DESTINY

PLANNING AND FORECASTING PROGRAM

DESCRIPTION OF CAPABILITIES

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I. Introduction

Although planning and policy analysis are perhaps ten percent retrospection and ninety percent prospection, the amount of computer software available to assist these functions is vastly weighted in favor of analyses of historical data, rather than on forecasting the future implications of alternative policies or demographic developments. The software for statistical analysis is well-known and ubiquitous -- SAS, SPSS, BMDP -- with powerful versions available for desk-top microcomputers. While recent years have seen the advent of much-improved time series analysis forecasting packages, the software available for supporting simulation or projections under alternative assumptions about demographic or programmatic changes is, by comparison, limited and relatively little-used.

A major factor is cost -- a single application of a major microsimulation forecasting program, for example, can cost thousands of dollars to set up, thousands of dollars in computer time to implement, and weeks of time may pass before the final results are available. Furthermore, such runs require massive amounts of computer core and disk or tape storage on a large mainframe computer. The exigencies of most planning situations do not allow for the luxury of such slow, high-cost, data-intensive and labor-intensive techniques. Faced with only a few hours to obtain, for example, an estimate of the budgetary implications of a proposed new program regulation or policy, the analyst often has to resort to "back-of-the-envelope guesstimates."

Times have changed! The DESTINY Planning and Forecasting System has been developed to provide the planner with a low-cost, easy-to-use means for making detailed forecasts of target populations, the need for services, the requirement for facilities, equipment, and personnel, and the cost under varying programmatic and demographic assumptions. The time required to implement a DESTINY run ranges from a few minutes to a few hours, and the computer cost is negligible -- a few minutes on a desktop microcomputer. The DESTINY system is a powerful new tool for the planner who needs detailed, state-of-the-art forecasts on a quick-turnaround, low-cost basis.

The essence of planning and policy analysis is the ability to identify potential demographic and economic developments, to synthesize alternative responses to those developments, and to evaluate the impact of those responses. The DESTINY Planning and Forecasting System has been developed to play a crucial role in this process -- it offers the user the ability to make fast, detailed population projections, and to forecast quantities linked to growth or structural changes in the population.

DESTINY can offer the planner or policy analyst valuable help in making a wide range of forecasts...

> In Population Planning, DESTINY can be used to forecast the population by age, sex, and race, or by geographic region and race.

In Education Planning, DESTINY can forecast local-area school enrollments, based on recent trends in birth rates and regional migration.

In Health Systems Planning, DESTINY can project the requirement for health services personnel (nurses, physicians) and equipment (beds, CAT scanners), by geographic region.

In Social Services Planning, DESTINY can be used to forecast the levels of need for various social services (counseling, day care, protective services, chore services), the requirement for agency personnel (counselors) and for contract services, and the associated budget. These forecasts can be specified by geographic region, or broken down by age, sex, and race. The budget estimates may be disaggregated by service, by resource (e.g., counselor), or by demographic characteristics of the served population (e.g., age, sex, race, or region).

In Market Research, DESTINY can be used to estimate demand for products or services whose demand is related to demographic changes.

In Criminal Justice Planning, DESTINY can make projections of the prison inmate population, and thereby be used to assist planning for prison construction requirements under different sentencing policies.

The preceding are but a few examples of DESTINY applications. With DESTINY, the user can make forecasts such as the above quickly and easily. The system can be used to make forecasts at national, state, or local levels. The analyst can use DESTINY to answer a wide range of "what-if" type questions. DESTINY eliminates the analyst's dependence on "standard" populations projections that may be too highly aggregated, or may correspond to assumptions that are no longer reasonable. Detailed forecasts, corresponding to alternative demographic or programmatic assumptions, may be developed in a matter of minutes or hours, in most cases using information that is readily available from standard statistical sources.

The DESTINY Planning and Forecasting System is an essential technical resource for anyone engaged in planning who needs to be able to produce detailed demographic-based forecasts quickly and at reasonable cost.

This brochure describes the DESTINY system and illustrates its capabilities by means of several examples.

II. What DESTINY Does

DESTINY is a computer-program system that is used to forecast the general population, special "target" or "service" populations of interest, demand for services to these populations, and the amounts of resources (personnel, facilities, equipment, supplies) and cost required to provide these services to the target population. It is designed to provide fast, detailed forecasts in applications in which the items of interest (target populations, service populations, services, resources, and cost) vary roughly in proportion to the sizes of various segments of the general population, such as age/sex/race/geographic-region categories.

A major use of the DESTINY system is to support policy analysis and program evaluation in service-oriented fields, such as health care, social services, education, and public safety. DESTINY can be used to develop service forecasts and budget estimates under a variety of demographic and programmatic assumptions, and to generate detailed breakdowns (tables and crosstabulations) of these forecasts by age, sex, race, and geographic-region categories.

Forecasting models based on population projections are not new. In general, however, the amount of data and computation required to develop a detailed population-based forecast is substantial, since to achieve an acceptable level of accuracy the method requires estimates of the future population broken down by age, sex, race, and region. While a few total-population projections may be readily available from national or state-level agencies, it is usually not possible to obtain detailed projections (disaggregated by age, sex, race, or region) quickly, corresponding to arbitrary demographic assumptions, particularly at the local level. One of the major features of the DESTINY system is its ability to generate detailed population projections rapidly, corresponding to a wide range of demographic assumptions (concerning fertility, mortality, and migration).

Except in the field of population planning, most forecasting applications are not directly concerned with projections of the general population, but instead with special "target" subpopulations, such as the physically or mentally ill, the disabled, the student population, or the prison population. The DESTINY system can be used to provide forecasts of these special subpopulations, and forecasts of the resources and cost required to provide specified services to them. Furthermore, these forecasts can be broken down, or disaggregated, by detailed demographic characteristics -- by age, sex, race, and geographic region.

At the local level, planners are often confronted with the problem of estimating numbers of persons with certain characteristics (e.g., acute illnesses, chronic health conditions, disabilities, or social problems) or the number of population-related events (e.g., school or prison admissions), but there is usually no usable Census or sample survey information on incidences or prevalences of these characteristics at the local level. What is often available, however, are national or regional sample survey data that indicate the incidence or prevalence, broken down by detailed demographic categories, such as age, sex, and race. In the absence of local-level incidence/prevalence data, the planner must use this national or regional information to develop local-area estimates.

In this situation, a recommended procedure for estimating the numbers of persons having the specified characteristics in the local area is synthetic estimation. With this procedure, the national incidences or prevalences for various age-by-sex-by-race categories are multiplied by the total numbers of persons of the general local-area population in these categories, to obtain estimates of the numbers having the specified characteristics in the local area. DESTINY has the capability for rapidly computing synthetic estimates. With this feature, the local planner can quickly construct reasonable target population estimates which make full use of available regional or national incidence/prevalence data.

While the DESTINY system can be quickly used to construct target-population estimates based on available incidence/prevalence rates (specific to age x sex x race categories), it can also be used in conjunction with other forecasting procedures to produce high-precision forecasts. For example, an analyst may use a multiple regression model, or an autoregressive integrated moving average (ARIMA or Box-Jenkins) time-series model, or a dynamic systems model to develop a precise forecast of a future incidence rate for a specific demographic category (e.g., arrest rates for males aged 20-35). This estimated arrest rate can then be input to the DESTINY system to forecast total number of arrests for a local area, taking into account not only trends in the arrest rate, but also anticipated trends in birth rates, death rates, migration, and population aging.

DESTINY has been designed to enable the planner to obtain forecasts of the general population, target populations, service populations, service needs, and the resources and cost required to provide these services. These projections can be made under a variety of "what-if" assumptions concerning demographic and programmatic conditions. The analyst can make alternative assumptions regarding population growth, target population incidences or prevalences, program service ratios, and costs. The corresponding projections can be computed quickly, and can be disaggregated by age, sex, race, and geographic region. DESTINY offers the user the ability to make detailed forecasts quickly and easily, at substantial savings over manual or partially-automated procedures.

III. How to Use the DESTINY System

The DESTINY system was designed to provide a substantial analytical capability to the user, but it was also designed with ease-of-use in mind. The DESTINY system works by setting up a mathematical representation, or "model," of the population, and using this model to project the future. To use the system, the user needs to set up a "parameter" file containing the following information:

Demographic Information

- Total Fertility Rate
- Fertility Age Distribution
- Infant Mortality Rate or Expectation of Life at Birth
- Base-year Population, by age and sex (race optional)

- o External Migration Rates or Amounts
- o Regional Populations (optional)
- o Regional Migration Rates or Amounts (if regions are included in the model)

Target Population Information (Optional)

- o Incidences (rates of occurrence of events) or Prevalences (proportions of the general population belonging to subpopulations of interest), either overall or by age and/or sex and/or race and/or region

Service Population Information (Optional)

- o Service Ratios (proportions of the target populations that are served), either overall or by age and/or sex and/or race and/or region

Service Information (Optional)

- o Average number of service units per year per case served

Resource Information (Optional)

- o Average number of resource units per year required per service unit expended

Cost Information (Optional)

- o Average cost per resource unit

Names

- o The names of the races, regions, target populations, service populations, services, resources, and cost categories.

