494- 499, 504, 506- 519
19		Diseases of the Digestive System			
	72	Diseases of the Stomach & Duodenum	540, 541, 543	531- 537	531- 537
	73	Hernia & Intestinal Obstruction	560, 561, 570	550- 553, 560	550- 553, 560
	74	Cirrhosis of the Liver	581	571	571
	75	Other Diseases of Digestive System	530- 539, 542, 544, 545, 550- 553, 571- 578, 580, 582- 587	444.2, 520- 530, 540- 543, 561- 570, 572- 577	520- 530, 540- 543, 555- 558, 562- 570, 572- 579
20		Diseases of the Genito- urinary System			
	76	Acute Glomerulonephritis Nephrotic Syndrome & Acute Renal Failure	590, 591	580, 581	580, 581, 584
	77	Chronic & Unspecified Nephritis & Renal Failure & Other Renal Sclerosis	592- 594	582- 584	582, 583, 585- 587
	78	Infection Kidney	600	590	590
	79	Calculi of Urinary System	602, 604	592, 594	592, 594
	80	Hyperplasia o Prostate	610	600	600

Major	Minor	Expanded NIOSH 99 Death Categories TITLE	6th, 7th Rev. 1950-1967	8th Revision 1968-1978	9th Revision 1979-
	81	Other Diseases of Male Genital Organs	611- 617	601- 607	601- 608
	82	Diseases of the Breast	620, 621	610, 611	610, 611
	83	Diseases of the Female Genital Organs	622- 637	612- 629	614- 629
	84	Other Genito- Urinary System Diseases	601, 603, 605- 609	591, 593, 595- 599	588, 589, 591, 593, 595- 599
21		Diseases of the Skin and Subcutaneous Tissue			
	85	Infections of the Skin & Subcutaneous Tissue	690- 698	680- 686	680- 686
	86	Other Diseases of the Skin &Subcutaneous Tissues	700- 716	690- 708	690- 709
22		Diseases of the Musculoskeletal System and Connective System			
	87	Arthritis & Spondylitis	720- 725	710- 715	711- 716, 720, 721
	88	Osteomyelitis & Periperiostitis	730	720	730
	89	Other Diseases of the MS System	726- 727	716- 718	710, 717- 719
23		Symptoms and Ill- defined Conditions			
	90	Symptoms & Ill- Defined Conditions	780- 793, 795	780- 793, 795, 796	780- 796, 798, 799
24		Accidents			
	91	Transportation Accidents	E800- E866	E800- E845, E940- E941	E800- E848, E929.0- E929.1
	92	Accidental Poisoning	E870- E895	E850- E877, E942	E850- E869, E929.2
	93	Accidental Falls	E900- E904	E880- E887, E943	E880- E888, E929.3
	94	Other Accidents	E910- E936, E960- E962	E890- E929, E944- E946	E890- E928, E929.4- E929.9
	95	Medical Complications & Misadventure	E940- E959	E930- E936, E947- E949	E870- E879, E930- E949
25		Violence			
	96	Suicide	E963, E970- E979	E950- E959	E950- E959
	97	Homicide	E964, E980- E985	E960- E978	E960- E978
26		HIV-related			
	98	HIV-related	no code	no code	042- 044**
27		Other Causes			
	99	Other Causes	residual & blank	residual & blank	residual & blank

* NIOSH rates for 1965-1969 are an underestimate of actual rates, as only 2 years of data are available. However observed should conform to expected, absent any exposure effect. No rates are available prior to 1965.

** NIOSH rates for 1975-1979 are an underestimate, as data are available fr only 1979. However observed should conform to expected, absent any exposure effect. No rates are available prior to 1975.

M

APPENDIX M. Table M-1: NIOSH Categories for SEER Cancer Incidence Rate File.

major	minor	SEER Cancer Incidence Rate title	8th Revision 1970 - 1978	9th Revision 1979 - present
1		Buccal Cavity and Pharynx		
	1	Mn of Lip	140 - 140.9	140 - 140.9
	2	Mn of Tongue	141 - 141.9	141 - 141.9
	3	Mn of Other Parts of Buccal Cavity	142 - 145.9	142 - 145.9
	4	Mn of Pharynx	146 - 149.9	146 - 149.9
2		Digestive Organs and Peritoneum		
	5	Mn of Esophagus	150 - 150.9	150 - 150.9
	6	Mn of Stomach	151 - 151.9	151 - 151.9
	7	Mn of Intestine Except Rectum	152 - 153.9	152 - 153.9
	8	Mn of Rectum	154 - 154.9	154 - 154.9
	9	Mn of Biliary Passages, Liver, and Gall Bladder	155 - 155.9 156 - 156.9	155 - 155.1 156 - 156.9
	10	Mn of Liver Not Specified	197.8 -197.8	155.2 - 155.2
	11	Mn of Pancreas	157 - 157.9	157 - 157.9
	12	Mn of Peritoneum and Other and Unspecified of Digestive Organs	158 - 159.9	158 - 159.9
3		Respiratory System		
	13	Mn of Larynx	161 - 161.9	161 - 161.9
	14	Mn of Trachea, Bronchus and Lung	162 - 162.9	162 - 162.9
	15	Mn of Other Parts of Respiratory System	160 - 160.9 163 - 163.9	160 - 160.9 163 - 165.9
4		Breast		
	16	Mn of Breast	174 - 174.9	174 - 175.9
5		Female Genital Organs		
	17	Mn of Cervix Uteri	180 - 180.9	180 - 180.9
	18	Mn of Other and Unspecified Parts of Uterus	181 - 182.9	179 - 179.9 181 - 182.9
	19	Mn of Ovary, Fallopian Tube and Broad Ligament	183 - 183.9	183 - 183.9
	20	Mn of Other Female Genital Organs	184 - 184.9	184 - 184.9
6		Male Genital Organs		
	21	Mn of Prostate	185 - 185.9	185 - 185.9
	22	Mn of Testes	172.5 - 172.5 173.5 - 173.5 186 - 186.9	186 - 186.9
7		Urinary Organs		
	23	Mn of Kidney	189.0 - 189.2	189.0 - 189.2
	24	Mn of Bladder and Other Urinary Organs	188 - 188.9 189.9 - 189.9	188.0 - 188.9 189.3 - 189.9
8		Other and Unspecified Sites		
	25	Mn of Skin Melanoma	172.0 - 172.4 172.6 - 172.9	172 - 172.9
	26	Other Mn of Skin	173.0 - 173.4 173.6 - 173.9	173 - 173.9
	27	Mn of Eye	190 - 190.9	190 - 190.9
	28	Mn of Brain and Other Parts of Nervous System	191 - 192.9	191 - 192.9
	29	Mn of Thyroid Gland	193 - 193.9	193 - 193.9
	30	Mn of Bone	170 - 170.9	170 - 170.9
	31	Mn of Connective Tissue	171 - 171.9	171 - 171.9
	32	Mn of Other and Unspecified Sites (Minor)	187 - 187.9 194 - 196.9 197.0 - 197.7 197.9 - 197.9 198 - 199.9	187 - 187.9 194 - 199.9

major	minor	SEER Cancer Incidence Rate title	8th Revision 1970 - 1978	9th Revision 1979 - present
9		Neoplasms of Lymphatic and Haematopoietic Tissue		
	33	Non-Hodgkins Lymphoma	200 - 200.9 202 - 202.9	200 - 200.9 202 - 202.9
	34	Hodgkin's Disease	201 - 201.9	201 - 201.9
	35	Leukemia and Aleukemia	204 - 207.9	204 - 208.9
	36	Myeloma	203 - 203.9	203 - 203.9
10		Other Causes		
	37	Other Causes	residual & blank	residual & blank