If only general population projections are desired, (i.e., no target population or service projections are desired), the user need specify only the demographic parameters. If a detailed program cost estimate is desired, all of the information must be specified. The demographic data are available from standard statistical publications, such as national and state vital statistics annual reports or statistical abstracts. The target population incidence/prevalence data are available from Census publications, national sample survey reports, agency publications, and statistical abstracts. The service, resource, and cost data are generally available from program administrative records.

The process of setting up the parameter file requires a little effort, but once the data are input to the computer, they are stored on disk and are easily updated.

While running the program, the user needs also to specify the following parameters:

- o how many five-year periods to project

- what crosstabulations are desired for the various population, service, resource, and cost projections
- for which years hard-copy printout are desired

With regard to output, the program computes projections for the following items:

- the general population
- the specified target populations
- the specified service populations
- service units
- resource units
- cost

The program can generate aggregate projections for each of the above quantities, and will (at the user's option) provide disaggregated projections, by age and/or sex and/or race and/or region.

Version 1.0 of the DESTINY system is set up to accommodate up to three races, fourteen regions, four target populations, ten services, seven resources, and four cost categories.

IV. Special Features of the DESTINY System

The DESTINY system is designed to accommodate a wide range of detail in both the input and output. In setting up the parameter file, the user may specify that the same value of a demographic parameter (such as fertility rates, infant mortality rates, and migration rates) for the entire population for all future time. On the other hand, quite detailed demographic or programmatic specifications may be made, to obtain highly "conditioned" projections.

With regard to specifying incidence/prevalence rates for the target populations, DESTINY offers the user the choice of ten different demographic "stratifications." The user may specify that the same rate applies to the entire general population, or that the rates vary according to various demographic classifications, or stratifications, of the general population. Specifically, the user may specify rate stratifications by age, sex, race, age x sex, age x race, sex x race, age x sex x race, region, or race x region. With this flexibility, the analyst may make use of a wide variety of available crosstabulation data from national surveys, to construct synthetic estimates of target populations for the local area.

In technical terms, the DESTINY system uses the "cohort-component" method for making its population projections. This method is the most widely-used analytical method for preparing regional population projections. (Shryock, Siegel, and Associates, The Methods and Materials of Demography, US Government Printing Office, Washington, DC, 1980, presents a detailed description of this method.) For the target population estimates, the program uses the method of synthetic estimation (also known as cohort-component participation rates).

The system is set up to enable parameter input and updating interactively through the video terminal. The specified parameters are stored on disk for future use. The projections may be directed to the video screen, to a printer, or to a file.

The user may specify either brief aggregated projections, or detailed disaggregated projections, in the form of tables or crosstabulations by age, sex, race, or region. In addition to demographic crosstabulations (such as a breakdown of service utilization by race or region), the user may request crosstabulations of services by target population; resources by service, or target population; and cost by resource, service, or target population.

V. Examples

This section presents a number of examples of DESTINY applications. These examples include:

- Projection of the General Population
- Projection of Various Target or Service Populations
  - School enrollments
  - Persons with certain health or disability conditions
  - The elderly in need of social services
  - Prison admissions
- Projection of Service Needs
  - Social Services
- Projection of Resource Requirements
  - Teachers
  - Short-term and long-term health care beds
  - Social services counselors
- Projection of Program Costs
  - Prison operating costs
  - Social service program costs

The following examples illustrate the wide range of applications of the DESTINY system. They also illustrate the varying levels of detail which are possible. On the one hand, the user may use the program to construct a single estimate of the total population; on the other hand, the user may request a detailed breakdown of a target population (e.g., the blind) by age, sex, and race, or a breakdown of costs for purchased social services by service type or geographic region.

While the examples presented here illustrate the possible levels of detail of DESTINY projections, they do not represent examples of policy analysis exercises. In a real planning or policy analysis situation, the user would very likely make a set of DESTINY runs, under a wide range of alternative demographic and programmatic assumptions. DESTINY is ideally suited for such use, since it stored all of the input data in a

"parameter" file, which the user may easily modify with the touch of a few buttons on the computer keyboard. Hence, while the first DESTINY run requires some effort (to assemble the needed data and set up the parameter file), successive runs are easily and quickly accomplished.

The examples are presented in order of increasing complexity. The examples and the principal features of each are listed below. The national projections are for the United States, and the state projections are for the State of Arizona. The examples are illustrated using actual program output listings (or extracts from listings). The projections are made from a "base year" of 1980 to the year 1990. The user may structure the program output in a variety of ways, requesting projections for various years and requesting different tables and crosstabulations for each year. These examples illustrate the wide variety of the program output.

Example 1. National Population Projection, Single-Race Model
Demographic representation: single race, single region
Service-system representation: none

Example 2. National Population Projection, Two-Race Model
Demographic representation: two races (white, other), single region
Service-system representation: none

Example 3. State Population Projection, Single-Race Model
Demographic representation: single race, single region
Service-system representation: none

Example 4. State Population Projection, Three-Race, 14-Region Model
Demographic representation: three races (white, Indian, other), 14 regions (counties)
Service-system representation: none

Example 5. Projection of the Hispanic Population
Demographic representation: two ethnic groups (Hispanic, nonHispanic), 14 regions (counties)
Service-system representation: none

Example 6. Rehabilitation Services, Projection of the Work-Disabled
Demographic representation: three races (white, Indian, other), 14 regions (counties)
Service-system representation: two target populations (severe and partially work-disabled)

Example 7. Education, Projection of School Enrollment
Demographic representation: three races (white, Indian, other), 14 regions (counties)
Service-system representation: one target population (students), one service population (elementary and secondary school students) one resource (teachers), one cost (teachers' salaries)

Example 8. Criminal Justice, Projection of Prison Admissions and Operating Cost

Demographic representation: three races (white, Indian, other), 14 regions (counties)
Service-system representation: one target population (admissions), one service population (sentence-years), one service (incarceration), one resource (cell), one cost (operating cost)

Example 9. Health Care, Projection of Short-term and Long-term Health Care Beds
Demographic representation: three races (white, Indian, other), 14 regions
Service-system representation: four target populations (beds in non-federal short-stay hospitals, nursing homes, and long-term care institutions for psychiatric and mentally handicapped patients)

Example 10. Projection of Social Services for the Elderly
Demographic representation: three races (white, Indian, other), 14 regions
Service-system representation: one target population (the elderly), seven services, three resources, and three costs

Example 1. National Population Projection by Age and Sex

This example illustrates the most basic application of DESTINY -- projection of a general population by age and sex. In this example, the resident population of the United States is projected from the base year of 1980 to the "projection year" of 1990. The program output includes all possible tables and crosstabulations involving age and sex: a table of the population by age, a table by sex, and a crosstabulation by age and sex.

The data on which this projection is based were taken from Statistical Abstract of the United States, 1981, US Government Printing Office, Washington, DC. The accuracy of the projection may be assessed by comparing the projected 1990 population estimates to the 1990 Census values (in Statistical Abstract of the United States, 1994). For example, DESTINY projected a resident US population of 250,026,462 for 1990; the 1990 Census value is 248,701,000. This is an error of about one-half of one percent. DESTINY projected 9,229,281 males under the age of five for 1990, compared to the 1990 Census value of 9,392,409 (an error of less than two percent).

Listing 1. PROJ Run for Example 1 (National Population Projection, Single-Race Model)

```
 DESTINY PLANNING AND FORECASTING COMPUTER PROGRAM PACKAGE, VERSION 1.0

 PROGRAM NAME: PROJ
 DATE OF RUN (DD/MM/YYYY):  5/ 6/1995
 TIME OF RUN (HH:MM:SS):   11:39: 2

 PARAMETER FILE NAME: US801.DAT
 GENERAL POPULATION DESCRIPTION:
 UNITED             STATES             RESIDENT             POPULATION

 BASE YEAR: 1980

 NO OF FIVE-YEAR PERIODS TO PROJECT = 2

 YEAR: 1990

 DISTRIBUTIONAL ANALYSIS OF POPULATN

 TOTAL POPULATN =   250026462.

 DISTRIBUTION OF POPULATN
  BY AGE
   0-4      18150140.
   5-9      18340630.
  10-14     16961798.
  15-19     17341700.
  20-24     18916165.
  25-29     21907018.
  30-34     22038919.
  35-39     20150596.
  40-44     18063934.
  45-49     14262631.
  50-54     11763287.
  55-59     10935458.
  60-64     11141584.
  65-69     10411490.
  70-74      8156979.
  75+       11484134.

 DISTRIBUTION OF POPULATN
  BY SEX
 MALE      122714472.
 FEMALE    127311990.


 CROSSTABULATION OF POPULATN
  BY AGE AND SEX
               MALE        FEMALE
   0-4       9229281.    8920859.
   5-9       9321578.    9019052.
  10-14      8668490.    8293308.
  15-19      8858743.    8482957.
  20-24      9644578.    9271587.
```

25-29	11108700.	10798317.
30-34	11004406.	11034512.
35-39	10003094.	10147502.
40-44	8909808.	9154126.
45-49	6987165.	7275467.
50-54	5721375.	6041912.
55-59	5251952.	5683506.
60-64	5234019.	5907564.
65-69	4745989.	5665501.
70-74	3592512.	4564467.
75+	4432781.	7051353.