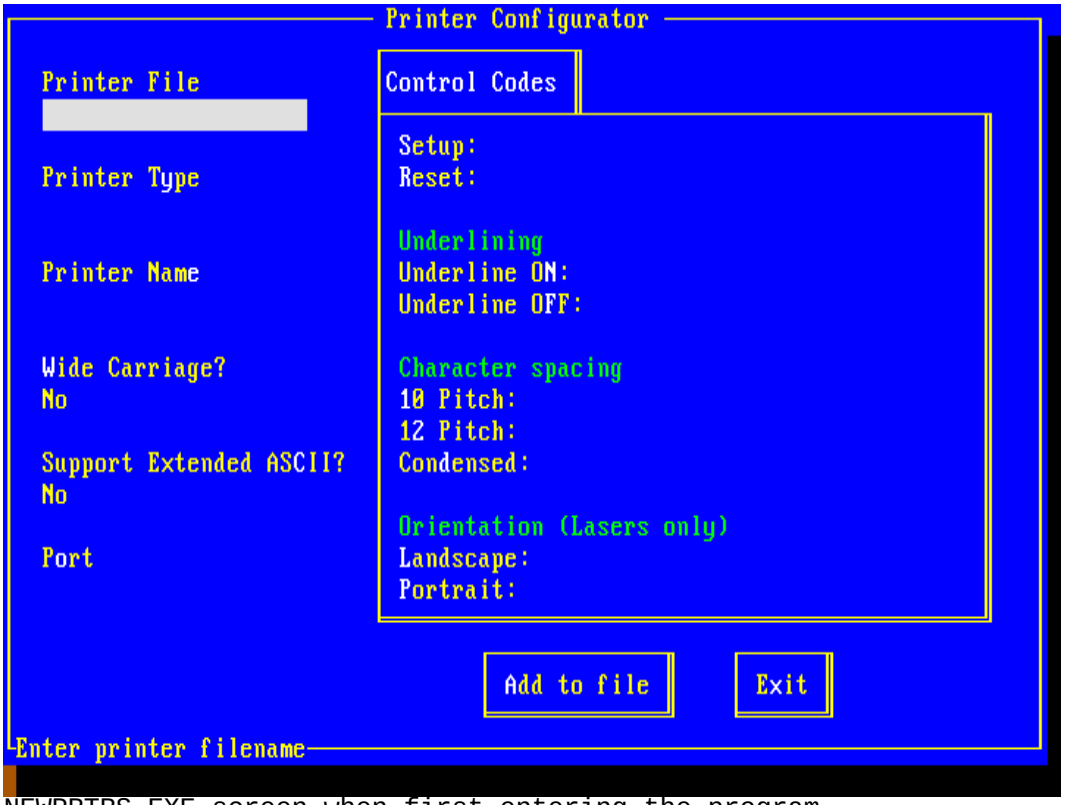
N

APPENDIX N. Printer configuration with NEWPRTRS.EXE.

PC LTAS comes with a printer configuration file called PRINTERS.LT. New printers can be added to this file or to a new file with NEWPRTRS.EXE. This is a utility which is started at the DOS prompt with the command “newprtrs”. The following figures show how it appears on the screen.

To enter a new printer you will need to read the printer manual to find the printer control codes. These are the characters to send to the printer to change its font, character spacing, character size, print direction, etc. Sometimes these are called “escape sequences” because they often begin with the escape character. You will need to enter the printer characters as pairs of hexadecimal bytes. Sometimes manuals will give these values as decimal numbers or as abbreviations. Use the table of ASCII characters at the end of this appendix to convert characters or decimal numbers into hexadecimal.

Tables of printer control characters are included in this appendix.



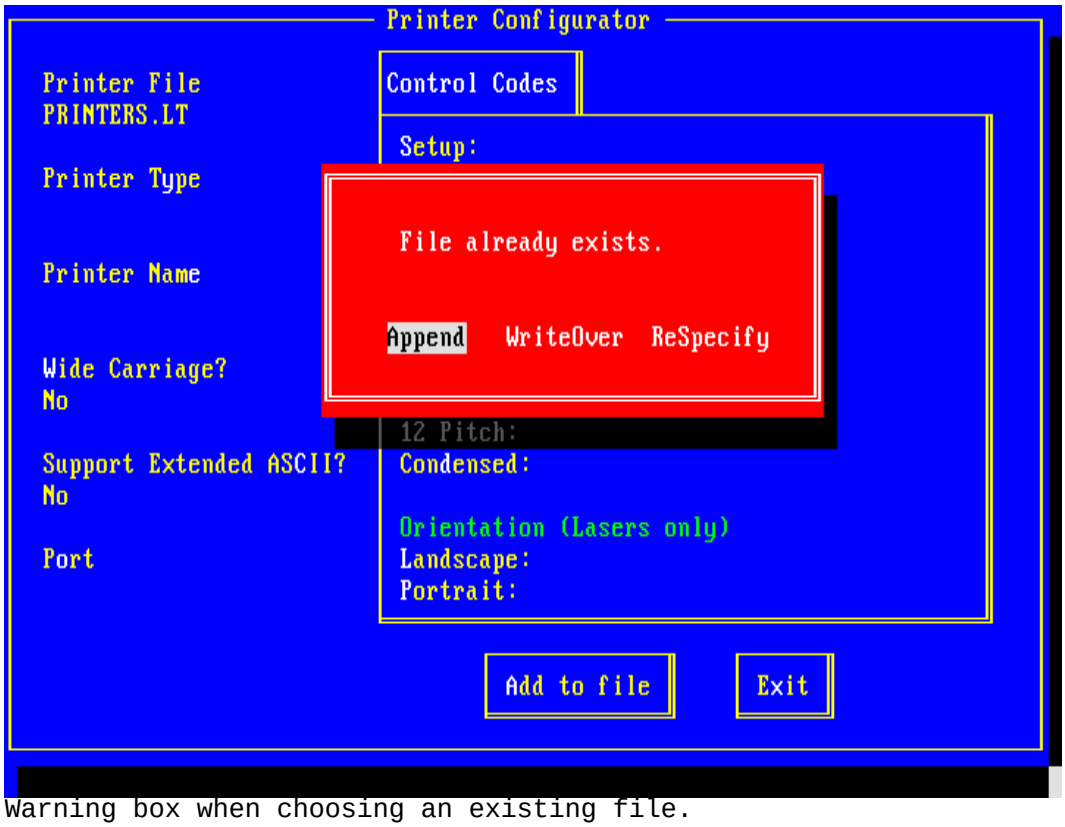
NEWPRTRS.EXE screen when first entering the program.

It is also necessary to identify the output port to which the printer is connected. By pressing the spacebar, NEWPRTRS cycles through a list available ports (generally LPT1 through LPTn for parallel ports and COM1 through COMn for serial ports.)

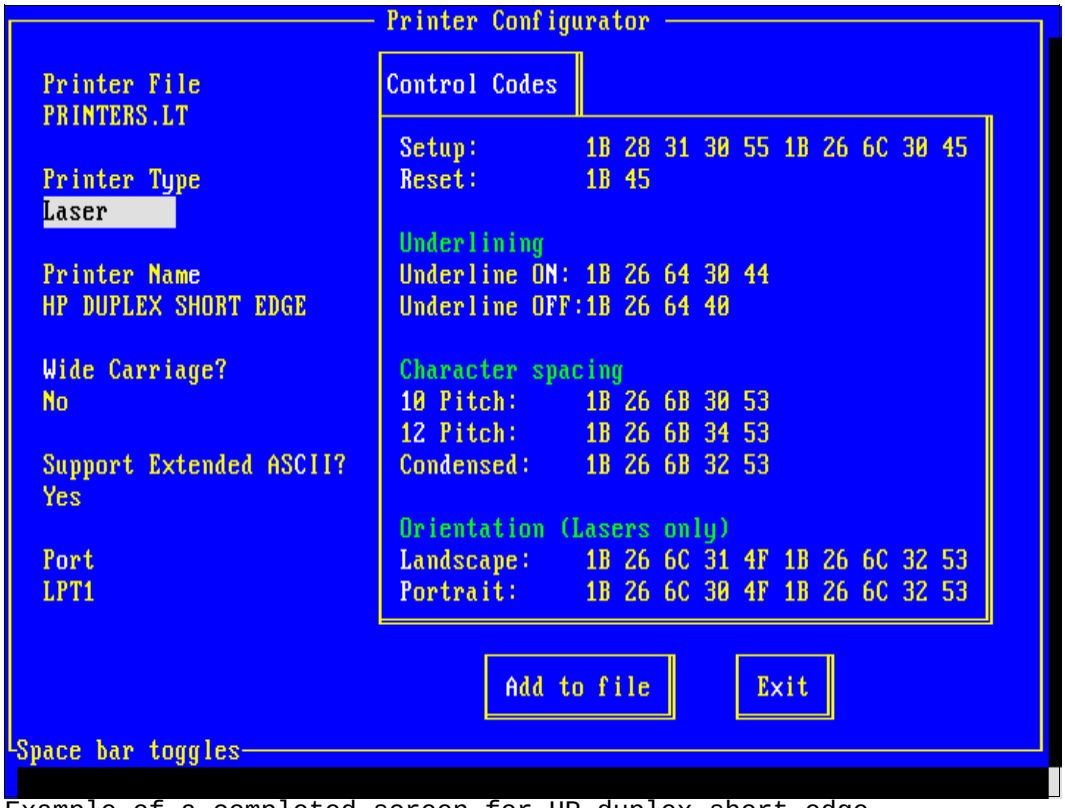
If you are adding to an existing file you will be given a warning. Choose “Append” if you are adding a new printer to the file. Choose “WriteOver” if you are starting the file from the beginning; this will remove older entries. Choose “ReSpecify” if you want to name a different file.