Example 2. National Population Projection by Age, Sex, and Race

This example extends the population model detail to include representation of two races in the model -- white and other. In this case, the projection may be disaggregated by age, sex, race, age-by-sex, age-by-race, sex-by-race, and age-by-sex-by-race.

The projection is based on data from the 1981 edition of the Statistical Abstract of the United States, and may be compared to 1990 Census values in the 1994 edition. For example, DESTINY projects 197,443,844 whites and 53,294,702 others in 1990. The corresponding 1990 Census figures are 199,686,000 for whites and 49,024,000 for others -- errors of or -1.1% and 8.7%, respectively.

Listing 2. PROJ Run for Example 2 (National Population Projection, Two-Race Model)

```
 DESTINY PLANNING AND FORECASTING COMPUTER PROGRAM PACKAGE, VERSION 1.0

 PROGRAM NAME: PROJ
 DATE OF RUN (DD/MM/YYYY):  5/ 6/1995
 TIME OF RUN (HH:MM:SS):   12:17: 5

 PARAMETER FILE NAME: US802.DAT
 GENERAL POPULATION DESCRIPTION:
 UNITED     STATES     RESIDENT     POPULATION     BY     RACE     (W/O)

 BASE YEAR: 1980

 NO OF FIVE-YEAR PERIODS TO PROJECT = 2

 YEAR: 1990

 DISTRIBUTIONAL ANALYSIS OF POPULATN

 TOTAL POPULATN =   250738546.

 DISTRIBUTION OF POPULATN
  BY AGE
   0-4      18669617.
   5-9      18806048.
  10-14     17101239.
  15-19     17460667.
  20-24     19000300.
  25-29     21967328.
  30-34     22058888.
  35-39     20138388.
  40-44     18001916.
  45-49     14192279.
  50-54     11705971.
  55-59     10862325.
  60-64     11041520.
  65-69     10298760.
  70-74      8064410.
  75+       11368890.

 DISTRIBUTION OF POPULATN
  BY SEX
 MALE      123028940.
 FEMALE    127709605.


 DISTRIBUTION OF POPULATN
  BY RACE
 WHITE     197443844.
 OTHER      53294702.

 CROSSTABULATION OF POPULATN
  BY AGE AND SEX
               MALE        FEMALE
```

0-4	9492151.	9177466.
5-9	9556684.	9249364.
10-14	8735127.	8366112.
15-19	8915115.	8545552.
20-24	9682667.	9317633.
25-29	11135944.	10831384.
30-34	11007309.	11051579.
35-39	9985651.	10152737.
40-44	8867066.	9134850.
45-49	6942907.	7249371.
50-54	5685799.	6020171.
55-59	5209615.	5652710.
60-64	5180874.	5860647.
65-69	4692481.	5606280.
70-74	3550310.	4514099.
75+	4389239.	6979651.

CROSSTABULATION OF POPULATN
BY AGE AND RACE

	WHITE	OTHER
0-4	13386385.	5283232.
5-9	13621659.	5184390.
10-14	12648435.	4452804.
15-19	13055499.	4405168.
20-24	14468046.	4532254.
25-29	16941640.	5025688.
30-34	17251096.	4807792.
35-39	15930166.	4208222.
40-44	14547949.	3453967.
45-49	11604716.	2587563.
50-54	9575698.	2130273.
55-59	9022988.	1839336.
60-64	9362446.	1679074.
65-69	8906125.	1392635.
70-74	7060025.	1004385.
75+	10060972.	1307918.

CROSSTABULATION OF POPULATN
BY SEX AND RACE

	MALE	FEMALE
WHITE	97116269.	100327575.
OTHER	25912671.	27382030.

CROSSTABULATION OF POPULATN
BY AGE, SEX, AND RACE

	WHITE	
	MALE	FEMALE
0-4	6808785.	6577600.
5-9	6925470.	6696189.
10-14	6486648.	6161786.
15-19	6690797.	6364702.
20-24	7400519.	7067527.
25-29	8607548.	8334093.
30-34	8649989.	8601107.
35-39	7966863.	7963303.
40-44	7239716.	7308232.

45-49	5738483.	5866234.
50-54	4701144.	4874554.
55-59	4377281.	4645708.
60-64	4439947.	4922499.
65-69	4080277.	4825848.
70-74	3124926.	3935098.
75+	3877875.	6183096.

OTHER

	MALE	FEMALE
0-4	2683366.	2599866.
5-9	2631214.	2553175.
10-14	2248479.	2204325.
15-19	2224318.	2180851.
20-24	2282148.	2250106.
25-29	2528396.	2497292.
30-34	2357320.	2450472.
35-39	2018788.	2189434.
40-44	1627350.	1826618.
45-49	1204425.	1383138.
50-54	984655.	1145617.
55-59	832334.	1007002.
60-64	740927.	938147.
65-69	612203.	780432.
70-74	425384.	579001.
75+	511364.	796554.

Example 3. State Population Projection by Age and Sex

This example illustrates the use of DESTINY to make projections of the resident population of the State of Arizona from the base year of 1980 to 1990. For this projection, all of the population is combined, i.e., the model involves a single "race" (consisting of the total state population) and a single "region" (consisting of the entire state).

The data were obtained from the 1981 Statistical Abstract of the United States and Arizona 1980 Vital Health Statistics, and may be compared to 1990 Census values in the 1990 Census of Population or the 1994 Statistical Abstract. From the base year of 1980, DESTINY projects a state population of 3,694,625 for 1990, compared to the 1990 Census value of 3,665,000 -- and error of less than one percent.

Listing 3. PROJ Run for Example 3 (State Population Projection, Single-Race Model)

```
 DESTINY PLANNING AND FORECASTING COMPUTER PROGRAM PACKAGE, VERSION 1.0

 PROGRAM NAME: PROJ
 DATE OF RUN (DD/MM/YYYY):  5/ 6/1995
 TIME OF RUN (HH:MM:SS):   12:22:57

 PARAMETER FILE NAME: AZ801.DAT
 GENERAL POPULATION DESCRIPTION:
 ARIZONA                        RESIDENT                              POPULATION

 BASE YEAR: 1980

 NO OF FIVE-YEAR PERIODS TO PROJECT = 2

 YEAR: 1990

 DISTRIBUTIONAL ANALYSIS OF POPULATN

 TOTAL POPULATN =     3694625.

 DISTRIBUTION OF POPULATN
  BY AGE
   0-4         308528.
   5-9         309834.
  10-14        265533.
  15-19        262196.
  20-24        272382.
  25-29        312138.
  30-34        326384.
  35-39        291639.
  40-44        255842.
  45-49        199194.
  50-54        163155.
  55-59        147819.
  60-64        144704.
  65-69        142762.
  70-74        121020.
  75+          171493.

 DISTRIBUTION OF POPULATN
  BY SEX
 MALE         1827212.
 FEMALE       1867413.

 CROSSTABULATION OF POPULATN
  BY AGE AND SEX
                MALE         FEMALE
   0-4         156914.      151614.
   5-9         157507.      152327.
  10-14        135307.      130226.
  15-19        133601.      128596.
  20-24        138207.      134175.
  25-29        158591.      153548.
```

30-34	164894.	161490.
35-39	146991.	144649.
40-44	128908.	126934.
45-49	97980.	101214.
50-54	80273.	82882.
55-59	71925.	75893.
60-64	67382.	77322.
65-69	63623.	79139.
70-74	53404.	67616.
75+	71705.	99788.

Example 4. Population Projection by Age, Sex, Race, and Region

This example illustrates application of DESTINY to project the Arizona population from 1980 to 1990, by age, sex, race, and region. For this example, three racial groups were selected -- white, American Indian, and other. The regions of the model are the 14 Arizona counties. Population data on these racial groups and counties is presented in the 1980 Census of Population, and vital statistics data are available from the 1991 Statistical Abstract of the United States and Arizona 1980 Vital Health Statistics.

This projection is based on the assumption that fertility and mortality rates continue at 1980 levels, and that the state experiences a net annual immigration of approximately 70,000 persons per year.

The projected values may be compared to 1990 Census figures presented in the 1990 Census of Population. For example, DESTINY projects a 1990 white population of 2,886,323 for 1990, compared to a 1990 Census value of 2,963,186 -- an error of -2.6%. The projected population of Maricopa County (where Phoenix is located) for 1990 is 1,893,992, compared to a 1990 Census value of 2,122,101 -- an error of -10.7%. DESTINY projects the 1990 Indian population of Pima County (where Tucson is located) as 21,069, compared to a 1990 Census value of 20,330 -- an error of 3.6%.

Listing 4. PROJ Run for Example 4 (State Population Projection, Three-Race, 14-Region Model)

```
 DESTINY PLANNING AND FORECASTING COMPUTER PROGRAM PACKAGE, VERSION 1.0

 PROGRAM NAME: PROJ
 DATE OF RUN (DD/MM/YYYY):  5/ 6/1995
 TIME OF RUN (HH:MM:SS):   12:53:32

 PARAMETER FILE NAME: AZ803C.DAT
 GENERAL POPULATION DESCRIPTION:
 ARIZONA   RESIDENT   POPULATION   BY   COUNTY   AND   RACE   (W/I/O)

 BASE YEAR: 1980

 NO OF FIVE-YEAR PERIODS TO PROJECT = 2

 YEAR: 1990

 DISTRIBUTIONAL ANALYSIS OF POPULATN

 TOTAL POPULATN =     3735219.

 DISTRIBUTION OF POPULATN
  BY RACE
 WHITE       2886323.
 AMERIND      228240.
 OTHER        620656.

 DISTRIBUTION OF POPULATN
  BY REGION
 APACHE        72497.
 COCHISE       97683.
 COCONINO      97171.
 GILA          40759.
 GRAHAM        26383.
 GREENLEE      11039.
 MARICOPA    1893992.
 MOHAVE        83827.
 NAVAJO        84127.
 PIMA         649633.
 PINAL        101590.
 STA.CRUZ      24075.
 YAVAPAI       95609.
 YUMA         108068.

 CROSSTABULATION OF POPULATN

  BY REGION AND RACE
                WHITE       AMERIND     OTHER
 APACHE         15397.      55256.       1844.
 COCHISE        78373.        692.      18618.
 COCONINO       59977.      29599.       7595.
 GILA           30676.       7197.       2886.
 GRAHAM         17766.       3880.       4737.
 GREENLEE        7876.        324.       2839.
```

MARICOPA	1582814.	32267.	278911.
MOHAVE	80313.	2070.	1444.
NAVAJO	34020.	45483.	4623.
PIMA	513643.	21069.	114920.
PINAL	57469.	12017.	32104.
STA.CRUZ	17931.	81.	6063.
YAVAPAI	91349.	1412.	2848.
YUMA	76044.	4582.	27442.

Example 5. Projection of the Hispanic Population

This example presents a projection of the population by Spanish origin ("Hispanic" vs. nonHispanic) and region (county), from 1980 to 1990. Data on Hispanic status by county are available from the 1980 Census of Population (or the County and City Data Book).

The projected values may be compared to 1990 Census figures presented in the 1990 Census of Population or the County and City Data Book 1994. From the base year of 1980, DESTINY projects 1990 Hispanic and nonHispanic populations of 647,662 and 3,054,470, compared to 1990 Census values of 688,388 and 2,976,840 -- errors of -5.9% and 2.6%, respectively.

(Note: The total-population estimate for 1990 for this example differs slightly from the total-population estimate for 1990 for Examples 3 and 4, since the demographic parameter specifications are not equivalent.)

Listing 5. PROJ Run for Example 5 (Projection of the Hispanic Population)

```
 DESTINY PLANNING AND FORECASTING COMPUTER PROGRAM PACKAGE, VERSION 1.0

 PROGRAM NAME: PROJ
 DATE OF RUN (DD/MM/YYYY):  5/ 6/1995
 TIME OF RUN (HH:MM:SS):   12:59:49

 PARAMETER FILE NAME: AZ80HC.DAT
 GENERAL POPULATION DESCRIPTION:
 ARIZONA   RESIDENT   POPULATION   BY   HISPANIC   STATUS   AND   REGION

 BASE YEAR: 1980

 NO OF FIVE-YEAR PERIODS TO PROJECT = 2

 YEAR: 1990

 DISTRIBUTIONAL ANALYSIS OF POPULATN

 TOTAL POPULATN =     3702132.

 DISTRIBUTION OF POPULATN
  BY RACE
 HISPANIC     647662.
 NON HISP    3054470.

 DISTRIBUTION OF POPULATN
  BY REGION
 APACHE        65014.
 COCHISE       98260.
 COCONINO      92212.
 GILA          38996.
 GRAHAM        26019.
 GREENLEE      11016.
 MARICOPA    1871693.
 MOHAVE        80664.
 NAVAJO        76668.
 PIMA         651822.
 PINAL        101675.
 STA.CRUZ      26575.
 YAVAPAI       92273.
 YUMA         111200.

 CROSSTABULATION OF POPULATN
  BY REGION AND RACE

               HISPANIC    NON HISP
 APACHE         2867.      62147.
 COCHISE       29228.      69032.
 COCONINO      10332.      81880.
 GILA           9098.      29898.
 GRAHAM         6958.      19061.
 GREENLEE       5633.       5383.
 MARICOPA     281931.    1589762.
```

MOHAVE	3602.	77062.
NAVAJO	5936.	70732.
PIMA	154500.	497322.
PINAL	33174.	68501.
STA.CRUZ	20544.	6031.
YAVAPAI	6584.	85688.
YUMA	36480.	74720.

Example 6. Rehabilitation Services, Projection of the Work-Disabled

This example illustrates a typical use of the DESTINY system -- the estimation of a target population, based on available incidence or prevalence data. This example illustrates the application of the technique of "synthetic estimation," by which national incidence/prevalence rates by demographic category are used to construct state estimates. This procedure assumes, of course, that the national rates do in fact apply to the state.

The following table indicates the prevalence of work disability by age group (the prevalence does not vary markedly by sex or race). The table rates are proportions of the total resident population.

Age	Persons with Work Disability (percent) Severe	Partial
18-24	2.1	3.9
25-34	2.9	7.0
35-44	6.3	8.3
45-54	11.0	12.4
55-64	24.2	11.8

Source: Derived from Table No. 555, Statistical Abstract of the United States, 1981. Data are for 1978. Source table figures adjusted from Civilian Non-institutional Population base to Resident Population base.

In the printout, the acronym WRKDISSV stands for "Severely Work-Disabled," and the acronym WRKDISPT stands for "Partially Work-Disabled."

Listing 6. PROJ Run for Example 6 (Rehabilitation Services, Projection of the Work-Disabled)

```
 DESTINY PLANNING AND FORECASTING COMPUTER PROGRAM PACKAGE, VERSION 1.0

 PROGRAM NAME: PROJ
 DATE OF RUN (DD/MM/YYYY):  5/ 6/1995
 TIME OF RUN (HH:MM:SS):   13:18: 6

 PARAMETER FILE NAME: AZ803CD.DAT
 GENERAL POPULATION DESCRIPTION:
 ARIZONA   RESIDENT   POPULATION   BY   COUNTY   AND   RACE   (W/I/O)

 BASE YEAR: 1980

 TARGET/SERVICE POPULATION DESCRIPTION:
 WORK-DISABLED  POPULATION  (SEVERELY  AND  PARTIALLY  WORK-DISABLED)

 NO OF FIVE-YEAR PERIODS TO PROJECT = 2

 YEAR: 1990

 DISTRIBUTIONAL ANALYSIS OF POPULATN

 TOTAL POPULATN =     3735219.

 DISTRIBUTION OF POPULATN
  BY AGE
   0-4        338816.
   5-9        338489.
  10-14       268314.
  15-19       263875.
  20-24       272520.
  25-29       312009.
  30-34       326222.
  35-39       290907.
  40-44       253597.
  45-49       196686.
  50-54       161169.
  55-59       145678.
  60-64       142066.
  65-69       139466.
  70-74       117950.
  75+         167454.

 DISTRIBUTIONAL ANALYSIS OF WRKDISSV

 TOTAL WRKDISSV =      169750.

 DISTRIBUTION OF WRKDISSV
  BY AGE
   0-4             0.
   5-9             0.
  10-14            0.
  15-19         2217.
  20-24         5723.
```

```
 25-29         9048.
 30-34         9460.
 35-39        18327.
 40-44        15977.
 45-49        21635.
 50-54        17729.
 55-59        35254.
 60-64        34380.
 65-69            0.
 70-74            0.
 75+              0.

DISTRIBUTIONAL ANALYSIS OF WRKDISPT

TOTAL WRKDISPT =      182943.

DISTRIBUTION OF WRKDISPT
 BY AGE
  0-4             0.
  5-9             0.
 10-14            0.
 15-19         4116.
 20-24        10628.
 25-29        21841.
 30-34        22836.
 35-39        24145.
 40-44        21049.
 45-49        24389.
 50-54        19985.
 55-59        17190.
 60-64        16764.
 65-69            0.
 70-74            0.
 75+              0.

TOTALS OF TARGET POPULATION(S)
WRKDISSV     169750.
WRKDISPT     182943.
```

Example 7. Education, Projection of School Enrollment

This example is similar to the preceding one, since it deals with the estimation of a specific target population -- in this case, school enrollments. This example carries the estimation process a little further, in also estimating the number of elementary and secondary school teachers. The number of teachers is estimated for 0-18 year olds, assuming a student/teacher ratio of 20. The total salary cost of the teachers is also estimated, assuming an average salary of $17,200 per year.

The following table presents the school enrollment rates for 1980, by age. The rates do not vary appreciably by sex or race.

Age	Enrollment Rate Noninst Civ Pop Base	Res Pop Base
3-4	.367	.357
5-6	.957	.930
7-13	.993	.965
14-15	.982	.955
16-17	.890	.865
18-19	.464	.451
20-21	.310	.301
22-24	.163	.158
25-29	.093	.090
30-34	.064	.062

Source: Table No. 225, Statistical Abstract of the United States, 1981. Data are for 1980. Source table figures adjusted from Civilian Non-institutional Population base to Resident Population base. National data used as proxy for state data.