“Add to file” button is used after entering all the information into the fields. Leave fields blank if the printer does not have a command for the option. The code for italic style might be substituted for underline on if the upright (normal) style is substituted for underline off. Other codes could be placed in the setup field.

After adding the printer configuration to the file the cursor will return to the “printer type” field. The values from the previous printer remain on the screen until they are overwritten. This is helpful when entering several configurations for the same printer with only minor changes. This figure has the control codes for Hewlitt-Packard LaserJet specifying duplex printing using the short edge as the binding edge. There is no place on the screen labeled “duplex short edge” so the codes are added to the end of the landscape and portrait fields. Whether landscape or portrait is chosen in PC LTAS, the “duplex short edge” command will also be sent to the printer.



Warning box when choosing an existing file.



Example of a completed screen for HP duplex short edge

The printer code sequences from the default PRINTERS.LT file supplied with PC LTAS are shown in two formats. The first line is a set of hexadecimal pairs separated by spaces. The second line lists the literal characters. Unprintable or upper ASCII characters are represented in curly brackets as the control code name or for upper ASCII the hexadecimal number. For example, escape, ^[, decimal 27, hex 1B = '{ESC}', character 255 = '{ chr 255 }'.

Table N-1: Printer control codes in “printers.lt” file

NAME	CONTROL STRING	HEXADECIMAL
EPSON DOT MATRIX		
reset	{ESC}@	1B 40
underline on	{ESC}-{SOH}	1B 2D 01
underline off	{ESC}-	1B 2D 00
ten pitch	{ESC}P	1B 50
twelve pitch	{ESC}M	1B 4D
condensed	{SI}	0F
IBM DOT MATRIX		
reset	{ESC}?{STX}	1B 3F 02
underline on	{ESC}-{STX}	1B 2D 02
underline off	{ESC}-	1B 2D 00
ten pitch	{DC2}	12
twelve pitch	{ESC}:	1B 3A
condensed	{SI}	0F
OKIDATA DOT MATRIX		
underline on	{ESC}C	1B 43
underline off	{ESC}D	1B 44
ten pitch	{RS}	1
twelve pitch	{FS}	1C
condensed	{GS}	1D
PANASONIC DOT MATRIX		
reset	{ESC}@	1B 40
underline on	{ESC}-{SOH}	1B 2D 01
underline off	{ESC}-	1B 2D 00
ten pitch	{ESC}n{ESC}P	1B 6E 1B 50
twelve pitch	{ESC}l{ESC}@	1B 6C 1B 40
condensed	{ESC}{SI}{SI}	1B 0F 0F
HP LASERJET		
setup	{ESC}(10U{ESC}&l0E	1B 28 31 30 55 1B 26 6C 30 45
reset	{ESC}E	1B 45
underline on	{ESC}&d0D	1B 26 64 30 44
underline off	{ESC}&d@	1B 26 64 40
ten pitch	{ESC}&k0S	1B 26 6B 30 53
twelve pitch	{ESC}&k4S	1B 26 6B 34 53
condensed	{ESC}&k2S	1B 26 6B 32 53
landscape	{ESC}&l1O	1B 26 6C 31 4F
portrait	{ESC}&l0O	1B 26 6C 30 4F
HP DUPLEX LONG EDGE		
setup	{ESC}(10U{ESC}&l0E	1B 28 31 30 55 1B 26 6C 30 45
reset	{ESC}E	1B 45
underline on	{ESC}&d0D	1B 26 64 30 44
underline off	{ESC}&d@	1B 26 64 40
ten pitch	{ESC}&k0S	1B 26 6B 30 53
twelve pitch	{ESC}&k4S	1B 26 6B 34 53
condensed	{ESC}&k2S	1B 26 6B 32 53
landscape	{ESC}&l1O{ESC}&l1S	1B 26 6C 31 4F 1B 26 6C 31 53
portrait	{ESC}&l0O{ESC}&l1S	1B 26 6C 30 4F 1B 26 6C 31 53
HP DUPLEX SHORT EDGE		
setup	{ESC}(10U{ESC}&l0E	1B 28 31 30 55 1B 26 6C 30 45
reset	{ESC}E	1B 45
underline on	{ESC}&d0D	1B 26 64 30 44
underline off	{ESC}&d@	1B 26 64 40