In the printout, the acronym ELEM/SEC stands for "Elementary and Secondary School Students." Also, in the distribution of teachers and teachers' salaries by age, "age" refers to age of students.

Listing 7. PROJ Run for Example 7 (Projection of School Enrollment)

```
 DESTINY PLANNING AND FORECASTING COMPUTER PROGRAM PACKAGE, VERSION 1.0

 PROGRAM NAME: PROJ
 DATE OF RUN (DD/MM/YYYY):  5/ 6/1995
 TIME OF RUN (HH:MM:SS):   13:25:44

 PARAMETER FILE NAME: AZ803CE.DAT
 GENERAL POPULATION DESCRIPTION:
 ARIZONA   RESIDENT   POPULATION   BY   COUNTY   AND   RACE   (W/I/O)

 BASE YEAR: 1980

 TARGET/SERVICE POPULATION DESCRIPTION:
 ELEMENTARY  &  SECONDARY  SCHOOL  ENROLLMENT;  TEACHERS;  SALARIES

 NO OF FIVE-YEAR PERIODS TO PROJECT = 2

 YEAR: 1990

 DISTRIBUTIONAL ANALYSIS OF POPULATN

 TOTAL POPULATN =     3735219.

 DISTRIBUTION OF POPULATN
  BY AGE
   0-4        338816.
   5-9        338489.
  10-14       268314.
  15-19       263875.
  20-24       272520.
  25-29       312009.
  30-34       326222.
  35-39       290907.
  40-44       253597.
  45-49       196686.
  50-54       161169.
  55-59       145678.
  60-64       142066.
  65-69       139466.
  70-74       117950.
  75+         167454.

 DISTRIBUTION OF POPULATN
  BY REGION

 APACHE         72497.
 COCHISE        97683.
 COCONINO       97171.
 GILA           40759.
 GRAHAM         26383.
 GREENLEE       11039.
 MARICOPA     1893992.
 MOHAVE         83827.
 NAVAJO         84127.
```

PIMA	649633.
PINAL	101590.
STA.CRUZ	24075.
YAVAPAI	95609.
YUMA	108068.

DISTRIBUTIONAL ANALYSIS OF STUDENTS

TOTAL STUDENTS = 925175.

DISTRIBUTION OF STUDENTS
BY AGE

0-4	48451.
5-9	322241.
10-14	258386.
15-19	189199.
20-24	58592.
25-29	28081.
30-34	20226.
35-39	0.
40-44	0.
45-49	0.
50-54	0.
55-59	0.
60-64	0.
65-69	0.
70-74	0.
75+	0.

DISTRIBUTION OF STUDENTS
BY REGION

APACHE	22833.
COCHISE	23786.
COCONINO	26060.
GILA	10332.
GRAHAM	6812.
GREENLEE	2769.
MARICOPA	457268.
MOHAVE	19512.
NAVAJO	24616.
PIMA	159357.
PINAL	26920.
STA.CRUZ	5960.
YAVAPAI	22237.
YUMA	27238.

DISTRIBUTIONAL ANALYSIS OF ELEM/SEC

TOTAL ELEM/SEC = 794438.

DISTRIBUTION OF ELEM/SEC
BY AGE

0-4	48451.
5-9	322241.
10-14	258386.
15-19	165360.

```
 20-24            0.
 25-29            0.
 30-34            0.
 35-39            0.
 40-44            0.
 45-49            0.
 50-54            0.
 55-59            0.
 60-64            0.
 65-69            0.
 70-74            0.
 75+              0.

DISTRIBUTION OF ELEM/SEC
 BY REGION
APACHE         19933.
COCHISE        20393.
COCONINO       22522.
GILA            8897.
GRAHAM          5865.
GREENLEE        2377.
MARICOPA      392016.
MOHAVE         16710.
NAVAJO         21394.
PIMA          136725.
PINAL          23184.
STA.CRUZ        5112.
YAVAPAI        19040.
YUMA           23393.

DISTRIBUTIONAL ANALYSIS OF TEACHING
TOTAL TEACHING =      794438.

DISTRIBUTION OF TEACHING
 BY AGE
  0-4          48451.
  5-9         322241.
 10-14        258386.
 15-19        165360.
 20-24            0.
 25-29            0.
 30-34            0.
 35-39            0.
 40-44            0.
 45-49            0.
 50-54            0.
 55-59            0.
 60-64            0.
 65-69            0.
 70-74            0.
 75+              0.

DISTRIBUTION OF TEACHING
 BY REGION
APACHE         19933.
COCHISE        20393.
```

COCONINO	22522.
GILA	8897.
GRAHAM	5865.
GREENLEE	2377.
MARICOPA	392016.
MOHAVE	16710.
NAVAJO	21394.
PIMA	136725.
PINAL	23184.
STA.CRUZ	5112.
YAVAPAI	19040.
YUMA	23393.

DISTRIBUTIONAL ANALYSIS OF TEACHERS

TOTAL TEACHERS = 39722.

DISTRIBUTION OF TEACHERS
BY AGE

0-4	2423.
5-9	16112.
10-14	12919.
15-19	8268.
20-24	0.
25-29	0.
30-34	0.
35-39	0.
40-44	0.
45-49	0.
50-54	0.
55-59	0.
60-64	0.
65-69	0.
70-74	0.
75+	0.

DISTRIBUTION OF TEACHERS
BY REGION

APACHE	997.
COCHISE	1020.
COCONINO	1126.
GILA	445.
GRAHAM	293.
GREENLEE	119.
MARICOPA	19601.
MOHAVE	836.
NAVAJO	1070.
PIMA	6836.
PINAL	1159.
STA.CRUZ	256.
YAVAPAI	952.
YUMA	1170.

DISTRIBUTIONAL ANALYSIS OF SALARIES

TOTAL SALARIES = 683216526.

DISTRIBUTION OF SALARIES
 BY AGE

0-4	41667598.
5-9	277127660.
10-14	222212066.
15-19	142209203.
20-24	0.
25-29	0.
30-34	0.
35-39	0.
40-44	0.
45-49	0.
50-54	0.
55-59	0.
60-64	0.
65-69	0.
70-74	0.
75+	0.

DISTRIBUTION OF SALARIES
 BY REGION

APACHE	17142535.
COCHISE	17538363.
COCONINO	19369276.
GILA	7650993.
GRAHAM	5044023.
GREENLEE	2044383.
MARICOPA	337133416.
MOHAVE	14370726.
NAVAJO	18399076.
PIMA	117583189.
PINAL	19938284.
STA.CRUZ	4396677.
YAVAPAI	16374272.
YUMA	20118045.

Example 8. Criminal Justice, Projection of Prison Admissions and Operating Cost

This example illustrates the use of DESTINY to predict the prison inmate population in 1990, from the base year of 1980. In 1979, the admissions rate and average times to parole eligibility were as follows. The admissions rate is calculated as a proportion of the total Arizona resident population.

Admission Rate

Age	Male	Female
15-19	.0020	.00020
20-24	.0042	.00019
25-29	.0029	.00024
30-34	.0021	.00016
35-39	.0013	.00010
40-44	.00082	.00006
45-49	.00070	.00006
50-54	.00060	.00003
55-59	.00026	.00001
60+	.00007	0

Average Time to Serve to Parole Eligibility

Male: 35.8 months
Female: 27.7 months

Source: Derived from Arizona Correctional Statistics, 1980 (admission numbers for 1980 were divided by the 1980 resident population for each age-by-sex category)

The per-inmate operating cost in Arizona is approximately $16,000 per year (source: Arizona Department of Corrections Information Office).

In the printout, the acronym ADMIS'NS denotes "Admissions," SENTYR denotes "sentence-years," CELL denotes "cell," and OP COST denotes the cost of care for inmates (exclusive of capital costs).

In an actual policy analysis, a number of runs similar to the example would be required. For example, to determine the effect of sentencing only violent criminals to prison, and at different sentence lengths from current practice, a run would be required which included not just one but several inmate ("target") populations, each representing a different level of violence and past behavior.

Listing 8. PROJ Run for Example 8 (Criminal Justice, Projection of Prison Admissions and Operating Cost)

```
 DESTINY PLANNING AND FORECASTING COMPUTER PROGRAM PACKAGE, VERSION 1.0

 PROGRAM NAME: PROJ
 DATE OF RUN (DD/MM/YYYY):  5/ 6/1995
 TIME OF RUN (HH:MM:SS):   13:29:55

 PARAMETER FILE NAME: AZ803CP.DAT
 GENERAL POPULATION DESCRIPTION:
 ARIZONA   RESIDENT   POPULATION   BY   COUNTY   AND   RACE   (W/I/O)

 BASE YEAR: 1980

 TARGET/SERVICE POPULATION DESCRIPTION:
 PRISON   ADMISSIONS;   PRISON   CELLS;   OBLIGATED   OPERATING   COST

 NO OF FIVE-YEAR PERIODS TO PROJECT = 2

 YEAR: 1990

 DISTRIBUTIONAL ANALYSIS OF POPULATN

 TOTAL POPULATN =     3735219.

 DISTRIBUTION OF POPULATN
  BY SEX
 MALE        1849940.
 FEMALE      1885279.

 DISTRIBUTIONAL ANALYSIS OF ADMIS'NS

 TOTAL ADMIS'NS =        2262.

 DISTRIBUTION OF ADMIS'NS
  BY SEX
 MALE           2118.
 FEMALE          145.

 DISTRIBUTIONAL ANALYSIS OF SENTYR

 TOTAL SENTYR   =        6686.

 DISTRIBUTION OF SENTYR
  BY SEX
 MALE           6353.
 FEMALE          333.

 DISTRIBUTIONAL ANALYSIS OF INCARC'N

 TOTAL INCARC'N =        6686.

 DISTRIBUTION OF INCARC'N
  BY SEX
 MALE           6353.
```

```
FEMALE          333.

DISTRIBUTIONAL ANALYSIS OF CELL

TOTAL CELL     =        6686.

DISTRIBUTION OF CELL
 BY SEX
MALE           6353.
FEMALE          333.

DISTRIBUTIONAL ANALYSIS OF OP COST

TOTAL OP COST  =   106971223.

DISTRIBUTION OF OP COST
 BY SEX
MALE      101648203.
FEMALE      5323019.
```

Example 9. Health Care, Projection of the Need for Short-term and Long-term Beds

This example shows a ten-year projection (by year) of bed needs for short-term care (less than 30 days) and for long-term care (30 days or more). This projection assumes the bed rates in the table presented below. The bed rates are expressed in terms of the ages of the bed users for short-stay hospital beds, and in terms of the ages of the residents for the long-term facility beds. The rates are relative to the resident population.

		Long-term Care Facilities			
	Short-stay	Nursing Home			Mentally
Age	Hospitals	Male	Female	Psychiatric	Handicapped
0-4	.00142	.00015	.00015	.00046	.00092
5-14	.00056	"	"	"	"
15-19	.00175	"	"	"	"
20-24	"	.0012	.0012	.00024	.00095
25-34	.00242	"	"	"	"
35-44	.00255	"	"	"	"
45-64	.00428	"	"	"	"
65-74	.01114	.011	.012	.00020	.00024
75+	"	.063	.097	"	"

Source: Derived from Tables 2, 29, 30, 77, 178, 179, 182, 183, 184, 185, 188, 530, and 597, Statistical Abstract of the United States, 1980. Rates are derived from age and facility distributional data from 1974 and 1976.

In the printout, ST BEDS refers to beds in short-stay hospitals, and the acronyms NH BEDS, PSY BEDS, and NH BEDS refer to beds in long-term care facilities (nursing homes, psychiatric facilities, and facilities for the mentally handicapped, respectively).

This example illustrates the application of DESTINY to address four different target populations (i.e., beds in the four types of facilities) simultaneously.

Listing 9. PROJ Run for Example 9 (Health Care, Projection of the Need for Short-Term and Long-Term Beds)

```
 DESTINY PLANNING AND FORECASTING COMPUTER PROGRAM PACKAGE, VERSION 1.0

 PROGRAM NAME: PROJ
 DATE OF RUN (DD/MM/YYYY):  5/ 6/1995
 TIME OF RUN (HH:MM:SS):   13:32:50

 PARAMETER FILE NAME: AZ803CH.DAT
 GENERAL POPULATION DESCRIPTION:
 ARIZONA   RESIDENT   POPULATION   BY   COUNTY   AND   RACE   (W/I/O)

 BASE YEAR: 1980

 TARGET/SERVICE POPULATION DESCRIPTION:
 NEED FOR SHORT-TERM & LONG-TERM BEDS (LONG-TERM: NURSING, PSYCH, MENTAL
HAND.)
 NO OF FIVE-YEAR PERIODS TO PROJECT = 2

 DISTRIBUTIONAL ANALYSIS OF POPULATN

 TOTAL POPULATN =     2718215.

 TOTALS OF TARGET POPULATION(S)
 ST BEDS        8883.
 NH BEDS       13025.
 PSY BEDS        837.
 MH BEDS        2337.

 YEAR: 1981

 DISTRIBUTIONAL ANALYSIS OF POPULATN

 TOTAL POPULATN =     2819125.

 TOTALS OF TARGET POPULATION(S)
 ST BEDS        9219.
 NH BEDS       13656.
 PSY BEDS        867.
 MH BEDS        2423.

 YEAR: 1982

 DISTRIBUTIONAL ANALYSIS OF POPULATN

 TOTAL POPULATN =     2920035.

 TOTALS OF TARGET POPULATION(S)
 ST BEDS        9555.
 NH BEDS       14287.
 PSY BEDS        897.
 MH BEDS        2510.

 YEAR: 1983
```

DISTRIBUTIONAL ANALYSIS OF POPULATN

TOTAL POPULATN = 3020944.

TOTALS OF TARGET POPULATION(S)
ST BEDS 9891.
NH BEDS 14918.
PSY BEDS 927.
MH BEDS 2596.

YEAR: 1984

DISTRIBUTIONAL ANALYSIS OF POPULATN

TOTAL POPULATN = 3121854.

TOTALS OF TARGET POPULATION(S)
ST BEDS 10227.
NH BEDS 15549.
PSY BEDS 957.
MH BEDS 2682.

YEAR: 1985

DISTRIBUTIONAL ANALYSIS OF POPULATN

TOTAL POPULATN = 3222764.

TOTALS OF TARGET POPULATION(S)
ST BEDS 10563.
NH BEDS 16180.
PSY BEDS 986.
MH BEDS 2768.

YEAR: 1986

DISTRIBUTIONAL ANALYSIS OF POPULATN

TOTAL POPULATN = 3325255.

TOTALS OF TARGET POPULATION(S)
ST BEDS 10889.
NH BEDS 16852.
PSY BEDS 1018.
MH BEDS 2857.

YEAR: 1987

DISTRIBUTIONAL ANALYSIS OF POPULATN

TOTAL POPULATN = 3427746.

TOTALS OF TARGET POPULATION(S)
ST BEDS 11214.
NH BEDS 17523.
PSY BEDS 1050.

```
MH BEDS        2945.

YEAR: 1988

DISTRIBUTIONAL ANALYSIS OF POPULATN

TOTAL POPULATN =     3530237.

TOTALS OF TARGET POPULATION(S)
ST BEDS       11539.
NH BEDS       18195.
PSY BEDS       1082.
MH BEDS        3034.

YEAR: 1989

DISTRIBUTIONAL ANALYSIS OF POPULATN

TOTAL POPULATN =     3632728.

TOTALS OF TARGET POPULATION(S)
ST BEDS       11864.
NH BEDS       18867.
PSY BEDS       1114.
MH BEDS        3122.

YEAR: 1990

DISTRIBUTIONAL ANALYSIS OF POPULATN

TOTAL POPULATN =     3735219.

TOTALS OF TARGET POPULATION(S)
ST BEDS       12189.
NH BEDS       19538.
PSY BEDS       1146.
MH BEDS        3211.
```

Example 10. Social Services: Forecasting the Counselors and Budget to Provide Certain Services to the Elderly Population

This example illustrates the use of the DESTINY program to project service levels, personnel, and budget levels required to provide social services to the elderly. The data used in this example are hypothetical. This example assumes that approximately five percent of the elderly population requires social services (specifically, 3% of those aged 65-69, 5% of those aged 70-74,and 7% of those aged 75+). The following tables indicate the average numbers of units of several types of service, resources, and cost required to provide social services to this served population.

Average Number of Service Units Per Case

	Service	No. of Units
S1.	Counseling	2 hours
S2.	Chore Services	16 dollars
S3.	Homemaker Services	750 dollars
S4.	Substitute Care	12 dollars
S5.	Day Care	7 dollars
S6.	Transportation	10 dollars
S7.	Other	10 dollars

Average Number of Resource Units Per Service Unit
(Service types as defined in the preceding table)

		No. of Resource Units per Service Unit (by Service Type)						
	Resource	S1	S2	S3	S4	S5	S6	S7
R1.	Counselor	1	0	0	0	0	0	0
R2.	Dollar (Purchase)	0	1	1	1	1	.5	.5
R3.	Dollar (Payment)	0	0	0	0	0	.5	.5

Average Cost Per Resource Unit
(Resource types as defined in the preceding table)

		Cost Per Resource Unit (by Resource Type)		
	Cost Category	R1	R2	R3
C1.	Direct Service	15	0	0
C2.	Purchased Service	0	1	0
C3.	Payment	0	0	1

In the social services example presented here, we show a three-year-ahead projection, as opposed to the ten-year-ahead projections that were illustrated in the other examples.

The printout shows the services, resources, and budget required to provide services to the served population. In a real application, the service ratios (3%, 5%, and 7%) would be estimated from client caseload data, and the unit of service, unit of resource, and unit cost data would be estimated from program administrative records.

The DESTINY program could be used to estimate the changes in the budget that would occur if different service levels or different service costs were adopted. Used in this way, DESTINY is an ideal tool in the evaluation of alternative strategies for rationing social services.