	NAME	CONTROL STRING	HEXADECIMAL
	ten pitch	{ESC}&k0S	1B 26 6B 30 53
	twelve pitch	{ESC}&k4S	1B 26 6B 34 53
	condensed	{ESC}&k2S	1B 26 6B 32 53
	landscape	{ESC}&l1O{ESC}&l2S	1B 26 6C 31 4F 1B 26 6C 32 53
	portrait	{ESC}&l0O{ESC}&l2S	1B 26 6C 30 4F 1B 26 6C 32 53

Table N-2: Dot matrix printers -- selected control codes.

	FUNCTION	CONTROL STRING	HEXADECIMAL
IBM ProPrinter 4201 IBM ProPrinter II/XL			
	bold	{ESC}E	1B 45
	condensed	{SI}	0F
	draft quality	{ESC}I{NUL}	1B 49 00
	letter quality	{ESC}G	1B 47
	reset	{FF}{DC}{ESC}F{ESC}H{ESC}4	0C 12 1B 46 1B 48 1B 34
NEC Pinwriter P-6			
	bold	{ESC}E	1B 45
	condensed	{ESC}{SI}	1B 0F
	draft quality - elite	{ESC}x0{ESC}!{SOH}	1B 78 30 1B 21 01
	draft quality - pica	{ESC}x0{ESC}!{NUL}	1B 78 30 1B 21 00
	draft quality - proportional	{ESC}x0{ESC}!{STX}	1B 78 30 1B 21 02
	letter quality - elite	{ESC}x1{ESC}!{SOH}	1B 78 31 1B 21 01
	letter quality - pica	{ESC}x1{ESC}!{NUL}	1B 78 31 1B 21 00
	letter quality - proportional	{ESC}x1{ESC}!{STX}	1B 78 31 1B 21 02
	reset	{FF}{FS}@	0C 1C 40
NEC Spinwriter 2050/3050			
	bold	{ESC}E	1B 45
	condensed	{ESC}{SI}	1B 0F
	reset	{FF}{ESC}#A	0C 1B 23 41
	bold	{ESC}*	1B 2A
	condensed	{ESC}]H	1B 5D 48
	reset	{FF}{ESC}#A	0C 1B 23 41
Panasonic 1080/1080i			
	bold	{ESC}E	1B 45
	condensed	{ESC}{SI}	1B 0F
	letter quality	{ESC}n	1B 6E
	reset	{FF}{ESC}@	0C 1B 40
	bold	{ESC}E	1B 45
	condensed	{ESC}{SI}	1B 0F
	draft quality - elite	{ESC}n	1B 6E
	draft quality - pica	{ESC}p	1B 70
	letter quality - elite	{ESC}o	1B 6F
	letter quality - pica	{ESC}n	1B 6E
	reset	{FF}{ESC}@	0C 1B 40
Star Gemini 10X			
	condensed	{SI}	0F
	letter quality	{ESC}E	1B 45
	reset	{FF}{ESC}@	0C 1B 40
Star NX-1000			
	condensed	{SI}	0F
	letter quality	{ESC}x1	1B 78 31
	reset	{FF}{ESC}@	0C 1B 40

Table N-3: HP LaserJet series -- selected control codes.