The example illustrates several of the different types of tables and crosstabulations that can be constructed by the DESTINY program. The total number of possible crosstabs is very large, and typically only a few of them would be selected by the user for printout. Up to nine different tables or crosstabulations may be constructed for each of the many variables forecast by the program (general population, target population (the elderly), service population (those receiving social services), seven social services, three resources, and three cost categories). These include tables or crosstabs by age, sex, race, age by sex, age by race, sex by race, age by sex by race, region, and race by region. In addition, nine different service-system-related distributions or crosstabs may be specified:

- distribution of services by type
- distribution of resources by type
- distribution of costs by type
- distribution of services by served population
- distribution of resources by served population
- distribution of cost by served population
- distribution of resources by services
- distribution of costs by services
- distribution of costs by resources

In this example, we present only a small fraction of the possible output tables.

Data such as these may be used to back up legislative budget request, to prepare Comprehensive Annual Services Program plans, or to estimate staffing levels. Additional runs could reveal the budgetary impact of changes in service levels or costs.

Listing 10. PROJ Run for Example 10 (Social Services, Projection of Counselors and Budget Needed to Provide Social Services to the Elderly Population)

```
 DESTINY PLANNING AND FORECASTING COMPUTER PROGRAM PACKAGE, VERSION 1.0

 PROGRAM NAME: PROJ
 DATE OF RUN (DD/MM/YYYY):  5/ 6/1995
 TIME OF RUN (HH:MM:SS):   13:36:48

 PARAMETER FILE NAME: AZ803CS.DAT
 GENERAL POPULATION DESCRIPTION:
 ARIZONA   RESIDENT   POPULATION   BY   COUNTY   AND   RACE   (W/I/O)

 BASE YEAR: 1980

 TARGET/SERVICE POPULATION DESCRIPTION:
 SOCIAL SERVICES FOR THE ELDERLY; 8 SERVICES, 3 RESOURCES, 3 COST
CATEGORIES
 NO OF FIVE-YEAR PERIODS TO PROJECT = 1

 YEAR: 1983

 DISTRIBUTIONAL ANALYSIS OF POPULATN

 TOTAL POPULATN =     3020944.

 DISTRIBUTION OF POPULATN
  BY SEX
 MALE        1490114.
 FEMALE      1530830.

 DISTRIBUTION OF POPULATN
  BY REGION
 APACHE        56418.
 COCHISE       86046.
 COCONINO      78946.
 GILA          37068.
 GRAHAM        23057.
 GREENLEE      10853.
 MARICOPA    1564786.
 MOHAVE        62054.
 NAVAJO        70367.
 PIMA         545662.
 PINAL         90021.
 STA.CRUZ      20673.
 YAVAPAI       73847.
 YUMA          91888.

 DISTRIBUTIONAL ANALYSIS OF ELDERLY

 TOTAL ELDERLY  =      344542.

 DISTRIBUTION OF ELDERLY
  BY SEX
 MALE         151885.
```

```
FEMALE       192658.

DISTRIBUTION OF ELDERLY
 BY REGION
APACHE         3592.
COCHISE       10119.
COCONINO       7908.
GILA           4198.
GRAHAM         2481.
GREENLEE       1232.
MARICOPA     186166.
MOHAVE         7886.
NAVAJO         5903.
PIMA          63245.
PINAL          9106.
STA.CRUZ       2345.
YAVAPAI        9390.
YUMA          10114.

DISTRIBUTIONAL ANALYSIS OF ELDR(SV)

TOTAL ELDR(SV) =       17254.

DISTRIBUTION OF ELDR(SV)
 BY SEX
MALE           7505.
FEMALE         9748.

DISTRIBUTION OF ELDR(SV)
 BY REGION
APACHE          181.
COCHISE         507.
COCONINO        396.
GILA            210.
GRAHAM          124.
GREENLEE         62.
MARICOPA       9322.
MOHAVE          395.
NAVAJO          296.
PIMA           3167.
PINAL           456.
STA.CRUZ        117.
YAVAPAI         470.
YUMA            506.

DISTRIBUTIONAL ANALYSIS OF COUNSLNG

TOTAL COUNSLNG =       34507.

DISTRIBUTION OF COUNSLNG
 BY SEX
MALE          15010.
FEMALE        19497.

DISTRIBUTION OF COUNSLNG
 BY REGION
```

```
APACHE          361.
COCHISE        1013.
COCONINO        793.
GILA            421.
GRAHAM          248.
GREENLEE        123.
MARICOPA      18645.
MOHAVE          790.
NAVAJO          592.
PIMA           6334.
PINAL           911.
STA.CRUZ        235.
YAVAPAI         941.
YUMA           1012.

DISTRIBUTIONAL ANALYSIS OF CHORE SV

TOTAL CHORE SV =      276057.

DISTRIBUTION OF CHORE SV
 BY SEX
MALE         120083.
FEMALE       155973.

DISTRIBUTION OF CHORE SV
 BY REGION
APACHE         2890.
COCHISE        8106.
COCONINO       6343.
GILA           3366.
GRAHAM         1988.
GREENLEE        987.
MARICOPA     149160.
MOHAVE         6322.
NAVAJO         4740.
PIMA          50668.
PINAL          7292.
STA.CRUZ       1878.
YAVAPAI        7527.
YUMA           8100.

DISTRIBUTIONAL ANALYSIS OF HOMEMAKR

TOTAL HOMEMAKR =    12940160.

DISTRIBUTION OF HOMEMAKR
 BY SEX
MALE        5628914.
FEMALE      7311246.

DISTRIBUTION OF HOMEMAKR
 BY REGION
APACHE       135452.
COCHISE      379987.
COCONINO     297316.
GILA         157762.
```

GRAHAM 93181.
GREENLEE 46267.
MARICOPA 6991865.
MOHAVE 296350.
NAVAJO 222174.
PIMA 2375079.
PINAL 341809.
STA.CRUZ 88026.
YAVAPAI 352815.
YUMA 379681.

DISTRIBUTIONAL ANALYSIS OF SUBSCARE

TOTAL SUBSCARE = 207043.

DISTRIBUTION OF SUBSCARE
BY SEX
MALE 90063.
FEMALE 116980.

DISTRIBUTION OF SUBSCARE
BY REGION
APACHE 2167.
COCHISE 6080.
COCONINO 4757.
GILA 2524.
GRAHAM 1491.
GREENLEE 740.
MARICOPA 111870.
MOHAVE 4742.
NAVAJO 3555.
PIMA 38001.
PINAL 5469.
STA.CRUZ 1408.
YAVAPAI 5645.
YUMA 6075.

DISTRIBUTIONAL ANALYSIS OF DAY CARE

TOTAL DAY CARE = 120775.

DISTRIBUTION OF DAY CARE
BY SEX
MALE 52537.
FEMALE 68238.

DISTRIBUTION OF DAY CARE
BY REGION
APACHE 1264.
COCHISE 3547.
COCONINO 2775.
GILA 1472.
GRAHAM 870.
GREENLEE 432.
MARICOPA 65257.
MOHAVE 2766.

```
NAVAJO         2074.
PIMA          22167.
PINAL          3190.
STA.CRUZ        822.
YAVAPAI        3293.
YUMA           3544.

DISTRIBUTIONAL ANALYSIS OF TRANSPRT

TOTAL TRANSPRT =      172535.

DISTRIBUTION OF TRANSPRT
 BY SEX
MALE          75052.
FEMALE        97483.

DISTRIBUTION OF TRANSPRT
 BY REGION
APACHE         1806.
COCHISE        5066.
COCONINO       3964.
GILA           2103.
GRAHAM         1242.
GREENLEE        617.
MARICOPA      93225.
MOHAVE         3951.
NAVAJO         2962.
PIMA          31668.
PINAL          4557.
STA.CRUZ       1174.
YAVAPAI        4704.
YUMA           5062.

DISTRIBUTIONAL ANALYSIS OF OTHER

TOTAL OTHER    =      172535.

DISTRIBUTION OF OTHER
 BY SEX
MALE          75052.
FEMALE        97483.

DISTRIBUTION OF OTHER
 BY REGION
APACHE         1806.
COCHISE        5066.
COCONINO       3964.
GILA           2103.
GRAHAM         1242.
GREENLEE        617.
MARICOPA      93225.
MOHAVE         3951.
NAVAJO         2962.
PIMA          31668.
PINAL          4557.
STA.CRUZ       1174.
```

YAVAPAI 4704.
YUMA 5062.

TOTALS OF SERVICE(S)
COUNSLNG 34507.
CHORE SV 276057.
HOMEMAKR 12940160.
SUBSCARE 207043.
DAY CARE 120775.
TRANSPRT 172535.
OTHER 172535.

DISTRIBUTION OF SERVICE(S)
BY SERVED POPULATION(S)

	COUNSLNG	CHORE SV	HOMEMAKR	SUBSCARE	DAY CARE	TRANSPRT	OTHER
ELDR(SV)	34507.	276057.	12940160.	207043.	120775.	172535.	172535.
TOTAL	34507.	276057.	12940160.	207043.	120775.	172535.	172535.

DISTRIBUTIONAL ANALYSIS OF COUNSELR

TOTAL COUNSELR = 34507.

DISTRIBUTION OF COUNSELR
BY SEX
MALE 15010.
FEMALE 19497.

DISTRIBUTION OF COUNSELR
BY REGION
APACHE 361.
COCHISE 1013.
COCONINO 793.
GILA 421.
GRAHAM 248.
GREENLEE 123.
MARICOPA 18645.
MOHAVE 790.
NAVAJO 592.
PIMA 6334.
PINAL 911.
STA.CRUZ 235.
YAVAPAI 941.
YUMA 1012.

DISTRIBUTIONAL ANALYSIS OF PURCHSVC

TOTAL PURCHSVC = 13716570.

DISTRIBUTION OF PURCHSVC
BY SEX
MALE 5966649.
FEMALE 7749921.

DISTRIBUTION OF PURCHSVC
 BY REGION
APACHE   143580.
COCHISE   402786.
COCONINO   315155.
GILA   167228.
GRAHAM   98772.
GREENLEE   49043.
MARICOPA   7411377.
MOHAVE   314131.
NAVAJO   235504.
PIMA   2517584.
PINAL   362317.
STA.CRUZ   93307.
YAVAPAI   373984.
YUMA   402462.

DISTRIBUTIONAL ANALYSIS OF PAYMENTS

TOTAL PAYMENTS =   172535.

DISTRIBUTION OF PAYMENTS
 BY SEX
MALE   75052.
FEMALE   97483.

DISTRIBUTION OF PAYMENTS
 BY REGION
APACHE   1806.
COCHISE   5066.
COCONINO   3964.
GILA   2103.
GRAHAM   1242.
GREENLEE   617.
MARICOPA   93225.
MOHAVE   3951.
NAVAJO   2962.
PIMA   31668.
PINAL   4557.
STA.CRUZ   1174.
YAVAPAI   4704.
YUMA   5062.

TOTALS OF RESOURCE(S)
COUNSELR   34507.
PURCHSVC   13716570.
PAYMENTS   172535.

DISTRIBUTION OF RESOURCE(S)
 BY SERVED POPULATION(S)
           COUNSELR   PURCHSVC   PAYMENTS
ELDR(SV)   34507.   13716570.   172535.
TOTAL   34507.   13716570.   172535.

DISTRIBUTION OF RESOURCE(S)
 BY SERVICE(S)

	COUNSELR	PURCHSVC	PAYMENTS
COUNSLNG	34507.	0.	0.
CHORE SV	0.	276057.	0.
HOMEMAKR	0.	12940160.	0.
SUBSCARE	0.	207043.	0.
DAY CARE	0.	120775.	0.
TRANSPRT	0.	86268.	86268.
OTHER	0.	86268.	86268.
TOTAL	34507.	13716570.	172535.

DISTRIBUTIONAL ANALYSIS OF DIRCTSV$

TOTAL DIRCTSV$ = 517606.

DISTRIBUTION OF DIRCTSV$
BY SEX

MALE	225157.
FEMALE	292450.

DISTRIBUTION OF DIRCTSV$
BY REGION

APACHE	5418.
COCHISE	15199.
COCONINO	11893.
GILA	6310.
GRAHAM	3727.
GREENLEE	1851.
MARICOPA	279675.
MOHAVE	11854.
NAVAJO	8887.
PIMA	95003.
PINAL	13672.
STA.CRUZ	3521.
YAVAPAI	14113.
YUMA	15187.

DISTRIBUTIONAL ANALYSIS OF PURCHSV$

TOTAL PURCHSV$ = 13716570.

DISTRIBUTION OF PURCHSV$
BY SEX

MALE	5966649.
FEMALE	7749921.

DISTRIBUTION OF PURCHSV$
BY REGION

APACHE	143580.
COCHISE	402786.
COCONINO	315155.
GILA	167228.
GRAHAM	98772.
GREENLEE	49043.
MARICOPA	7411377.
MOHAVE	314131.
NAVAJO	235504.

```
PIMA        2517584.
PINAL        362317.
STA.CRUZ      93307.
YAVAPAI      373984.
YUMA         402462.

DISTRIBUTIONAL ANALYSIS OF PAYMENT$

TOTAL PAYMENT$ =      172535.

DISTRIBUTION OF PAYMENT$
 BY SEX
MALE          75052.
FEMALE        97483.

DISTRIBUTION OF PAYMENT$
 BY REGION
APACHE         1806.
COCHISE        5066.
COCONINO       3964.
GILA           2103.
GRAHAM         1242.
GREENLEE        617.
MARICOPA      93225.
MOHAVE         3951.
NAVAJO         2962.
PIMA          31668.
PINAL          4557.
STA.CRUZ       1174.
YAVAPAI        4704.
YUMA           5062.

TOTALS OF COST CATEGORY(IES)
DIRCTSV$     517606.
PURCHSV$   13716570.
PAYMENT$     172535.

DISTRIBUTION OF COST CATEGORY(IES)
 BY SERVED POPULATION(S)
           DIRCTSV$    PURCHSV$    PAYMENT$
ELDR(SV)     517606.   13716570.     172535.
TOTAL        517606.   13716570.     172535.

DISTRIBUTION OF COST CATEGORY(IES)
 BY SERVICE(S)
           DIRCTSV$    PURCHSV$    PAYMENT$
COUNSLNG     517606.          0.          0.
CHORE SV          0.     276057.          0.
HOMEMAKR          0.   12940160.          0.
SUBSCARE          0.     207043.          0.
DAY CARE          0.     120775.          0.
TRANSPRT          0.      86268.      86268.
OTHER             0.      86268.      86268.
TOTAL        517606.   13716570.     172535.

DISTRIBUTION OF COST CATEGORY(IES)
```

BY RESOURCE(S)

	DIRCTSV$	PURCHSV$	PAYMENT$
COUNSELR	517606.	0.	0.
PURCHSVC	0.	13716570.	0.
PAYMENTS	0.	0.	172535.
TOTAL	517606.	13716570.	172535.

Cost of Using DESTINY

The cost of making a forecast includes three components -- the analyst time used in assembling the required data and in setting up the run (data entry), the computer running cost, and the program use charges (purchase or lease). For the DESTINY runs presented here, the analyst time varied from a few minutes to several hours. (These estimates assume that census and vital-statistics publications are readily available; otherwise, delays will be incurred in obtaining them.) The several-hour run was the first one, in which the base-year population data and other demographic parameters had to be collected. The health-care example required about an hour to extract the bed-use rate by age from several Statistical Abstract tables, none of which contained the information in the desired form. The other examples generally required only a few minutes to assemble the required data.

DESTINY runs are very fast, so that the amount of microcomputer time involved in making the projections is small. Apart from initial data entry, the major component of computer time involves examining different model specifications (changes in structural parameters or parameter values).

The major cost component of DESTINY application is the cost of the analyst's time in assembling the required data and entering it into the system. Compared to data-intensive methodologies such as microsimulation, the cost of analyst time would be low.

Joseph George Caldwell, PhD, developer of the DESTINY system, is a consultant specializing in program planning, evaluation, and policy analysis. His consulting career has included much work in studies, analysis, and system development in these disciplines, in a variety of application areas.

As president of Vista Research Corporation, he directed the project to develop the prototype MICROSIM microsimulation forecasting program for the US Department of Health and Human Services, and the Economic and Social Impact Analysis / Women in Development project for the Government of the Philippines.

He conducted needs assessment and client satisfaction surveys under the project, "Measuring the Effectiveness of Social Services," for the State of West Virginia. He developed the sampling plans for a number of major nationwide surveys, such as the Survey of Institutionalized Persons, the Elementary and Secondary School Civil Rights survey, the National Center for Health Services Research (NCHSR) Survey of Hospital Costs and Utilization, the Profession Services Review Organization (PSRO) Data Base Development Study, the US Department of Housing and Urban Development (HUD) Housing Market Practices Study, and the Vocational Rehabilitation Follow-up Study.

He developed the sampling manuals for a number of government statistical reporting systems, including the Social Services Reporting Requirements (SSRR), the Office of Child Support Enforcement Reporting Requirements, and the Utilization Review of Medicaid; conducted cost-benefit studies of day care and alcoholism treatment centers; directed the Health Care Financing Administration (HCFA) study of the cost impact of Skilled Nursing Facility / Intermediate Care Facility (SNF/ICF) standards on nursing homes; and developed improved matching/allocation formulas for distributing funds to states under the Medicaid, Aid to Families with Dependent Children (AFDC), and Vocational Rehabilitation programs. He served as manager of monitoring and evaluation for the Egypt Local Development II – Provincial project, the largest local-level infrastructure development project in the world funded by the US Agency for International Development.

In the field of information technology, he developed the Personnel Management Information System for the Government of Malawi civil service, and the data processing and reporting component of the EdAssist Education Management Information System used by the Government of Zambia Ministry of Education (Academy for Educational Development / US Agency for International Development / Zambia Ministry of Education).

He developed TIMES, the first commercially-available general-purpose Box-Jenkins time series forecasting program, and the popular short course, "Sample Survey Design and Analysis."

He is the author of several books, including The Value-Added Tax: A New Tax System for the United States and Can America Survive?

Dr. Caldwell received his BS degree in mathematics from Carnegie-Mellon University and his PhD degree in mathematical statistics from

the University of North Carolina at Chapel Hill. He previously served as Director of Management Systems for the Bank of Botswana; as Manager of Research and Development and Principal Scientist at the US Army Electronic Proving Ground’s Electromagnetic Environmental Test Facility; and as Adjunct Professor of Statistics at the University of Arizona in Tucson, Arizona.