FUNCTION	CONTROL STRING	HEXADECIMAL
Character Set - IBM USA (PC-8)	{ESC}(10U	1B 28 31 30 55
Character Set - Line Draw	{ESC}(0B	1B 28 30 42
Character Set - Roman Extension	{ESC}(0E	1B 28 30 45
Character Set - Roman-8	{ESC}(8U	1B 28 38 55
Character Set - USASCII	{ESC}(0U	1B 28 30 55
Duplex - Long Edge Binding	{ESC}&l1S	1B 26 6C 31 53
Duplex - Short Edge Binding	{ESC}&l2S	1B 26 6C 32 53
Orientation - Landscape	{ESC}&l1O	1B 26 6C 31 4F
Orientation - Portrait	{ESC}&l0O	1B 26 6C 30 4F
Pitch 10	{ESC}&k0S	1B 26 6B 30 53
Pitch 12	{ESC}&k’s	1B 26 6B 34 53
Pitch 16.6 - Condensed	{ESC}&k2S	1B 26 6B 32 53
Reset	{ESC}E	1B 45
Simplex	{ESC}&l0S	1B 26 6C 30 53
Stroke - Light	{ESC}(s-3B	1B 28 73 2D 33 42
Stroke Weight - Bold	{ESC}(s3B	1B 28 73 33 42
Stroke Weight - Normal	{ESC}(s0B	1B 28 73 30 42
Style - Italic	{ESC}(s1S	1B 28 73 31 53
Style - Upright (Normal)	{ESC}(s0S	1B 28 73 30 53
Top Margin - 0 lines	{ESC}&l0E	1B 26 6C 30 45
Underline Off	{ESC}&d@	1B 26 64 40
Underline On - Floating	{ESC}&d3D	1B 26 64 33 44
Underline On - Solid	{ESC}&d0D	1B 26 64 30 44

Table N-4: ASCII characters

Each character is shown with its decimal number, hexadecimal number, and the character. The first 32 characters (0 through 31) are not printable so they are shown with their standard abbreviation followed by their control code. “^” is an abbreviation for the control key. For example, the null character is shown as “^@” -- an abbreviation for control key plus “@” key.

0	00	NUL	^@	32	20		64	40	@	96	60	`
1	01	SOH	^A	33	21	!	65	41	A	97	61	a
2	02	STX	^B	34	22	"	66	42	B	98	62	b
3	03	ETX	^C	35	23	#	67	43	C	99	63	c
4	04	EOT	^D	36	24	$	68	44	D	100	64	d
5	05	ENQ	^E	37	25	%	69	45	E	101	65	e
6	06	ACK	^F	38	26	&	70	46	F	102	66	f
7	07	BEL	^G	39	27	'	71	47	G	103	67	g
8	08	BS	^H	40	28	(	72	48	H	104	68	h
9	09	HT	^I	41	29	)	73	49	I	105	69	I
10	0A	LF	^J	42	2A	*	74	4A	J	106	6A	j
11	0B	BT	^K	43	2B	+	75	4B	K	107	6B	k
12	0C	FF	^L	44	2C	,	76	4C	L	108	6C	l
13	0D	CR	^M	45	2D	-	77	4D	M	109	6D	m
14	0E	SO	^N	46	2E	.	78	4E	N	110	6E	n
15	0F	SI	^O	47	2F	/	79	4F	O	111	6F	o
16	10	DLE	^P	48	30	0	80	50	P	112	70	p
17	11	DC1	^Q	49	31	1	81	51	Q	113	71	q
18	12	DC	^R	50	32	2	82	52	R	114	72	r
19	13	DC3	^S	51	33	3	83	53	S	115	73	s
20	14	DC4	^T	52	34	4	84	54	T	116	74	t
21	15	NAK	^U	53	35	5	85	55	U	117	75	u
22	16	SYN	^V	54	36	6	86	56	V	118	76	v
23	17	ETB	^W	55	37	7	87	57	W	119	77	w
24	18	CAN	^X	56	38	8	88	58	X	120	78	x
25	19	EM	^Y	57	39	9	89	59	Y	121	79	y
26	1A	SUB	^Z	58	3A	:	90	5A	Z	122	7A	z
27	1B	ESC	^[	59	3B	;	91	5B	[	123	7B	{
28	1C	FS	^\	60	3C	<	92	5C	\	124	7C	|
29	1D	GS	^]	61	3D	=	93	5D	]	125	7D	}
30	1E	RS	^^	62	3E	>	94	5E	^	126	7E	~
31	1F	US	^_	63	3F	?	95	5F	_	127	7F	DEL

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See also the beginning of this user documentation for the list of figures (illustrations) and list of tables.